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FEASIBILITY STUDY OF MASS RAIL TRANSIT ON EXISTING RAIL LINES IN CHATTOGRAM CITY

Jewel Rana Palit*[1] and Md. Ataur Rahman[2]

[1]Graduated Student,Department of Civil Engineering, Chittagong University of Engineering & Technology, Chattogram. e-mail: tpalit7@gmail.com
[2]Graduated Student, Department of Civil Engineering, Chittagong University of Engineering & Technology, Chattogram. e-mail: engataur14ce07@gmail.com

***Corresponding Author**

ABSTRACT

Chattogram is a major coastal city and the heart of economy of Bangladesh. The transportation network represents the flowing blood in the veins of economy. Due to exponential increase of population, the traffic pressure is heavy on roadway and this leads to traffic congestion. The Railway is another mode of transport which provides fast and congestion free movement of passengers and cargo. With the introduction of Mass Rail Transit in a form such as commuter train to city rail network, Chattogram has a real opportunity to become a tycoon in the industrial sector. Moreover, the circulation of traffic will be congestion free. But due to lack of proper transit system, this area is being ignored. Hence an initiative has been taken to study the feasibility of Mass Rail Transit on existing rail lines within Chattogram City.

The feasibility study has been done with subsequent physical investigation and detailing of all the existing permanent ways and several infrastructures of city rail network such as signals, level crossing, stations etc. The land use map of Chattogram City has been collected. Afterwards, the present area coverage with respect to land use has been checked. It has been found that present area coverage is not adequate for introducing Mass Rail Transit in existing rail network. Moreover, people from many outer periphery zones can't access to the network easily. Finally, few alternate routes have been proposed with their increased area coverage to improve the city rail network.

Keywords: *Traffic congestion, Mass Rail Transit, Area coverage.*

1. INTRODUCTION

From engineering aspects, a city should be free from traffic congestion, environmental pollution and must provide safety in traffic movement to all inhabitants. Chattogram is a significant littoral city and economic center of Bangladesh. The city is located at the intermediate portion of the Chattogram topographical Hill Tracts and the Bay of Bengal, having a global co-ordinate 22°22′N & 91°48′E. Almost 40% of Bangladesh's overall industrial outcome, 75% of its worldwide trade and 45% of its national revenue are achieved from Chattogram (Chittagong,2019).

The transportation system of Chittagong mainly consists of roadways, railway, waterway & airway. The roadway is the most common mode of transportation that is frequently used by people. Like other developed cities in the world, there is no mass transport system besides general road networks. With the extensive population growth, the highways have become saturated with traffic. As the inhabitants of the city have started to increase exponentially, the Chittagong Development Authority (CDA) has taken a few efficient transportation initiatives to lessen the traffic congestion in Chattogram (Chittagong Development Authority,2019). But the necessity of a properly planned transit system is still hunting the development of the city. Chattogram city, having about 59.45 km of rail-lines, utilizes almost less than half of its asset. This railway network may be used to facilitate the transportation system through mass transit to reduce the extensive pressure of congestion in highways.

Adopting "Mass Rail Transit" in the local railway lines can not only boost the economy but also shift the extra pressure of traffic from highway to rail transport. By using the transit system of the same, other cities of the country can also push a step forward to sustainable development. This study deals with the scope of mass transit system in existing local rail lines and recommends some improvement options.

2. OBJECTIVE & METHODOLOGY

This study follows three prime objectives.

- To survey the existing permanent way in city area & find out its present status.
- To check the feasibility of Mass Rail Transit regarding the improvement of the system.
- To propose alternate route regarding the feasibility of Mass Rail Transit on existing rail lines.

Initially the local rail lines of Chattogram city area was selected as the case study area. A railway map was collected, and the rail lines were divided into 12 splits under 5 routes to ease the work. A detail reconnaissance survey had been conducted to assess the present condition of the existing rail lines. After surveying each route, several characteristics of the existing signals, stations, level crossings and gauge of rail lines were observed with the classification of signals into active or inactive, stations into very good, good, fair and poor, level crossings into guarded / unguarded, double tracks / single track, Busy / Less busy, rail lines into broad gauge, meter gauge and narrow gauge.

After analysing data, it was found out how much area the existing rail lines will cover and how much people will be attracted towards the Mass Rail Transport on existing rail lines from the connecting highways. Some limitations were fixed during survey such as inactive signals, unguarded level crossings, insufficient number of stations, poor strengthening condition of rail lines. Based on land use and other necessary details, a final proposal was given for providing Mass Rail Transit.

3. PHYSICAL INVESTIGATION

The whole existing rail network has been surveyed and necessary data have been obtained through this survey along with some help from the corresponding authority. In order to ease the arrangement,

the whole network is divided into 5 sections which are further sub-divided into 12 splits. Five major sections are:

- Sholosohor-Oxygen-Chittagong University
- Ambagan-Sholosohor-Kalurghat
- North Halishohor-Port Colony-Marine Academy
- Middle Salimpur-Ambagan- Rail Station-Bander thana
- Bhatiari-Middle solimpur-north halishohor-Cement Klinker

All splits were investigated physically in details. The existing city rail network collected from Google Earth has been shown in Figure 1. The whole rail network within Chattogram City boundary which were divided into 5 routes, the details of the level crossings are showed in Table 1 along with their respective locations. It should be noted that all rail tracks within city area are metre gauge.

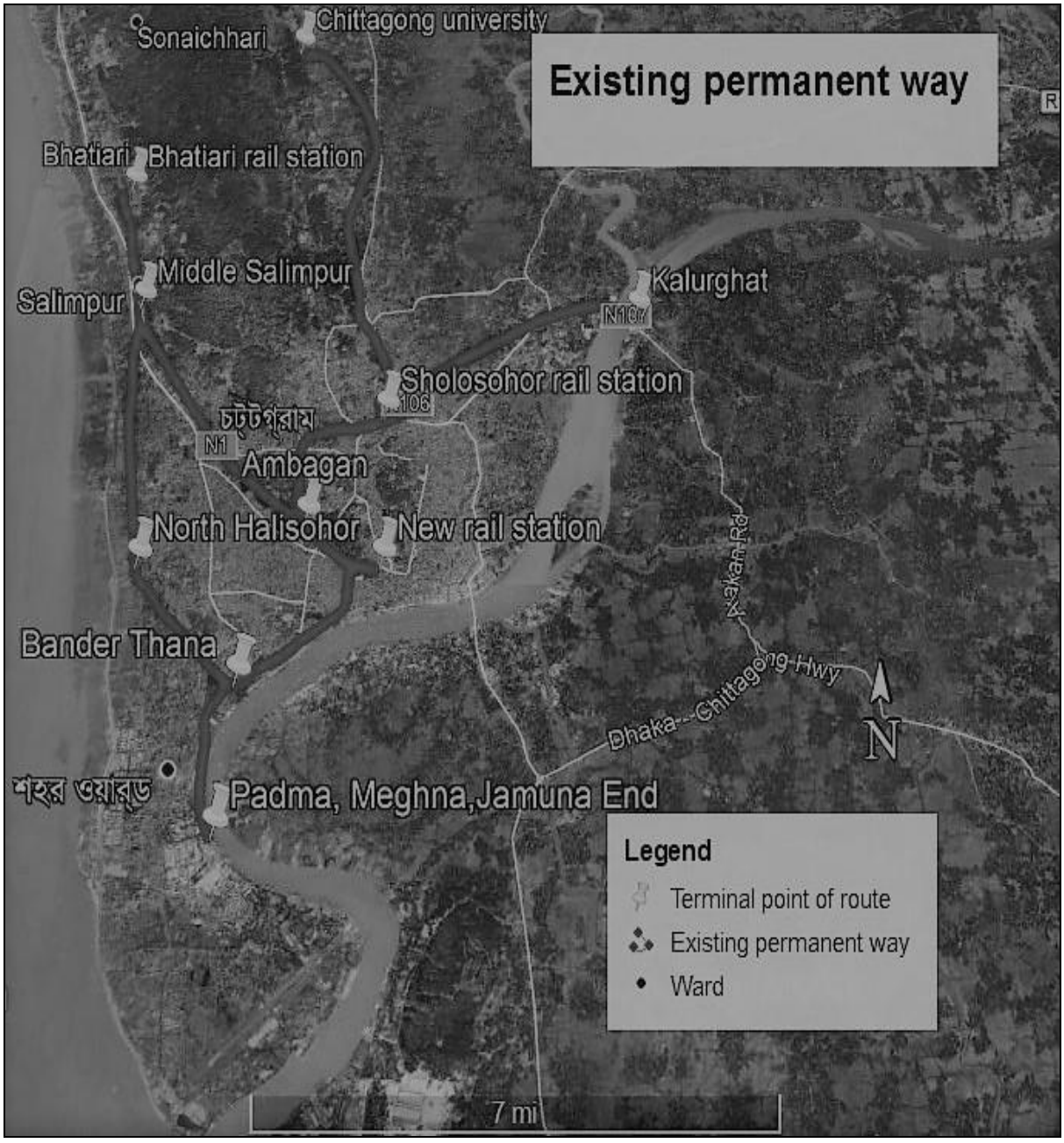


Figure 1:Existing permanent way

Table 1: Status of level crossings of existing rail lines within city area (Personal Field Survey,2019)

Route Name	Split Name	Location	Physical feature		
			G/U	D/S	B/L.B
Sholoshahar-Oxygen-Chittagong University	Sholoshahar-Oxygen	Oxygen	G	S	B
		Amin jute mill	G	S	L.B
		Raufobad	G	S	L.B
		Basher market	U	S	L.B
		Forest gate	G	D	L.B
	Oxygen-Chittagong University	Baluchora	G	S	L.B
		Notun para	G	S	L.B
		Borodigir par	U	S	L.B
		College road	U	S	L.B
		Fauzi flower mill	U	S	L.B
		Chowdhury hat	U	S	L.B
		Fathehabad	U	S	L.B
		Nondirhat	U	S	L.B
		CU	G	S	L.B
Ambagan-Sholoshahar-Kalurghat	Ambagan-Sholoshahar	2 no gate	G	D	B
		Khulsi	G	D	B
		Jhautola bazar	G	D	L.B
		Ambagan	G	D	B
	Sholoshahar- Kalurghat	Muradpur	G	S	B
		Sunnia madrasa	U	S	L. B
		Shyamoli residential	U	S	L. B
		Chand mia road	U	S	L. B
		Bahir signal	G	S	L. B
		Rastar matha	G	S	B
		A.K khan school Road,mohra	U	S	L.B
		Moulovi bajar	U	S	L.B
		Kalurghat	G	S	B
North halishahar-Port Colony-Marine Academy	North halishahar-Portcolony	Halishahar,boropul	G	S	L.B
	Portcolony-Marine Academy	Port colony	G	D	L.B
		Gasfill	G	S	B
		Port residential area	G	S	L.B
		Saltgola	U	S	B
		M.P.B gate	U	S	B
		Labour colony	U	S	B
		China mate	U	S	B
		Airport road 1 (TSP Complex)	U	S	L.B
		Airport road 2 (Eastern Refinary)	U	S	L.B
		Jamuna	U	S	L.B

Contd.

Route Name	Split Name	Location	Physical feature		
			G/U	D/S	B/L.B
		Megna	U	S	L.B
		Padma	U	S	L.B
Middle solimpur-Ambagan-Rail Station-Bander thana	Middle solimpur-Ambagan	Pahartoli	G	3 tracks	B
		Pahartoli Cda	G	D	B
		Ispahani	G	D	B
		Koibollodham	G	D	L.B
		Cda 1	G	D	L.B
		Fakirhat 1	U	D	L.B
		Fakirhat 2	U	D	L.B
	Ambagan-Rail station	Kodomtoli	G	5 tracks	B
	Rail station-Bander thana	Maderbari	U	S	B
		Rashid building	U	S	L.B
		Naval gate	G	S	B
		Barek building	U	S	B
		2 no gate bander	U	S	L.B
		3 no gate	U	S	B
Bhatiary-Middle solimpur-North halishahar-Cement clinker	Bhatiary-Middle solimpur	Kalushah Nogor, Overbridge	U	S	L.B
		Fauzdharhat Cadet College	G	3 tracks	L.B
		Jalil textile	G	4 tracks	L.B
		Jalil station	U	4 tracks	L.B
		BMA gate	G	D	L.B
		Port link	G	D	B
		Baneer bazar	G	D	
	Middle solimpur-North halishahar	Chowdhury Para	U	S	L.B
		Abbas Para (1)	U	S	L.B
		Abbas Para (2)	U	S	L.B
		Alisha majar	U	S	L.B
		Ful Chowdhury para	U	S	L.B
		Jella para,north cattoli	G	S	L.B
		Colonel road	U	S	L.B
		Ishan mohajon road	U	S	L.B
		Jella para,north cattoli	G	S	L.B
	North halishahar-Cement clinker	-	-	-	-

Here G/U means guarded/unguarded, D/S means double / single track, B/L. B means busy or less busy. It can also be observed clearly that there are no crossings in the Noth Halishahar- Cement Clinker split. The reason is that at present no permanent way exists there. The 12 splits are also tabulated along with their measurement and respective signal features in Table 2.

Table 2: Split length, Status of existing stations, signals within Chattogram City (Field Survey,2019)

Route Name	Split Name	Length (Km)	Station		Signal	
			Station name	Condition	Active	Inactive
Sholoshahar-Oxygen-Hathazari	Sholoshahar-Oxygen	3.50	Sholoshahar	Good	2	1
	Oxygen-Chittagong University	10.20	Notunpara	Good	6	0
			Chowdhury hat	Poor		
			Fatehabad	Good		
Ambagan-Sholoshahar-Kalurghat	Ambagan-Sholoshahar	4.05	Jhautola	Poor	9	0
	Sholoshahar-Kalurghat	7.80	Janali Hat	Good	9	0
North halishahar-Portcolony-Marine Academy	North halishahar-Portcolony	3.40	-	-	1	0
	Portcolony-Marine Academy	6.20	-	-	0	0
Middle Solimpur-Ambagan-Rail Station- Bander thana	Middle Solimpur-Ambagan	7.50	Pahartoli	Fair	19	0
	Ambagan-Rail Station	1.50	Chittagong rail junction	Good	33	0
	Rail station-Bander thana	4.30	Debar Par	Poor(off)	0	0
Bhatiary-Middle Solimpur-North halishahar-Cement clinker	Bhatiary Middle Solimpur	4.00	Bhatiary	Good	28	0
	Middle Solimpur-North halishahar	7.00	-	-	0	1
	North halishahar Cement clinker	-	-	-	-	-

4. FEASIBILITY OF MASS RAIL TRANSIT

After investigating the existing rail lines, they are analysed with respect to their present condition and effective area coverage to check the feasibility for providing mass rail transport along this network.

In the internal development the city is mainly based on 5 industrial areas. They are:

- Kalurghat Export Zone
- Nasirabad Sholosohor Export Zone

- Fouzdarhat Industrial Zone
- Export Processing Zone (EPZ)
- Patenga Industrial Area. (Land Use report,2005)

The overall development of this division is mainly on the North West and on the North East direction. The North East direction is blocked by Khagrachari hilly area. So, the overall possibility of the future growth of this city is North West region which heads towards the direction of Dhaka (Chowdhury, 2014). The details can be seen in the land use map given in Figure 2.

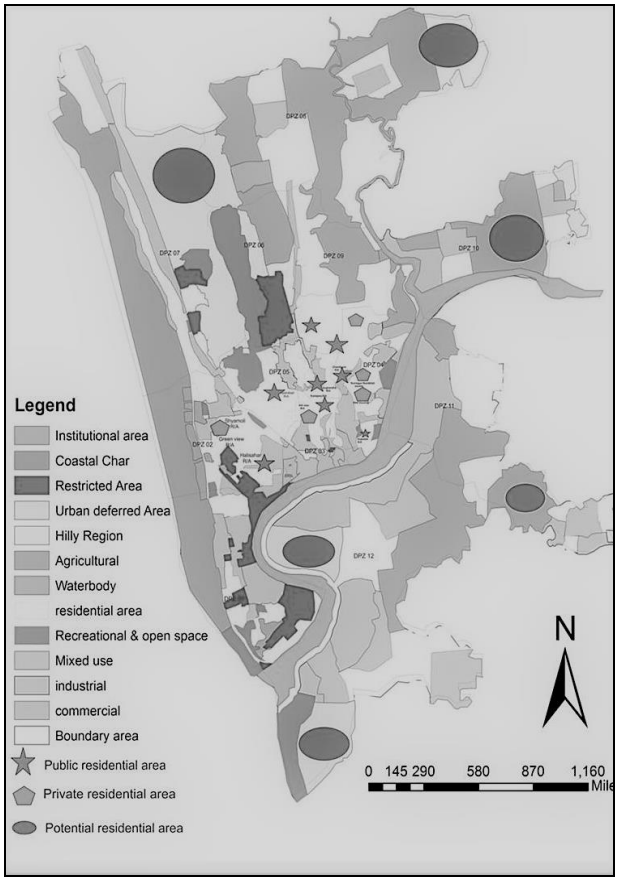


Figure 2: Land Use map (Chowdhury,2014)

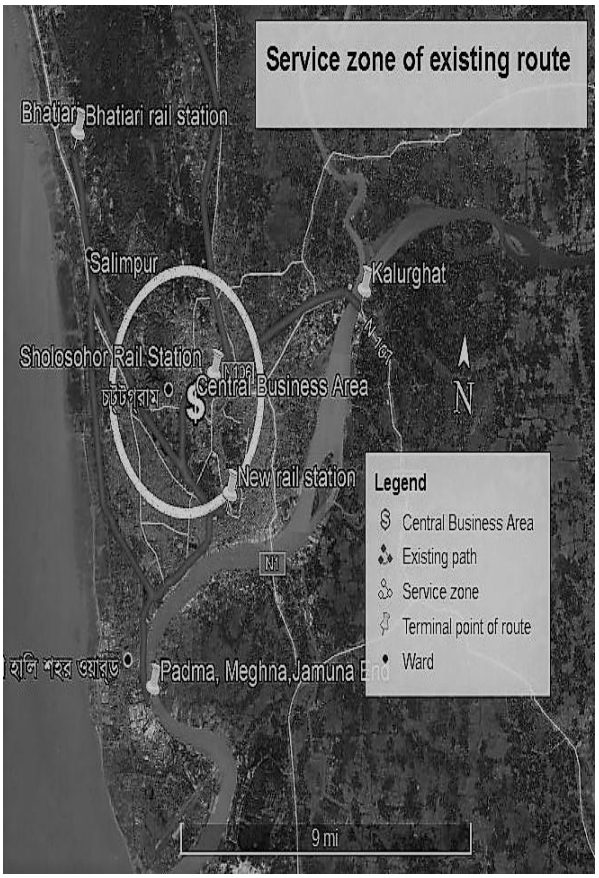


Figure 3: Service Zone of Existing Network

From Figure 3, an estimation of the area coverage of existing permanent way is almost 43.53 km sq. (calculated automatically from Google Earth). Chattogram city is about 168.1 km sq. So, the area coverage is almost 25% which is not enough for the Mass Rail Transport. Moreover, mainly New rail station to Dhaka, Sholosohor, and CU –these are the mostly used route which are centralized. Other routes are not efficient enough. Hence people on the periphery, can't access the rail network easily. As a result, main purpose of carrying mass traffic effectively and reducing congestion fails.

5. PROPOSED ROUTE IN THE CITY AREA

As the existing network is not enough to provide efficient service to the increased traffic, new route is needed to be introduced to overcome the shortcomings. So, conducting analysis on the topography to suggest probable route that may shift more amount of traffic from the congested area and outer perimeter. Considering mass traffic frequency 3 network can be suggested.

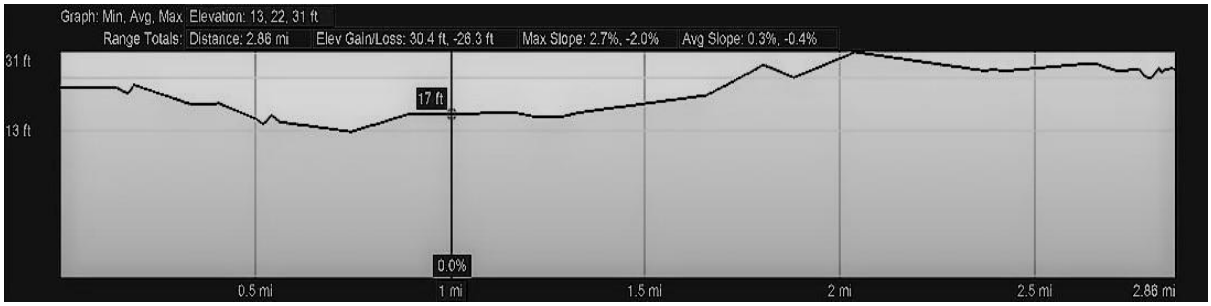
- Proposed route 01: Muslimabad to North Halishohor along outer coastal road.
  i) North Halishohor-CEPZ exit Road

ii) CEPZ exit Road-Muslimabad

- Proposed route 02: New Rail Station- East Bakalia –Janalihat Station-Fateabad rail station-Bhatiyari rail station.
  i) Rail station – Neyamot ali rd.
  ii) Neyamot ali rd.- Bhatiyari
- Proposed Route 3: East Bakalia-Sholosohor Rail Station

The topographical analysis has been shown here in Figure 4.

North Halishohor to CEPZ Exit Rd.



CEPZ Exit Rd. to Muslimabad

Rail Station to Neyamot Ali Rd.

Neyamot Ali Rd. to Bhatiyari

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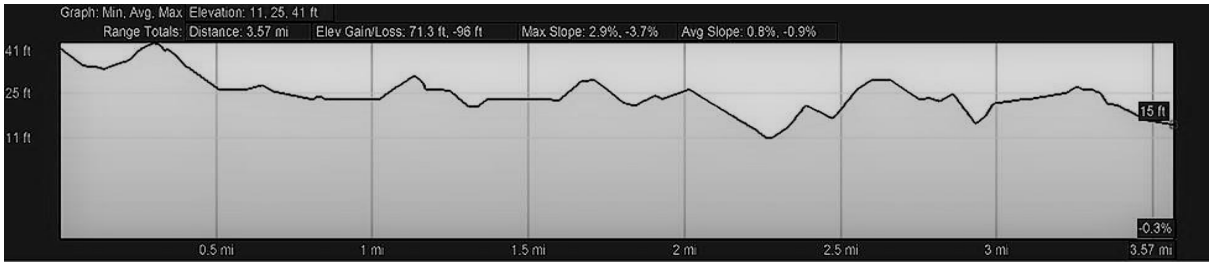


East Bakalia to Sholosohor Rail station

Figure 4: Distance vs Elevation (mi vs ft)

The elevation and slope variations are shown in Table 3

Table 3: Elevation and slope details of proposed route

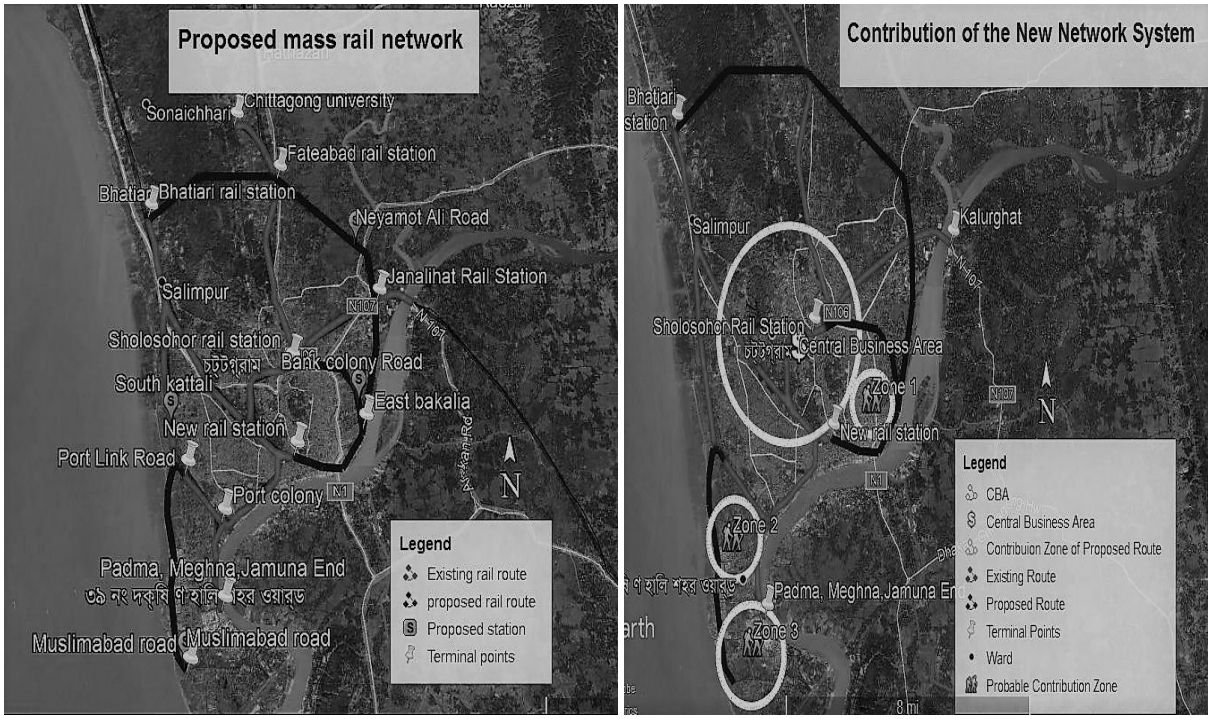
Route Name	Split	Max. Elevation(ft)	Min. Elevation(ft)	Avg. Elevation(ft)	Max Slope (%)	Avg. Slope (%)
Muslimabad-North halisohor	North halisohor-CEPZ exit rd	28	13	17	3.9	0.4
	CEPZ exit - Muslimabad	31	11	22	2.7	0.3
Newmarket rail station-Bhatiari	Rail station-Neyamot ali rd.	117	5	26	0.6	-2.9
	Neyamot ali rd. -Bhatiari	196	6	68	-19.9	1.5
East bakalia-sholosohor	East bakalia-sholosohor	41	11	25	-3.7	0.8

Calculating automatically from Google Earth, Chattogram City area is about 168.1 km square. Chattogram contains 178.15 km of rail line where the city has 59.45 km of rail lines. Providing 3 new routes we get 3 additional service zone which are shown in Figure 5 along with newly formed network. The area coverage of those also increases as in table 4.

Table 4: Area Coverage of New Network

Zone no.	1	2	3
Area (km square)	3.55	5.81	9.38

Net area coverage =3.55+5.81+9.38+43.53=62.27 km sq. which is 40% of city area. Previous area coverage was 25%. So new network increases the area coverage by 15%, making it feasible for carrying mass traffic.



New Network Extra service zones

Figure 5: New network with extra service zone

6. CONCLUSIONS

Traffic congestion is a serious problem that needs immediate attention and sustainable solution. A Mass Rail Transit system can reduce traffic congestion and enhance economic growth. Existing network carry passenger only centrally. So, people from outer periphery and distant places can't access the rail Network. It has been found unsuitable for less area coverage and all routes not being used effectively. Hence new routes have been introduced which increase the area coverage about 15%. New network can provide traffic circulation along outer periphery of major residential zone and provide easy access from any places within city area.

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