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### **Urban Transport Development and Environmental Issues: A Perceptive Study along the First Phase Extension Site of Metro Railways in Kolkata**

**Dr. Anirban Roy**

*Assistant Professor, Department of Geography,*

*Government General Degree College, Narayangarh, Paschim Medinipur, West Bengal*

#### **Abstract:**

*Metro Railway started its commercial operation in Kolkata on 24<sup>th</sup> October, 1984. It was World's 85<sup>th</sup>, Asia's fifth and India's first underground railway system. Full stretch, from Dumdum in North to Tollygunge in South became operative on 27<sup>th</sup> September, 1995. Needless to say, this 'class-apart' experience of smooth and fast urban transportation got huge patronization from very beginning. Boasted on its popularity and considering the rising demand of efficient public transport system connecting the city fringes and highly populated suburbs to the city core, Ministry of Railways in Government of India and the state Government of West Bengal consented to extend metro railway services to further south of Tollygunge up to Garia. Unlike the operational underground line, the stretch between Tollygunge and Garia, marked as the Expansion Phase – I in the master plan of Metro Railways, was proposed to be constructed as an elevated corridor along Tolly's Nullah, a water channel connecting River Vidyadhari with Adi- Ganga.*

*In a never before move, the State Irrigation Department permitted the Railways to construct pillars along the thalwage of the Tolly's Nullah debarring whatever flow it maintained. To ensure the flow, Irrigation department planned for broadening the course and started evicting encroachers alongside Tolly's Nullah with the help of the administration.*

*The encroachers, living in shanties and semi-permanent huts are predominantly poor and lower middle class people, who make their small livings depending on the city of Kolkata. Although encroachment was unlawful to the administration, their eviction without proper rehabilitation stirred the much discussed debate of 'development of some at the cost of the others' once again arising complex social-environmental problems along the proposed metro construction site.*

*The present study was conducted on the Ward no. 97 and 115 of the then Calcutta Municipal Corporation between April and July, 2002, just before and after the eviction work was done along the proposed metro construction site. Two distinct groups, the people facing eviction or the 'victims' and the 'beneficiaries', was identified as their perception regarding the proposed project differ remarkably. This work deals with some physical and*

*social environmental problems perceived by the victims and beneficiaries related with the first phase of metro rail expansion in Kolkata.*

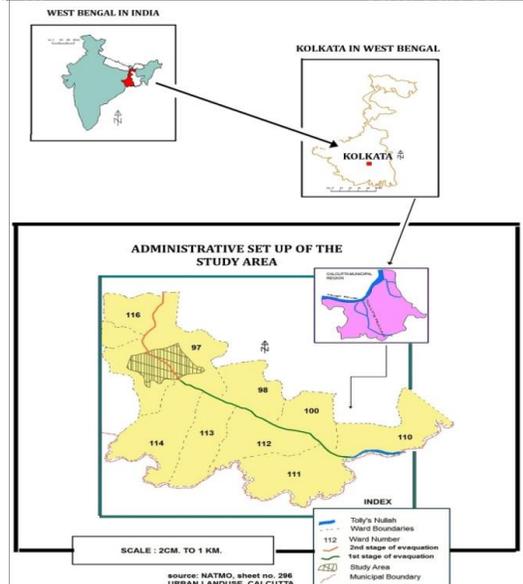
**Key Words:** *Urban transport, paleochannel, Drainage disruption, encroachment, eviction, perception.*

**Introduction:** Kolkata, once being the capital of British India and a noted industrial hub in Asia faces the population pressure from its early days. It is still the most important city of the Eastern India and a major economic centre. This city serves as the gateway to the Eastern and North-Eastern part of the country. Moreover the city of Kolkata had to assimilate the pressure of uprooted population from the East Bengal after partition of India in 1947. These lead to unplanned growth of the city where transport network development, particularly the roads, was neglected badly. During the first three five year plans less than eight kilometres of roads were added to its arterial transport system. While in the modern cities, road surface relative to its total area is around 30 percent, the city of Kolkata has barely 4.2 percent, way below the national average. The result is perpetual congestion on roads and slow movement of traffic that leads to loss of man-hour.

As early as 1949, Dr. B.C. Roy, the then Chief Minister of West Bengal, had, with foresight, requested a French team to consider the feasibility of an underground rapid transit system. A comprehensive study of the city's transportation needs made by the Calcutta Metropolitan Organization in 1967 suggested two high capacity corridors to enhance the ease of movement within and across the city. Based on this, a special metropolitan transport team of Planning Commission recommended in 1969 a techno-economic study for mode of transport selection. Ministry of Railways, Government of India, entrusted with this task received expert consultation from M/S Technoexports of Moscow, USSR in the end of 1970. The project was sanctioned in 1972 and the construction began in 1973. The commercial operation of Metro Railway, after overcoming several odds, started on 24<sup>th</sup> October, 1884. It was world's 85<sup>th</sup>, Asia's fifth and India's first underground railway. It started with a partial service between Esplanade and Bhawanipur, a 3.4 km route with five stations. The next phase, Esplanade to Tollygunge started operation from April, 1986. Part operation in the Dumdum to Shyambazar stretch began only in August, 1994. Full journey from Dumdum to Tollygunge became a reality on 27<sup>th</sup> September, 1995. At present, 142 trains consisting of eight coaches with gross capacity of around 2,500 passengers each run from 0700 to 2200 hours every weekday at interval of 10 minutes at peak times.

Metro services got huge patronage from the city commuters from its very beginning. The timely service, the smooth ride and most importantly its class-apart efficiency in operation made the metro rail a matter of pride for the civil society of Kolkata. Boasted on its popularity and to address the rising public demand, the authorities in the State and the Centre have decided to extend the metro service further south of Tollygunge up to Garia station. The project was sanctioned in 1999 at an estimated cost of Rs. 696/- crores. Unlike the previous one, this time it was decided to extend the metro line through an elevated track aligned along Tolly's Nullah. This section will be of 8.45 km of length with seven stations. This was termed as 'Expansion Phase – I' in the master plan of Metro Railways.

The preliminary work of expansion began in 2001. Suddenly some controversies aroused in the first quarter of 2002 regarding the displacement of a group of urban poor from the banks of Tolly's Nullah with connection to this expansion project. The socio-political environment became volatile with the intervention of media into the matter. Some renowned environmental activists raised the matter of the possible disruption of the Tolly's Nullah – Adi Ganga drainage system that added energy in the anti-expansion campaign. Thus a scope of geographical study has prepared right along the path of metro expansion that can reveal a new shade in the relation between urban transport development and the environmental perception.



**Fig. 1: Location of the study Area.**

**The study area:** The present study area, the stretch between Tollygunge and Garia railway station is the proposed site for extension of metro rail way along the course of Tolly's Nullah. This particular area, situated at the southern fringe of the city has made to the headlines during the winter of year 2001 because of a very complex and multifaceted issue of urban transport development raising debate across the society. The causes can be simplified into three categories –

- i) Expansion of Metro Railways from Tollygunge to Garia along the course of Tolly's Nullah by means of pillars and cantilevers.
- ii) Revival of Adi Ganga/ Tolly's Nullah drainage system under the Ganga Action Plan Phase II.
- iii) Eviction of poor people living alongside the bank of Tolly's Nullah.

The expansion of metro railways through construction of pillars and cantilevers on the bed of Toll's Nullah is a unique project of its kind in the country. Some questions have already being raised whether it will cause severe problem of drainage or completely destroy the Adi Ganga drainage system in near future.

Revival of the Adi Ganga drainage course also bears a question mark. In some areas it is now not even possible to demarcate its original thalwage. On the other hand eviction of the urban poor without proper compensation and rehabilitation plan attracted controversies across the socio-political strata of the urban society. To geographers this situation possesses a rare opportunity to examine the concept of

**Box – 1: Important Features of the Project**

- Number of elevated stations: 5
- Number of surface stations: 1
- Distance between stations: 0.9 to 1.9 km.
- Train composition: 8 coach trains.
- Class: One class
- Speed: 30 km/hour (Scheduled)
- Expected Traffic: 129, 942 persons/day
- Traction System: 750v/DC at 3<sup>rd</sup> rail top connection.
- Control: Rheostatic.
- Signalling: Continuous Automatic Train Control (CATC)

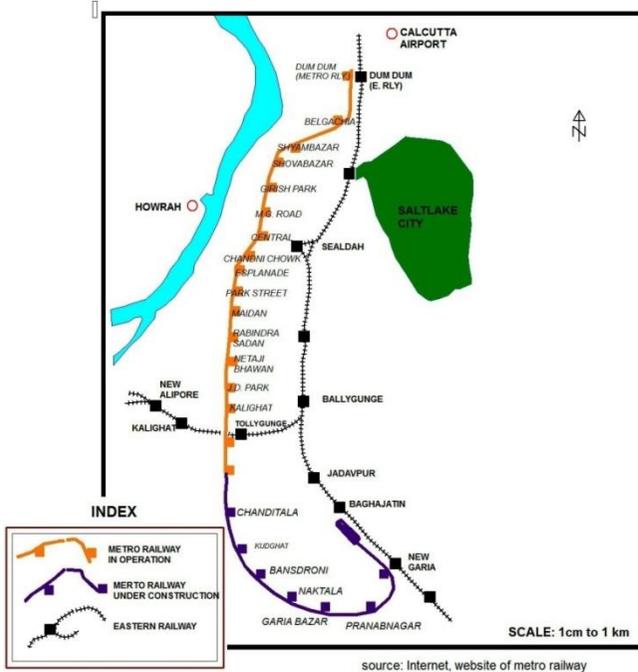


Fig. 2: Existing and proposed Metro Rail routes in Kolkata.

urban development in the basis of ‘Who gets What at the cost of Whom/What’. The first phase of evacuation along Tolly’s Nullah was done between Garia railway station and Kundghat. The second phase was scheduled to start shortly and extended from Kundghat to Hastings. So Kundghat locality may be identified as a junction point between two phases which eventually turned into a conflict ground of ‘pro-extension’ and ‘anti-extension’ group of people. Kundghat and its surroundings along both sides of Tolly’s Nullah are part of Ward No. 97 and 115 of Kolkata Municipal Corporation (KMC). Ward – 97 have been chosen as intensive study area because of its close proximity to the on-going construction site of the metro railway. More over the Ward – 97 offered almost every socio-political-

economic and environmental variety one

could get from the entire expansion site of the metro railways. As the expansion work was at a very early state, all of the major stakeholders – the eviction affected population and the potential beneficiaries of the project were available for study.

**The Extension Project of Metro railway:** Extension of metro railway between Tollygunge and Garia would link the southernmost end of the KMC with Eastern railways Southern section creating a much needed mode of communication for the population residing at that part of the city. The extension covers an additional 8.45 km length over the existing 16.45 km metro link between Dumdum in North and Tollygunge in South in the Kolkata Metropolitan Region.

**i. The Proposal:** The proposed extension project includes laying of double line partly on the viaduct and partly on the surface. Major part of this, approximately 7.50 km is planned to be constructed over the Tolly’s Nullah. Rest 0.75 km is on surface and 0.20 km is over roads. New Garia terminus of the metro rail will be closely located to the existence Garia railway station of the Eastern Rail. The viaduct will be of 7.5 km length at an elevation of 13 metres above the ground. This will be constructed over Reinforced Cement Concrete (RCC) piers of two metres diameter over pile foundation. The piers will be at around 25 metres interval and will follow the centre line of Tolly’s Nullah bed. The bed-width of the Nullah varies from 15 metres to 19 metres. There will be total six stations in this extended route. Out

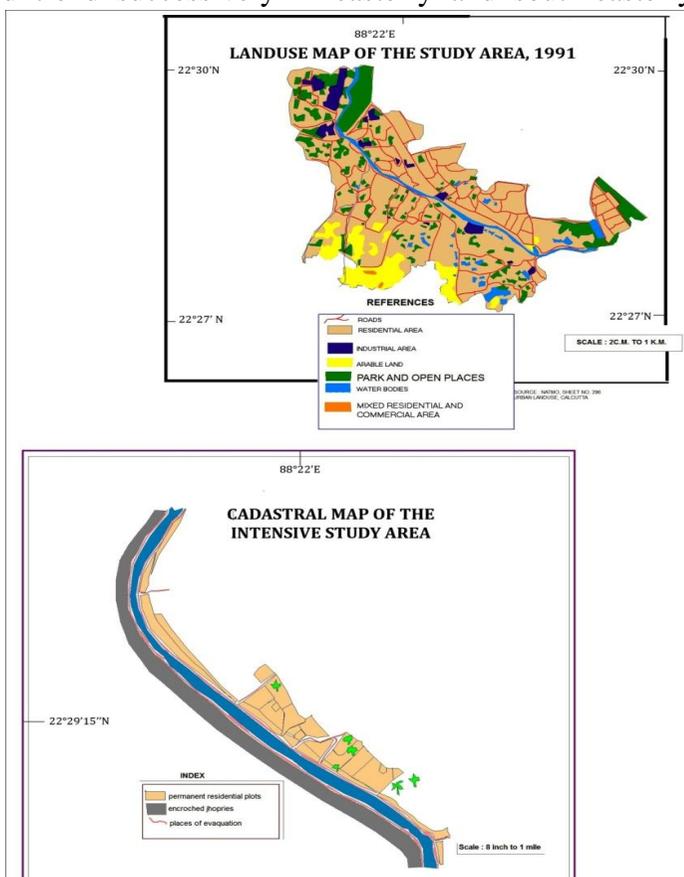
of six, five stations will be elevated and one will be on surface. Approximately one lakh people will be benefited daily after the completion of the Garia – Tollygunge expansion project.

**ii. Environmental quality along extension site:** According to the survey report prepared by the metro rail authority prior to the implementation of the expansion project, the Land Class Units (LCUs) in the core area i.e. between Garia station and Tollygunge terminus, along the Tolly's Nullah course are distributed as 6 percent water bodies, 32 percent residential areas, 38 percent for mixed uses and rest 28 percent is open space. The overall distribution of LUCs in the entire study area i.e. 40 sq.km area covering ward no.- 97 and 115 of KMC, accounts for nearly 60 percent residential uses, open spaces almost 23 percent and rest is for mixed use.

**a) Physico-chemical:** At the study area, the principal water course is Tolly's Nullah that, in parts, traditionally called Adi Ganga. However, investigation on the paleochannels of the river Ganga in the deltaic plains of Kolkata reveal that there were two major paleochannels of river Ganga during the Holocene period. None of these two paleochannels follow the course of Tolly's Nullah. There was another small paleochannel that start at the location of Hastings, south of Fort William and trend successively in easterly and south-easterly directions joining with paleochannel near Tollygunge. It was later excavated and renovated by Major Tolly in 1775, for commercial navigation purpose and extended towards east up to Shamukpota near Sonarpur joining river Vidyadhari. This course there after is known as Tolly's Nullah and commonly termed as Adi Ganga, though the original paleochannel of Adi Ganga is different. The present status of Tolly's Nullah is

extremely deteriorated due to silting, growth of water hyacinths and waste disposal from the residential buildings, market places and small industries situated at its banks.

The geohydrological setup of Kolkata city indicates that groundwater exists in both unconfined and confined aquifers in the silty zone. Piezometric surface study indicates varying water tables



**Fig. 3 & 4: Land use pattern in the study area.**

from 4.6 to 15.6 meters below ground level. In Tollygunge – Garia belt, the water table was recorded within 13 to 14 meters below the ground.

The climate in Kolkata is humid-tropical. The extremes of day time temperature during April to June have been recorded at 43.9° Celsius and night time temperature in the month of January to March has been recorded at 10°C. The wind speed varies in the range of 3.9 to 7.6 km/h and predominant wind directions are from south and southwest.

The quality of ambient air in the densely populated study area cannot be stated as good. It has crossed the allowable values of Suspended Particulate Matters (SPM), Sulphur Dioxide (SO<sub>2</sub>), and Nitrogen compounds (NO<sub>x</sub>) as per National Ambient Air Quality Standards for residential areas. The prime source of air pollution is vehicular emission on the busy roads and poor dispersal of pollutants.

The day time noise level as recorded in the study area varies from 61 to 71 decibels (db) which is higher than the permissible value of 55 db.

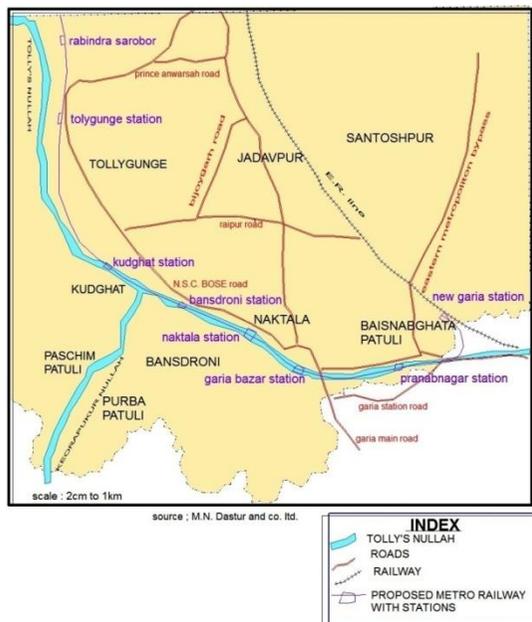
**b) Biological:** The terrestrial floristic status in the study area is poor due to large scale urbanization, which is to be precise, largely unplanned in nature. A little over one hundred floristic species have been recorded. The predominant among them are common varieties of fruit bearing and flowering trees along with foliage and ornamental flora. Common floristic species recorded are Jackfruit, Mango, Areca Nut, Banana, Coconut and Gulancha etc.

Aquatic ecological status of Tolly's Nullah for the stretch from Siriti near Tollygunge to Garia is poor. A few species of phytoplankton and zooplankton were identified. The water course is mostly filled with water hyacinths. There is a sparse growth of vegetation, commonly shrubs and creepers upon the course of Tolly's Nullah.

**c) Human:** The total population in the study area comprising the ward no. 26 of Kolkata Municipal Corporation was nearly 0.8 millions in 2001 (Census, 2001). The literacy rate was 76 percent in 1991 and increased to 89 percent in 2001 (ibid). The communication, especially road, depends upon two arterial transport lines i.e. N.S.C Bose road, connecting Garia and Tollygunge and Raja S.C. Mullick road connecting Garia, Jadavpur and E.M bypass. There are too many interconnecting roads between these two arterial roads that lead to massive traffic jam at every crossing in the busy hours of the day. The principal mode of public transport in the Garia – Tollygunge belt is public and private bus services. Besides there are para-transits like Taxi, Auto-Rikshaw etc.

The study area is an added area of KMC that came under the urban civic body in 1980's. The city of Kolkata experienced huge unplanned settlements along its fringe at that time. Naturally the aesthetic part of the study area, particularly the close surroundings of Tolly's Nullah does not contain any worth mentioning features.

**iii. EIA, EMP and risks:** Environmental Impact Assessment (EIA) is potentially one of the most valuable interdisciplinary decision making tool with respect to development projects. It is an ideal anticipatory mechanism allowing measures that ensure environmental compatibility at the facet of economic development. According to United Nations Environment Programme (UNEP, 1988), EIA is a formal process that is a must for any proposed development project to reduce the unacceptable changes to local environment. Based on the proposed extension project features and the prevailing environmental status of



*Fig 5: Existing and proposed transport network of the study area.*

The present status of Tolly's Nullah, as mentioned earlier, is in highly adverse state. Construction of Reinforced Concrete Column (RCC) piers at the centre line or the thalwage line of Tolly's Nullah between Kudghat and Pranabanandanagar would certainly reduce the flow area of the channel, at least where it still maintains some flow. But it can be compensated through excavation of the channel and widening it along both side of the present course. Very little eviction would be required from the encroached lands alongside the Nullah, which originally belongs to the State Irrigation Department. As per the proposal, there would be no discharge of waste water from the Metro Railways to the Nullah. So the project apparently would not make any impact on the quality of Tolly's Nullah water.

There would be significant beneficial impact on the ambient air quality due to introduction of pollution free transport system in the area. It will also release pressure on the current fossil fuel dependant transit system of the locality like bus, taxi and auto-rickshaw. The impact due to noise produced by the running trains would marginally affect the environment adversely.

On the ecological front, no significant impact is visible in terrestrial part. In highly stressed aquatic ecology of Tolly's Nullah, there will be a marginal improvement due to formation of sub-stratum on the portion of RCC piers dipped under water by algae and other bacteria to facilitate the purification of water and formation of aquatic life, provided the water flow along the Nullah course get improved.

Impact due to relocation of few residential settlements may invite marginal adverse impact. Nevertheless, the impact of infrastructure, employment potential, economic growth of the area, improvement on social set-up and life style and community health would be

the study area, two potential impact areas have been identified as – the water environment of Tolly's Nullah and the Human environment.

If the proposed project is abandoned, the impact due to 'No Project' will continue to remain adverse due to loss of an opportunity of a major investment towards infrastructural development of the area in particular and the entire Kolkata city in general. Besides growing hardship of people living in Garia – Tollygunge belt in accessing fast, modern and pollution free mass transit system is another issue to address.

The proposed route alignment from Tollygunge to Garia by constructing viaduct over Tolly's Nullah from Kudghat to Pranabanandanagar covering 7.5 Km only has been considered keeping in mind to minimise the impact on land and Human environment.

beneficial. However the impact on passengers and community safety may become significantly adverse if proper safety measures are not adopted.

Environmental Management Plans (EMP) adopted by Metro Rail authority may create some adverse impacts. The areas of concern are firstly the Tolly's Nullah itself and the second is the human environment related to displacement and safety. The EMP proposal takes into consideration of the project in totality since the commencement of the construction activities at site. During construction period several proposals have been made to avoid the adverse environmental impacts. The major environmental improvement task would be the complete restoration of Tolly's Nullah for the stretch on which RCC piers will be constructed. It requires desilting and widening of the Nullah course to compensate the reduced flow area. After desilting the side slopes of the Nullah need to be protected by geomembrane liner over which per-cast slabs to be placed up to the embankment level. The embankment needs to be widened, protected and beautified by tree plantation and illumination of the Nullah bank. The execution of the Nullah improvement work will be undertaken by the Department of Irrigation and Water ways, Government of West Bengal. It is expected that the improvement of the entire course of Tolly's Nullah from Hastings to Garia would be taken up by the Government of West Bengal. Adequate care is need to be taken by the local public and the state administration so that no further encroachment are repeated. Discharge of untreated effluents from the settlements including market complexes and small scale industrial units into the Nullah needs to be prevented. The adverse impact to the human environment can be substantially minimised by least demolition of residential buildings, providing passenger amenities and safety in travel by Metro Rail. Public cooperation is needed in holding the disciplined culture of rapid transit system that is clean and eco-friendly.

Railway risks are concerned with passenger's safety and community safety. Events like structural failure, derailment, power failure, signalling error, fire and human error would lead to panic among the passengers and the public living nearby. All those hazardous events do not have the same consequences. Consequences due to fire or collision may lead to disastrous situations. Some major safety measures in the proposed extension site to avoid disastrous consequences include structural stability of viaduct over Tolly's Nullah, precaution against derailment, performance requirement, rolling stocks, speed restrictions, vestibule coaches etc.

**iv. Life along the Tolly's Nullah:** Three distinct economic classes of the residents can be viewed easily in the intensive study area. Well decorated, multi-storeyed buildings of well to do people are situated away from the Nullah course. Middle class residences are scattered in between the riches and the urban poor are confined along the bank of the Tolly's Nullah. Particularly this class of people living near the bank are direct victims of 'development' i.e. they will be evicted from their homes and whatever belongings they have to make way for the broadening work of the Nullah course to compensate the flow area.

The area bounded by M.N. Ghose road and the Tolly's Nullah is entirely inhabited by a group of people who are refugees, though they are very eager to hide the information about their past residence, coming from the adjacent country of Bangladesh during the decade of

1980s. Clearly they are encroachers and residing on the state owned land illegally. Squatter type settlements prevail, covering the area with low roofed thatched or tiled houses made of mud or brick walls. Unplanned growth of ill spaced houses created sever problem of ventilation and sanitation. A few houses have latrine of their own, but seldom are they of sanitary type. For others, the Nullah course is the only place for defecation. Nearly all bathrooms are of open type and the horribly polluted Nullah water is used by most of the residents for cleaning purposes. The only source of potable water in the area is a Kolkata Corporation water supply tap where a very long serpentine queue of pots never ends. There is a tube well, but it only emits saline and silty water, thus almost unusable for most purpose.

Social environment of the area cannot be stated as good. Lack of recreational facilities, poor urban amenities and above all the tough life struggle made the local residents a bit rustic and devoid of aesthetic sense, but there are always exceptions. The prevailing insufficient life conditions sometimes tended the local unemployed youth to antisocial activities but according to the residents, the area is more or less peaceful.

Contrary to the disease infected quarrel-clad livelihood of the squatter a far better healthy living condition is found in the adjacent middle and high class neighbourhood. Permanent concrete structures, with adequate spaces and better ventilation, stand apart contrasting to their poorer counterparts. Sanitation is good with every homestead provided with sanitary latrines and piped water. Almost all houses have their own connection of corporation water. The urban amenities like garbage disposal, health care, education, efficient and available transport system and fire control etc. are good or moderate here. Almost every house possesses several consumer durable items like television, refrigerator, two-wheelers etc. Predominant fuel used in kitchen is LPG while some use Kerosene along with LPG. The life among the better-offs are more or less peaceful, though they want local authorities to act more responsibly. Apparent ease of life promoted different aesthetic and cultural activities among the residents. According to the respondents of higher class residential areas the area suffer from noise pollution caused by some small scale industries located nearby. Among other odds there are lack of pure ambient air and intermittent agitation performed by the residents of the squatter.

### **Perception of the Changing Environment; the Victims and the Beneficiaries:**

Analysing the overall perception of the interviewed population, it is clear that there are three distinct groups of respondents. One that has a negative attitude, one that is non-concerned and the other that feels the project will be beneficial.

The first group is mostly comprised of those people who live on the banks of the Tolly's Nullah and were directly being hit by the eviction process. Most of them are economically backward urban poor, living there life on small time money earned from odd jobs. They have been promised a paltry sum of two and a half thousand rupees per family as compensation. This will hardly suffice to find a new home anywhere. Construction of Metro Rail in the proposed area will escalate land price locally and the paltry compensation will not create the provision for paying escalated house rent, leave alone the scope for buying

own land. More over they will lose whatever employment they have and will be compelled to look for new jobs.

According to these people, the ‘victims’, sound pollution will increase in the area. Another problem that they brought forward was that, once the Nullah is renovated and widened for metro construction, the present prevalent practice of garbage disposal into the Nullah course and use of the same as open latrine will have to stop. Without proper planning for garbage disposal and public sanitation it will cause a huge problem to the residents living nearby.

The second group of respondents, who feels that the extension of metro rail will have no significant effect on their daily life as well as on the local environment, are predominantly people not hit by the eviction process. They mostly earn their livings from the employment generated within the locality or they are self employed who do not need to commute distances on regular basis. Also this group is almost ignorant about the whole process of metro rail extension and least bothered about its pros and cons.

The third group of respondents can well be termed as ‘beneficiaries’ because they thought that the process of metro rail extension and the works allied with it i.e. removal of shanties, broadening of the Nullah course etc. will lead to a better socio-cultural urban environment with the dividend of improved sanitation and faster transportation. These people essentially belong to the socio-economically better-offs residing away from the Nullah course. Therefore, they will not possibly be affected by the increased sound pollution caused by the metro-rail. Occupationally the beneficiaries are mainly white-

collared workers intricately connected with the city core to earn their living. They need faster and efficient transport mode. Expansion of metro railways over Tolly’s Nullah will provide them better opportunities and will help to reduce the time constraint. Thus they earnestly support the metro extension project.

**Concluding remarks:** The extension of metro rail from Tollygunge to Garia is absolute necessary in view of the rapidly growing size of south suburban Kolkata. This extension will vent the pressure on the road ways and pave the way for overall improvement of the area. This line will also act as a fast corridor

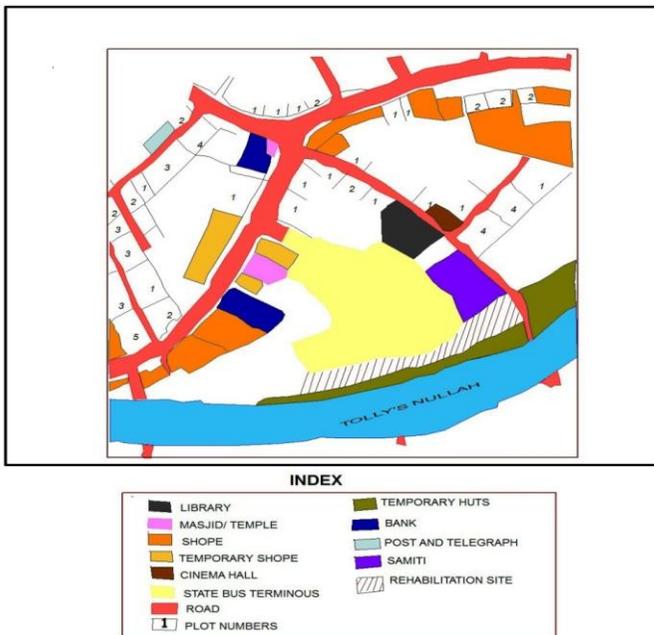


Fig. 6: Proposed rehabilitation site of the evicted families.

Source: Dastur & Co.

between Northern and Southern suburbs of Kolkata. Moreover, it will connect between two suburban sections of Eastern Railways i.e. Sealdah South and Sealdah Main. It will be a relatively less polluting rapid mass-transport system catering more than one lakh commuters a day. As to the means and ways of extension project, there are some controversies. The present route over the Tolly's Nullah has proponents and opponents but on the whole, after thorough evaluation of existing human and environmental status of the region, appears to be the best option. Agreed that, some people, mostly unauthorised settlers on the bank of Tolly's Nullah, will be displaced by the implementation of the project, but that may be termed as a 'necessary evil' affecting a minor section of the population against the betterment of a far larger population base and over all development of the transport scenario in the city of Kolkata.

There has been some proposal of compensation to the affected population, which perhaps still has a scope for enhancement. Keeping in mind the economic condition of the evicted people it can be said that in a welfare state like India, administration cannot shred their responsibility towards the weakest section of the society, here the urban poor, just because they have settled in a part of the city illegally. Hopefully the State and the Central Government came up with a plan to relocate the evicted families under the '*Balmiki Awas Yojona*' but some questions still humming in the air about the capability of the displaced families to avail the scheme.

In fine it can be said without doubt that on completion of the metro rail extension project between Tollygunge and Garia, it will be a major boost to the urban development in the city of Kolkata.

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