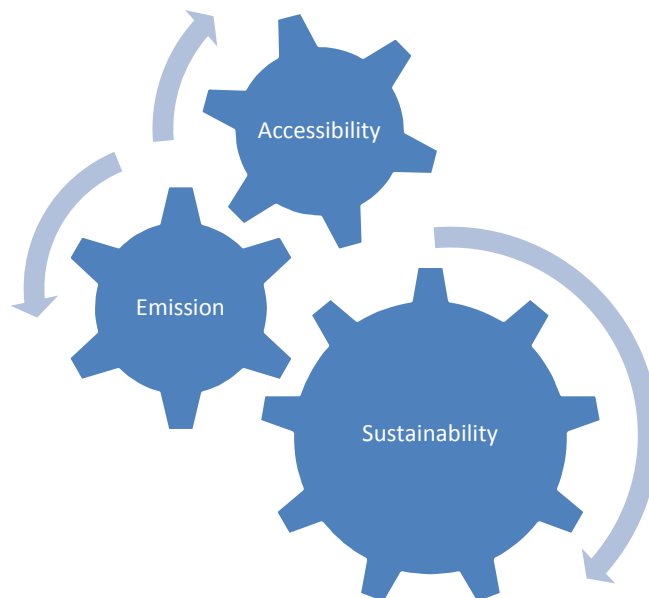# Mymensingh Strategic Development Plan (MSDP) Project, 2011- 2031

September, 2015.

Final Report

On Transportation

Ahsanul Kabir, *PhD*

Professor, Urban and Rural Planning Discipline,
Khulna University.

Table of Contents

List of Table

List of Figure

Introduction

Background

Bangladesh is one of the most climatic vulnerable countries in the world and the impact of climate change is being appeared very clearly. Floods, tropical cyclones, earth quack, storm surges and droughts are likely to become more frequent and severe in the coming years. These changes would be threatened for the significant achievements of Bangladesh which has been made over the last 20 years in increasing incomes and reducing poverty.

Realizing these problems a paradigm has been shifted in disaster management from its conventional response and relief management approach to a more comprehensive risk reduction culture. The Government of Bangladesh along with its development partners designed and implemented the Comprehensive Disaster Management Programme (CDMP) Phase-I during 2003-2009. On the basis of deriving actions of CDMP-I such as achievements, lessons learned, utilizing knowledge resources generated and knowledge products published, a vertical and horizontal expansion of the Phase-I has been designed which is known CDMP-II (2010-2014). The overall goal of CDMP-II is to further reduce country's vulnerability to adverse natural and anthropogenic events – including cyclones, hurricanes, floods, tidal surges, earthquakes, tsunamis, climate change and variability, avian flu, fire, toxic chemical/gas/pollutant leaks – through technical assistance in risk reduction and comprehensive disaster management activities. The main approach of CDMP-II is to channel support through government and development partners, civil society and NGOs into a people-oriented disaster management and risk reduction partnership and allocate resources to disaster management activities, risk reduction activities and climate change adaptation activities in Bangladesh.

CDMP II offers an outstanding opportunity to improve linkages with, and collaborations between national and the general stakeholder level for disaster risk reduction and adaptation to climate change. The linkages are clearly expressed in many of the activities outlined in the operational outcomes of the project design, as well as through strengthened institutional capacities. Under this opportunity, a Memorandum of Understanding (MoU) delineated the area of collaboration on 21th march, 2011 between CDMP-II and Urban Development Directorate (UDD). A pilot project on comprehensive Land Use development planning and

management for Mymensingh (Municipality) Strategic Development Planning (MSDP) Area for twenty years (2011-2031) time-span has been formed for preparing a module between CDMP-II and Urban Development Directorate (UDD) for mainstreaming disaster risk preventive measures.(Mymensingh Strategic Development Plan (MSDP) Project, 2011. Available from: <http://msdp.gov.bd/index.php> [06 July. 2014]).

Objective

MSDP project aims to develop a sustainable development plan for the study area ensuring to accommodate future growth in a sustainable manner. Among the various components of development plan, transportation planning is very crucial in developing a sustainable and climatic adoptive city. The main purpose of this exercise is to aid the MSDP projects in its transport component in making/ designing a city.

Assigned Task

Major tasks as mentioned in the ToR are:

(i)   to analyse the surveyed traffic volume, O-D and trip generation study data etc. and identify the existing pattern of traffic for the project area;

(ii)   to analyze transportation existing network of the project area;

(iii)   to propose a future transportation network to establish an efficient inter and intra town circulation system and also to establish rural-urban linkage for the project area;

(iv)   to develop traffic prediction model of the next 20-year period for the project area by using latest available transportation related software.

(v)   to work with a multidisciplinary team to integrate the output of the traffic surveys and transportation studies with both attribute and spatial data of other different components of the project;

(vi)   to provide transportation related detailed design and drawing (nodal point, lane, turning radius, L-Section and X-section and related infrastructure design, material of the road and footpath etc.);

(vii)   preparation of working paper, analytical report based on the studies and surveys.

Scope of the work

Within the outcome of MSDP, risk reduction is a potential thematic area that comprise of reducing risk for urban and rural populations through structural and non-structural interventions. This project has been given emphasis on initiatives those are comprises with disaster preparedness interventions. These initiatives mainly addresses future transportation network to establish an efficient inter and intra town circulation system and also to establish rural urban linkage. Apart from this, project wants to develop traffic prediction model of the next twenty year period. Furthermore, finally this MSDP project provides transport related detail design and drawing and suggest about evacuation route for contingency plan.

Methodology

Socio- economic studies and land use prediction will act as main founding stone to this transport studies. So, emphases are been given on understanding the socio economic dynamics in the area and extracting travel behavior and parameters for it.

Transport Modeling Component in MSDP
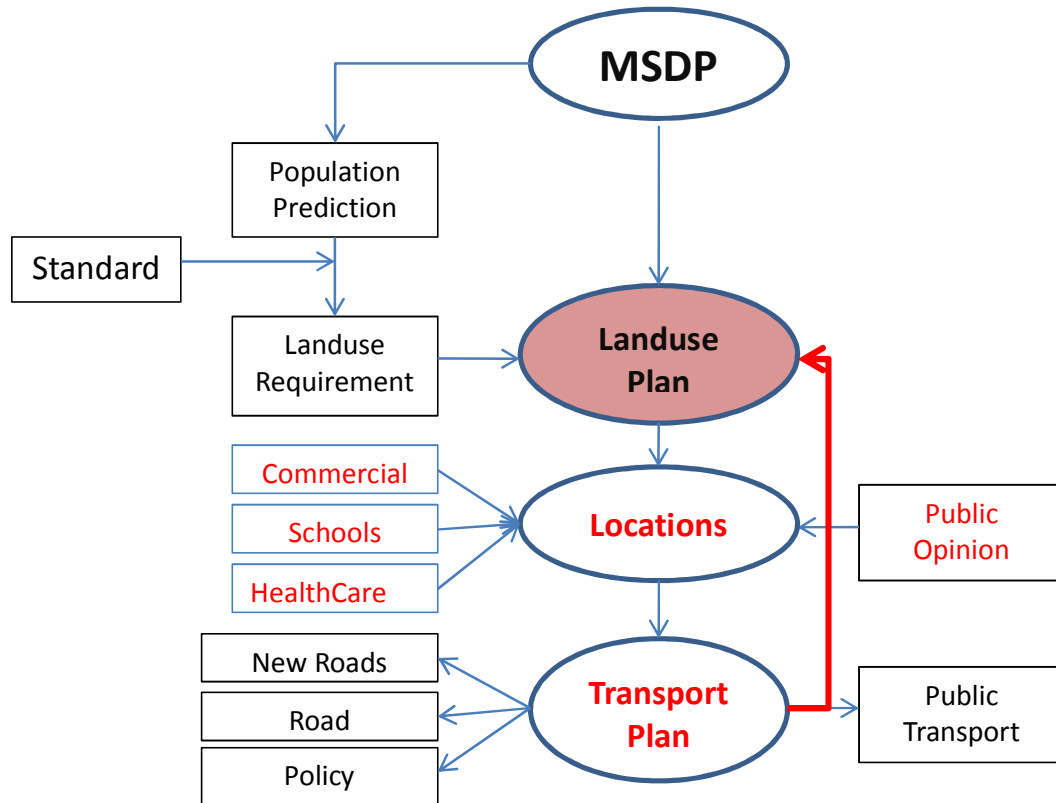
Figure 1 Transport Modeling Component in MSDP

Major s steps of this task are:

Travel Behaviour Analysis: This analysis has been conducted after collecting data by questionnaire survey. This analysis illustrates the purpose of travelling, which mode are preferable for travelling; along with distance and location of travelling.

The transport component of this project yet to accomplish the following task:

Transportation Prediction: In MSDP a long term 20 years land use planning is being prepared which will be used for future transportation prediction. It will illustrate the production and attraction of travelling pattern for projected land use plan.

Transport Network Analysis: A Network analysis will be conducted to know about future travelling pattern such as in where congestion will be concentrated, what travelling behavioral problems will be emerged, what types of interventions have to provide to overcome these.

Critical Infrastructure and area identification: After Network analysis this study will explore future congestion points, bottleneck of intervention, which roads have to be widened, where have to provide foot path etc.

Proposed intervention: After identifying the bottlenecks there will be provided various interventions to overcome these impediments which will create a sustainable transportation system for Mymensingh.

Transport Data

Data collection team of the project provided socio economic data of urban and rural area which also contains various transport related data. This data is provided into *.sav format which contains respondents purpose of travelling, mode of travelling, problem they faced and other data of tenement. GIS data of existing road network, building footprint, land-use and other relevant data were also provided.

Household Survey

Household surveys were conducted to gather respondents' travel behavior related information. For this a semi-structured questionnaire (Appendix-A) were prepared which consists of the questions about their purpose of trip, used mode, trip rate, destination, cost, travel time. SPSS data base was developed with the mentioned variable for further analysis.

Outline of Work Plan

The transport study explores the travel behaviors and investigates the transportation system to identify the bottle neck towards a sustainable transportation system. Travel behavior helps to identify the trip rate and to estimate future trips. Road network along with these travel pattern identifies overall movement of traffic and helps to pin-point the roads and areas that require geometric intervention for capacity improvement.

Once the landuse component of the plan is completed it will possible to estimate the number of trips, congestion zone and requirement of improvement.

| Purpose |
| Mode |
| Distance |
| Location |

Travelling Behavior	Questionnaire Survey
Future Land Use	Land Use Plan
Future Travelling Pattern	Production
	Attraction
Network

| Congestion | Intervention | Emission | Concentration |
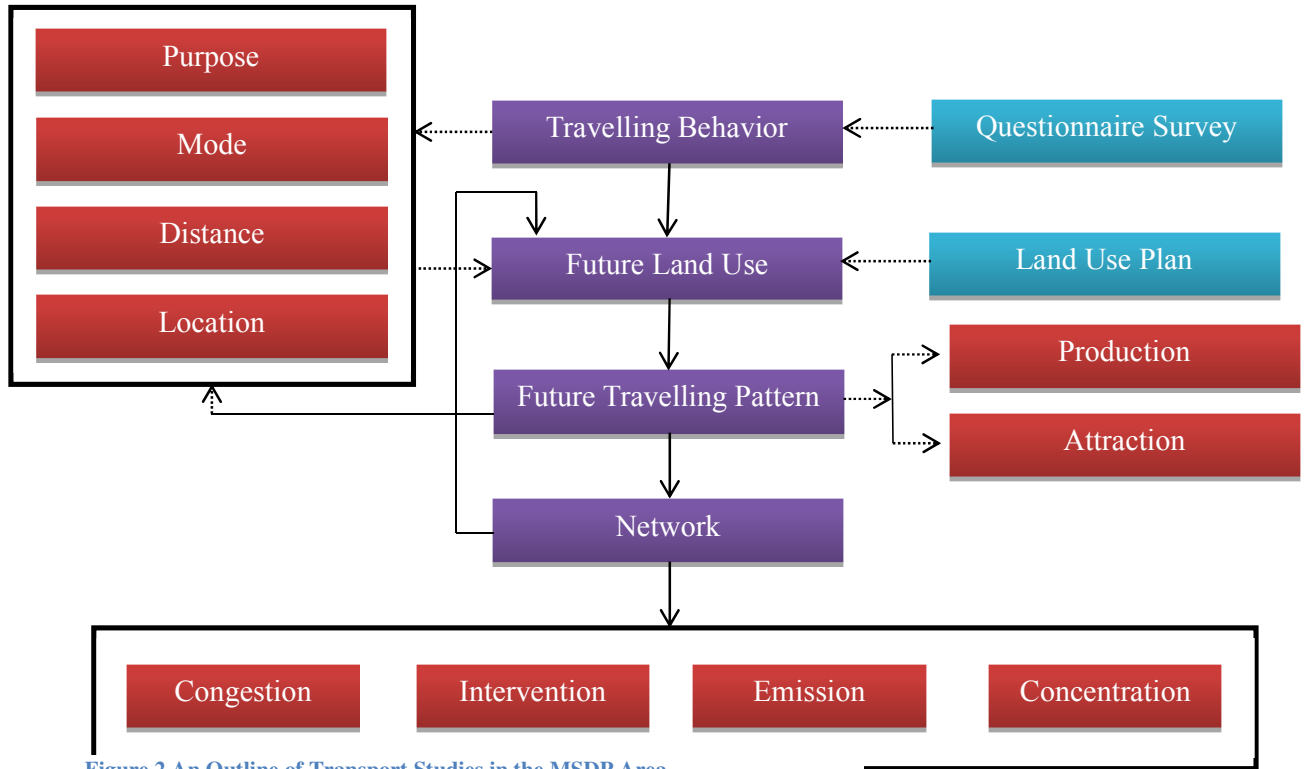
Figure 2 An Outline of Transport Studies in the MSDP Area

Travel and Transport in MSDP Area

Choice of travel mode depends on availability, associated cost to travel by that mode, distance travelled and also safety, comfort and social concern issues. This study mainly attempts to capture travel information for the main purposes (work, education, shopping and social). However, there are significant amount of pseudo reasons of travel which accumulates to a significant number when you total them to a city scale. This unrecorded travels are short in distance in many cases and mostly performed by walking.

Choice of Mode

Mode choice of total trip
- Walking 29%
- Bus 3%
- Easy Bike 30%
- Taxi 1%
- Rickshaw 26%
- Van 0%
- Bycycle 3%
- Motor Cycle 3%
- Car 1%
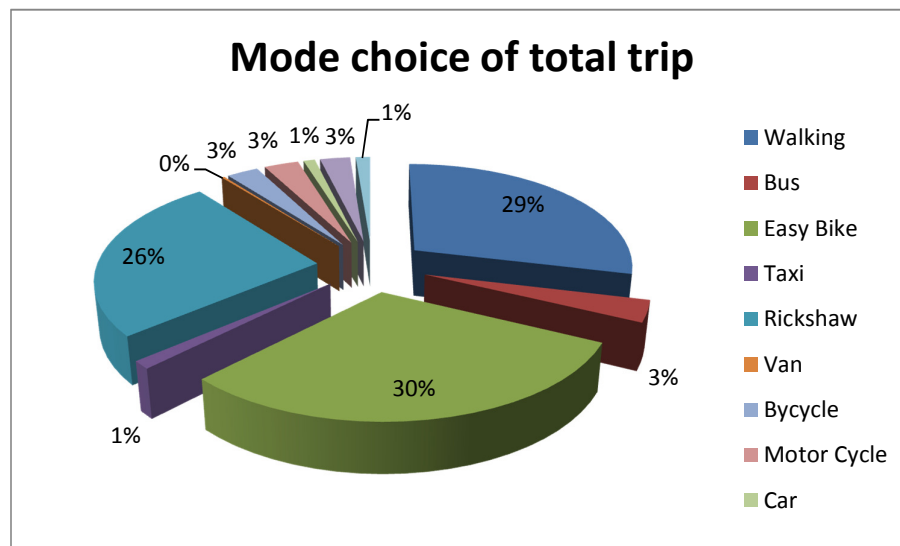
Figure 3 Choice of mode for total trip

It appears walking, easy bike and rickshaw account for equal number of trip in the MSDP area (Figure 3). The same pattern exists in other travel (Figure 4).

Working trip

- Walking — 32%
- Bus — 3%
- Easy Bike — 26%
- Taxi — 2%
- Rickshaw — 19%
- Van — 1%
- Bycycle — 5%
- Motor Cycle — 6%
- Car — 1%
- Tempo — 2%
- Train — 3%

Educational trip

- Walking — 26%
- Bus — 4%
- Easy Bike — 36%
- Taxi — 0%
- Rickshaw — 26%
- Van — 0%
- Bycycle — 0%
- Motor Cycle — 2%
- Car — 2%
- Tempo — 4%
- Train — 0%

Legend:
- Walking
- Bus
- Easy Bike
- Taxi
- Rickshaw
- Van
- Bycycle
- Motor Cycle
- Car
- Tempo
- Train

Shopping trip

- Walking — 29%
- Bus — 1%
- Easy Bike — 31%
- Taxi — 0%
- Rickshaw — 35%
- Van — 1%
- Bycycle — 2%
- Motor Cycle — 1%
- Car — 0%
- Tempo — 0%
- Train — 0%

Social trip

- Walking — 16%
- Bus — 6%
- Easy Bike — 31%
- Taxi — 3%
- Rickshaw — 30%
- Van — 0%
- Bycycle — 5%
- Motor Cycle — 0%
- Car — 1%
- Tempo — 6%
- Train — 2%
- 0%

Other trip

- Walking — 42%
- Bus — 5%
- Easy Bike — 27%
- Taxi — 5%
- Rickshaw — 13%
- Van — 0%
- Bycycle — 3%
- Motor Cycle — 0%
- Car — 2%
- Tempo — 2%
- Train — 1%

Figure 4 Choice of mode for different purpose

Road Network

MSDP Road

Urban

Rural

Arterials

Primary Road

Secondary and Tertiary Road

Pucca

Semi-Pucca

Katcha
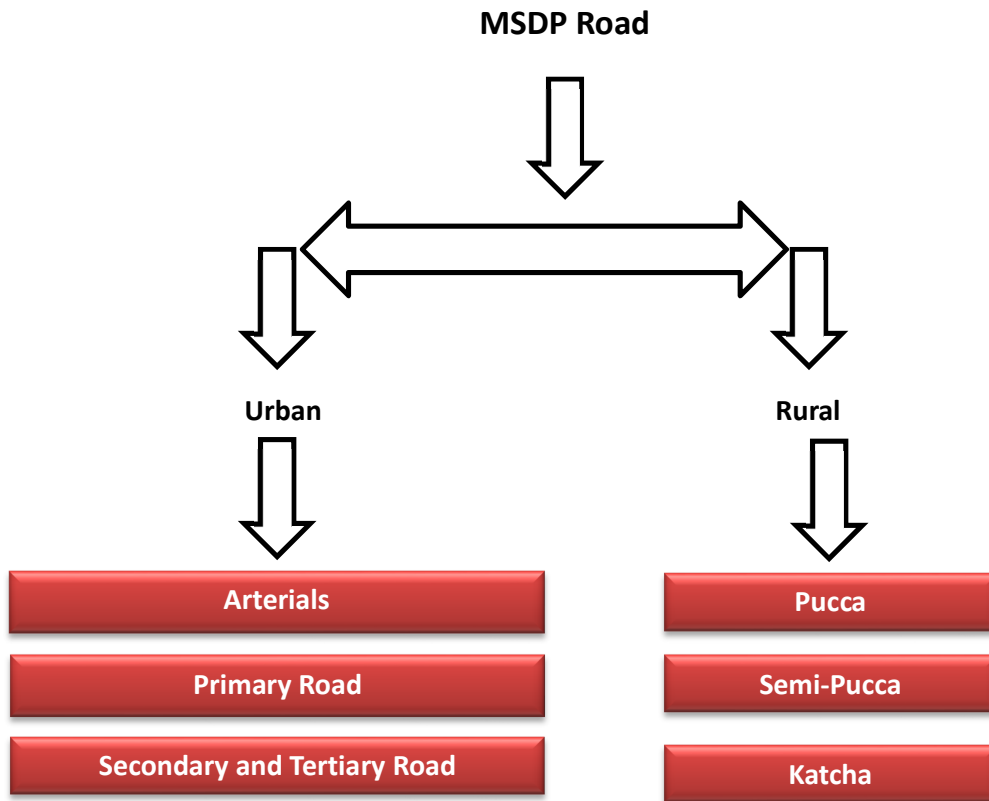
Figure 5 MSDP Road Category

Urban Road:

Urban roads of Mymensingh have been classified into four categories. These are Arterials, Primary, Secondary and Tertiary Roads (Local roads).

Arterials

Arterial are major through roads that are expected to carry large volumes of traffic. Those roads are connected one cities with other cities are classified as arterial roads. In MSDP, those roads of Mymensingh are connected it with Dhaka or other district headquarters are classified as arterial road.

Primary Road

Collector road collect traffic from local roads, and distribute it to arterials. Traffic using a collector is usually going to or coming from somewhere nearby.

Secondary and Tertiary Road (Local roads)

At the bottom of the hierarchy are local streets and roads. These roads have the lowest speed limit, and carry low volumes of traffic. This road ensures existing road network within the city. Those roads consist more than 15ft width are classified as secondary road and else are denoted as Tertiary road.

Rural Road:

Rural roads are classified on the basis of its pavement whether it is paved or unpaved. These roads are classified into three categories; these are Pucca, Semi-Pucca and Katcha.

Table 1 MSDP Road Classification

MSDP Road Classification	Class	Length (Km.)
Urban Road	Arterial Road	7.34
	Primary Road	16.10
	Secondary and Tertiary Road (Local Roads)	68.14
Rural Road	Pucca	248.47
	Semi-Pucca	22.20
	Katcha	676.52
	Unknown	.06

Road Classification Map

Figure 6 Road Classification Map
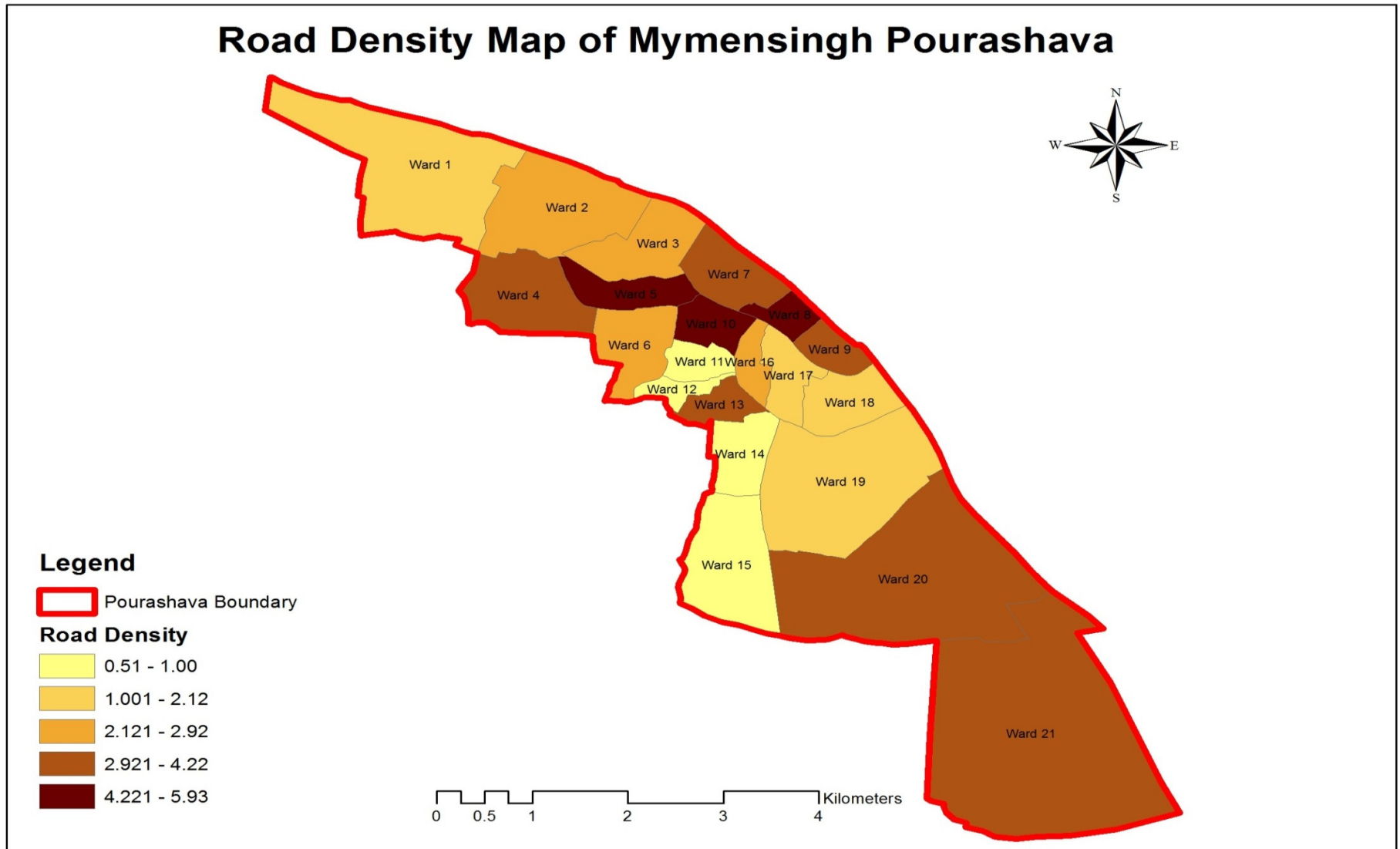
Road Density

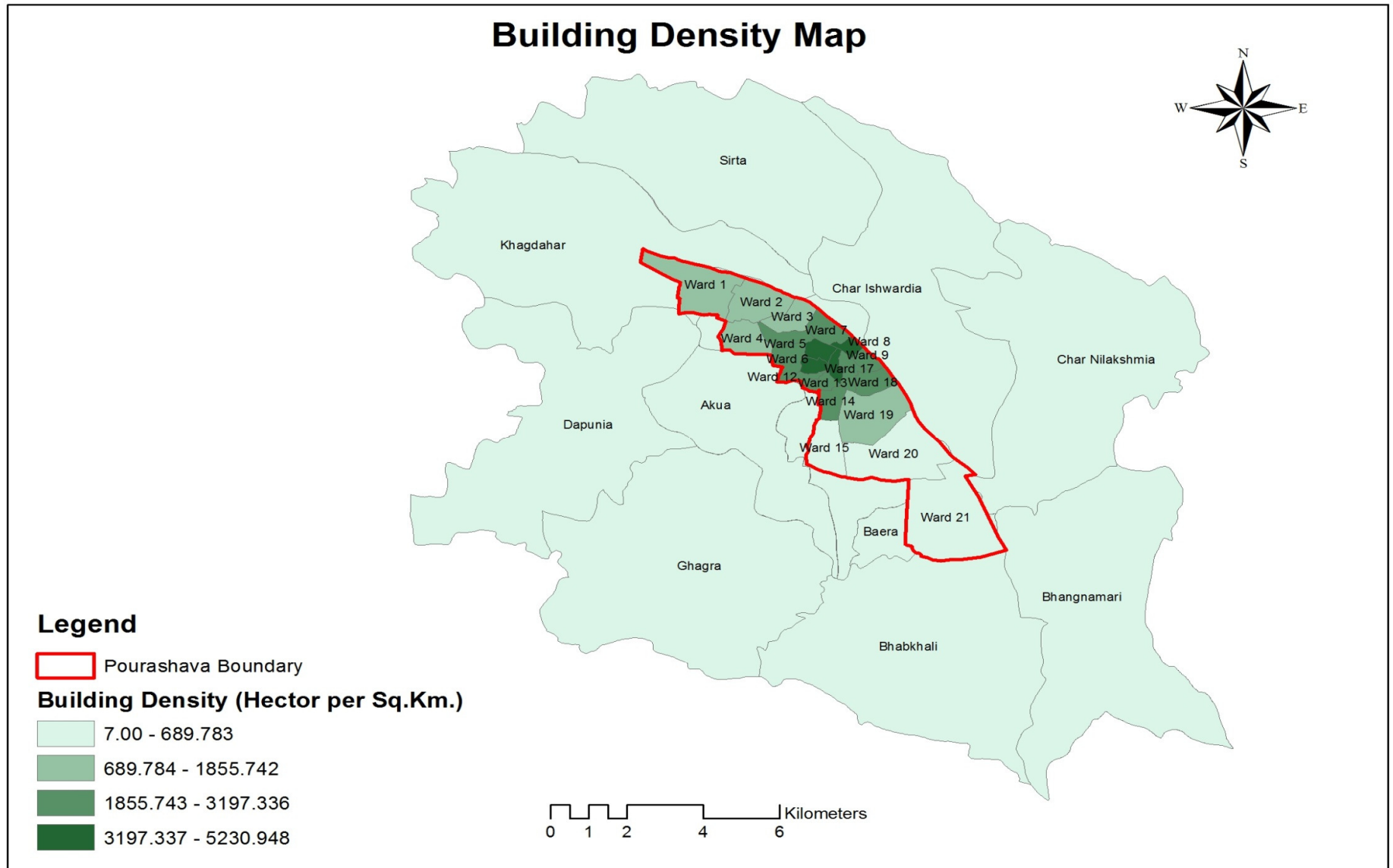Figure 7 Road Density Map

Building Density

Figure 8 Building Density Map

Trip Density Map
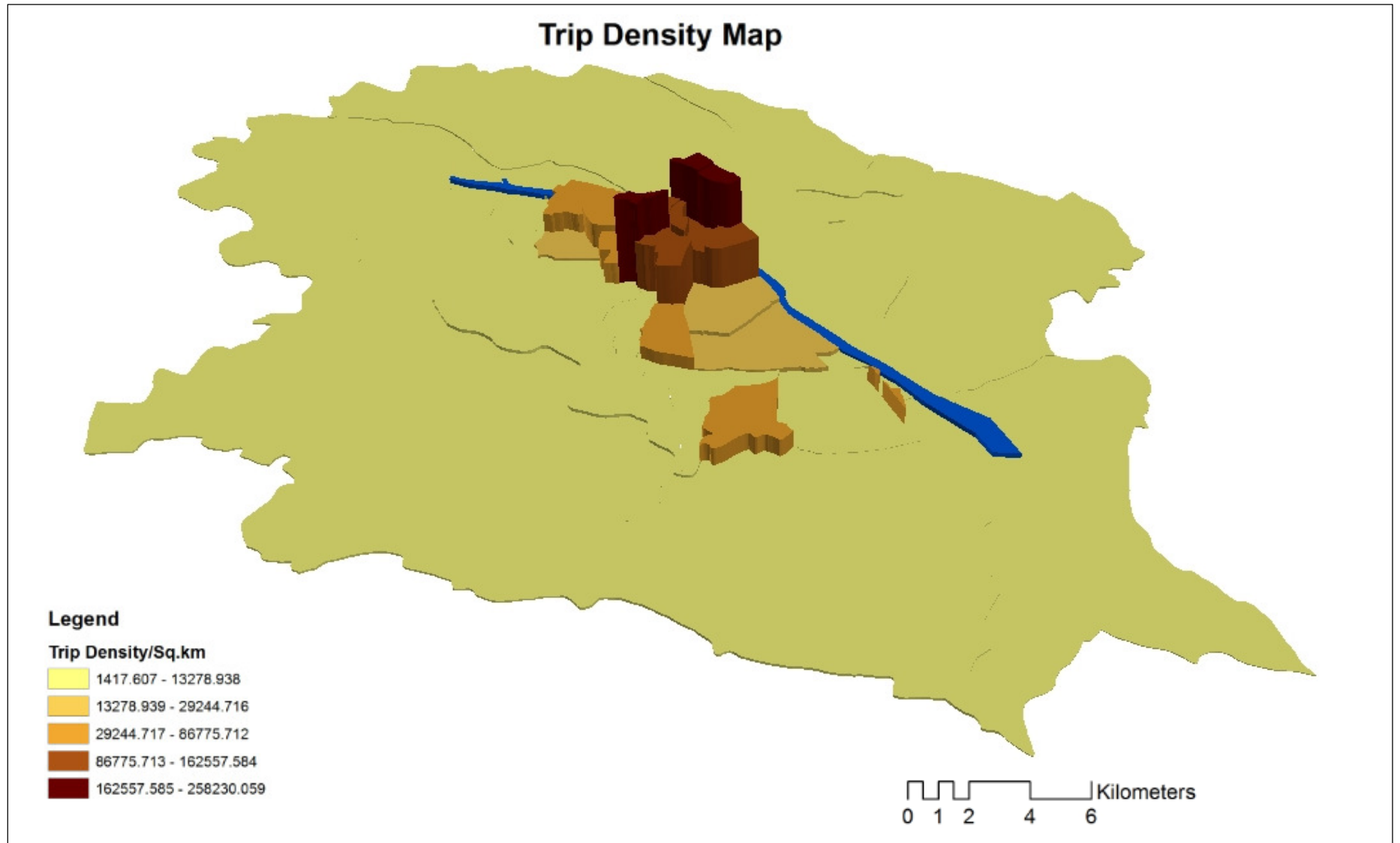
Figure 9 Trip Density Map

Most of the roads of the city are constructed with bitumen surface where most of them are in good physical condition (Table 2). But most of the city dwellers face problem in the time of travel due to traffic condition and narrow road (Figure 11).

Table 2 Type and Condition of local road of the Household

Type of Local Road of the House	Condition of Main Road		Total
	Good Condition	Bad Condition	
Bitumen	69.3	31.2	67.1
Brick-dust	13.1	35.4	14.4
Brick Covered	11.3	10.4	11.3
Raw	6.3	22.9	7.2
Total	**100.0**	**100.0**	**100.0**

Problem faced by the city dwellers
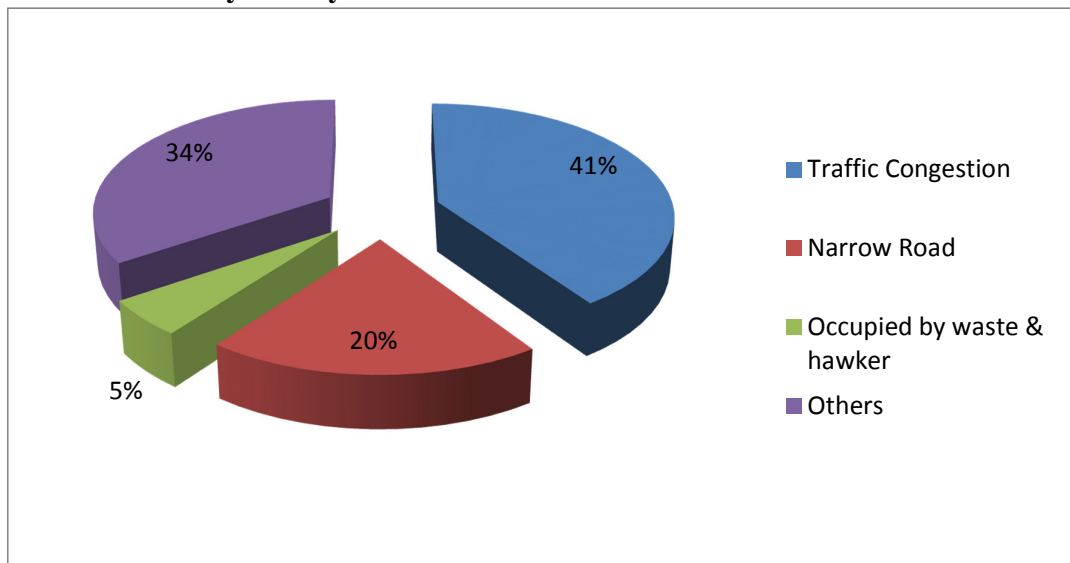
Figure 10 Problem faced by the city dwellers

Road Coverage

Access is not an issue for the Mymensingh city (figure 8). Road density is high in the ward no 5, 8 and 11 which consist the main city and its business centre. However, their geometric is not suitable for the traffic volume it carries. It shows nearly 80% roads are below 4 meter which is the minimum requirement for any fire and rescue vehicle.

Public Transport

The urban form in the Mymensigh is compact like many other medium sized cities in Bangladesh. Due to its nature of the distribution of economic activities and development pattern, people are linked with short connections. As a result, large bus based public transport is not practiced in the city nor the road geometry in the city are appropriate for that. Instead, small scale public transport and paratrasits (like easy bike, Mahindra and Maxi) are plying the role along with rickshaw.

Smaller version of paratransit like Easy bike, Mahinder, tempoo and Rickshaws are available like other cities of Bangladesh. Figure 5 shows the route of major public transport modes and route and its coverage. It shows most easy bike routes are limited within main city and connecting the city centre and major business district. Tempoo and Mahindar serves to connect the rural hinterland with the main city.
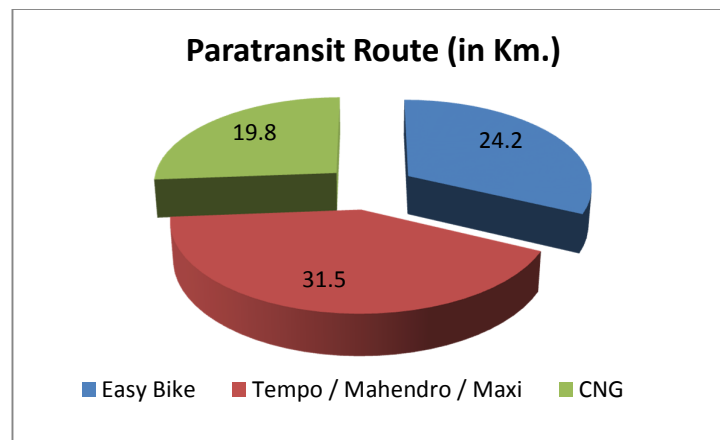
Figure 11 Route Length of Different Public Transport Option in Mymensingh

Route

Easy bike runs a total of 24.2 Km in two routes. In route-A it runs between Pathgudam and Bipin park. This 6.2 Km. route is the busiest route and serves the CBD area through Charpara. Easybike also runs between Rahmatpur and Agriculture University (Figure 12).

Figure 12 Public Transport Routes in Mymensingh

Network coverage

The travel behavior survey depicts that people find it comfortable to walk up to 500m from their stoppage to attend their school, job and to visit physicians. 65% of the city area can be accessed within walk able distance (500m) from the public transport routes (Figure 13).

Figure 13 Public Transport Accessibility
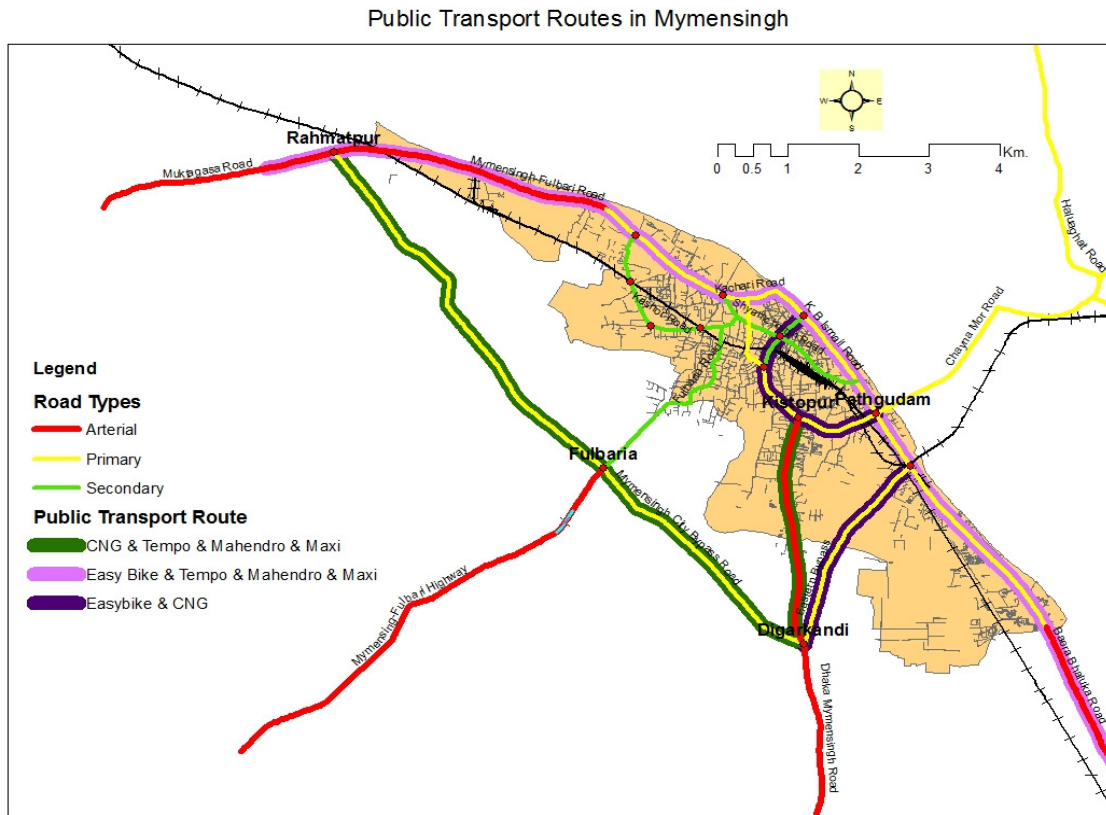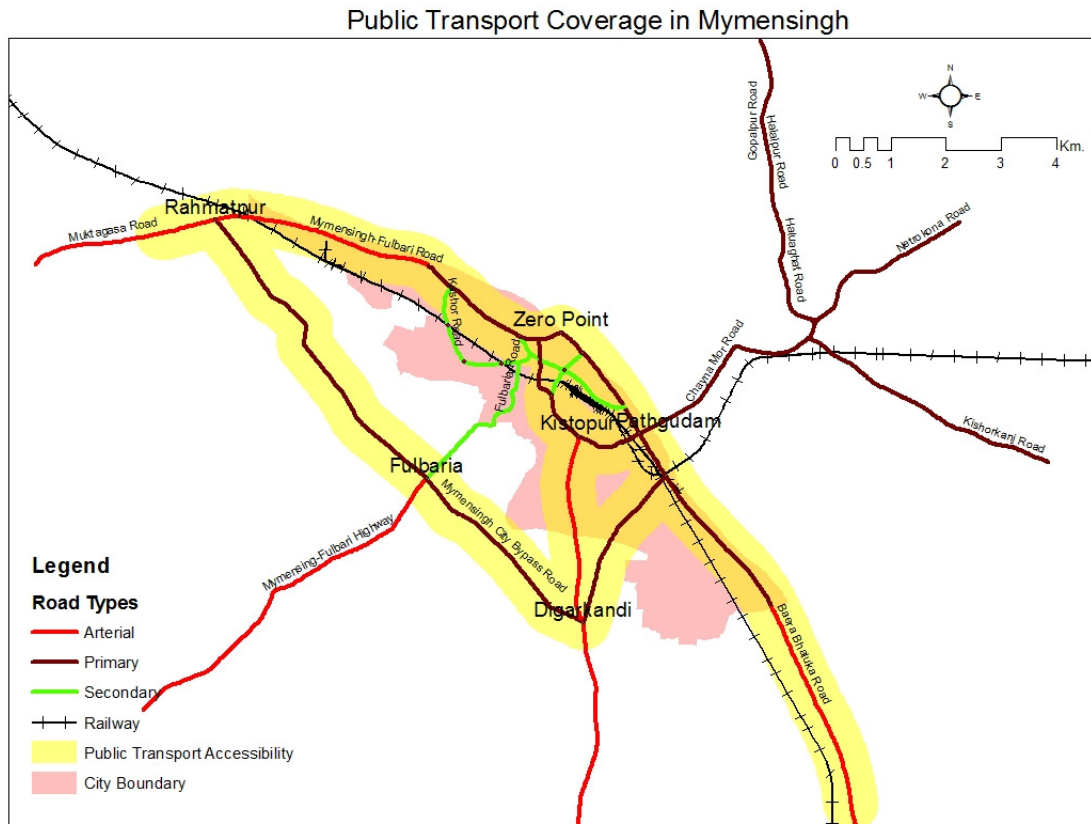
Public Transport Operations

Rickshaw has been the only mode of mass urban transportation since historical time. With the rapid advent of rechargeable battery technologies and manufacturing of light weight vehicles has transformed the urban transportation system. Easybike, Maxi, Mahindra etc are relatively new mode. They operate very well in shorter route (around 10 Km.). Due to its engine capacity, it can hardly carry six to eight passengers. Use of battery has made it environmental friendly and well accepted across different stratum of the community. There are several issues related with these: Unskilled driving, Safety, Congestion, Too many. Unplanned stop to mention few. Since these transport mode have been accepted by the society, our approach should be to regulate the operation in such a way as maximum benefit can be achieved with minimal cost rather than to eradicate it from operations.

There are both governance and management issues that need to address for the improvement of the public transport services and its performances. Important issues in this aspect are:

- Public transport governance. All motorized vehicle licenses are controlled by the Bangladesh Road Transport Authority (BRTA) and rickshaws are in general by the city corporation or municipalities. In term of easy bike and mahindar our regulatory institutes are yet to finalize their policy and control mechanism. Certain number of easy bikes are licensed by the Mymensigh city corporation and in reality the number of vehicles operating are manifolds. So, it should be first stage to decide its governance issue. Who will control the licensing and hence number, who will take care their fitness and policing their driving behavior. There should be provision and practice to apply fines (with impact on license) to all for violating prevailing rules.

- Driving license. Public transport drivers require advanced training or requirement as they have greater responsibilities on public safety. But it is found that most small public transport or paratransit drivers do not have driving licensing nor any training. As a result they are causing accident and congestion in road.

- Stoppage. As most paratransit operates, there is no fixed stoppage for the easybike. However there are few key locations for each of the routes. Along the whole city, stoppage location can be determined (connecting points to job and schools) and guideline can be developed for the public transport. In figure 14 a schematic guideline for stop locations are illustrated.

Figure 14 Schematic guideline for Stoppage location

- Fitness of vehicle. It is not regulated at all. As operators try to keep it light (due to capacity of the engine), they use thinner and hence weaker metal structure which is vulnerable to any collision. Several of them have customized design in term of having handle, passenger side side-guard etc.

- Driving behavior. That needs to be put under heavy vigilance indeed. Driving licensing and associated training can do that. However, emphasis is required on the dress code of the driver, use of mobile phone while driving. Several studies suggest that use of mobile phone is

Travel Behavior

Distance

The information on travel distance for various reason gives a good indication about the travel demand of the area. It reveals people travel more distance for work compare to their social, shopping and school trip (Figure 15). This also indicates the concentric urban structure of the area revealing a rather clustered job concentration. Except work trip people travel less than a kilometer.

Travel Distance from household to different facilities (ft)

Travel Distance to Work place
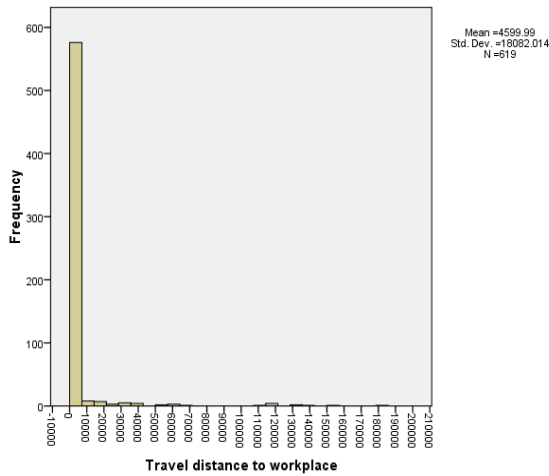
Travel Distance to Shopping
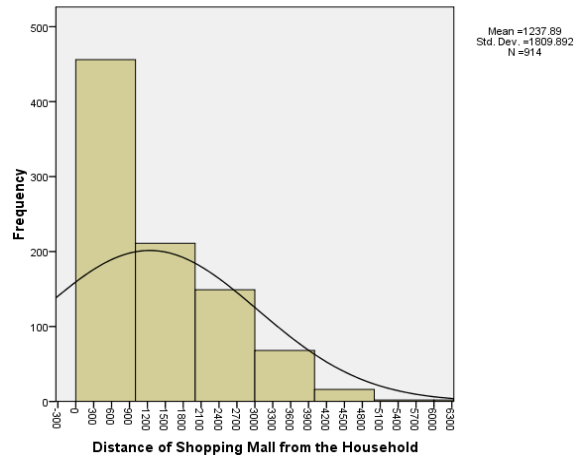
Travel Distance to Post Office

Travel Distance to Fire Service Station
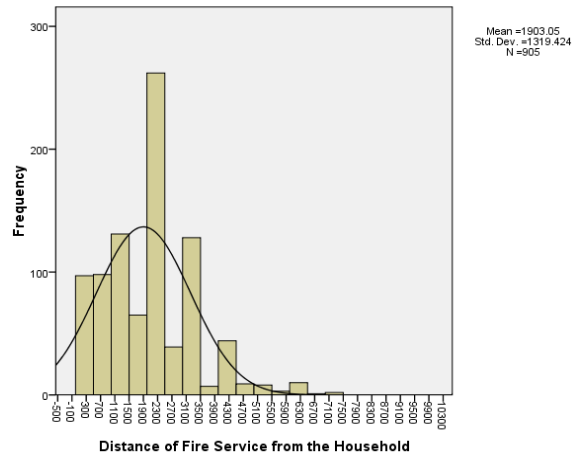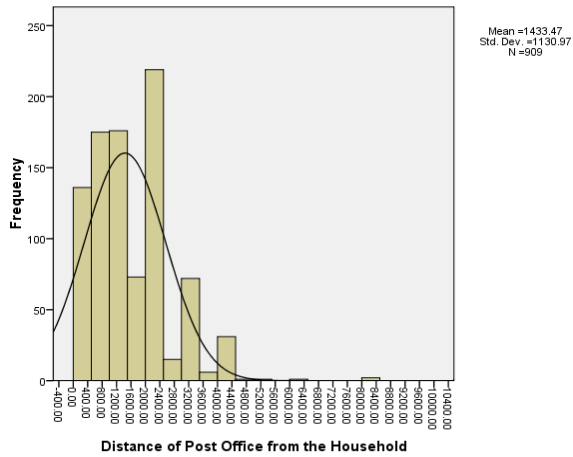
Travel Distance to Library
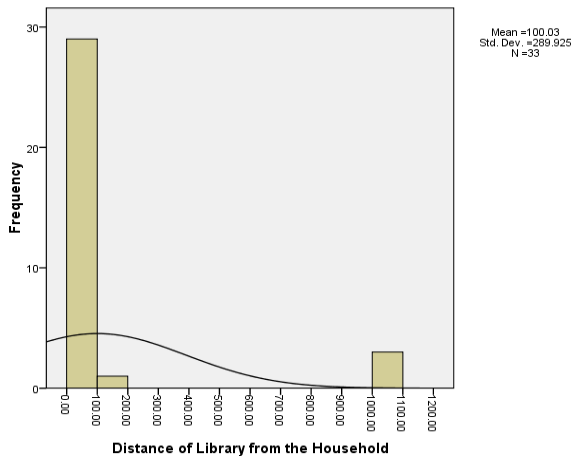
Travel Distance to Religious Centre
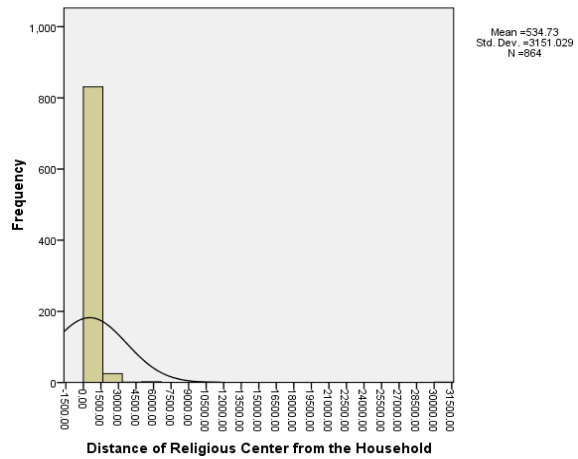
Travel Distance to Bazar
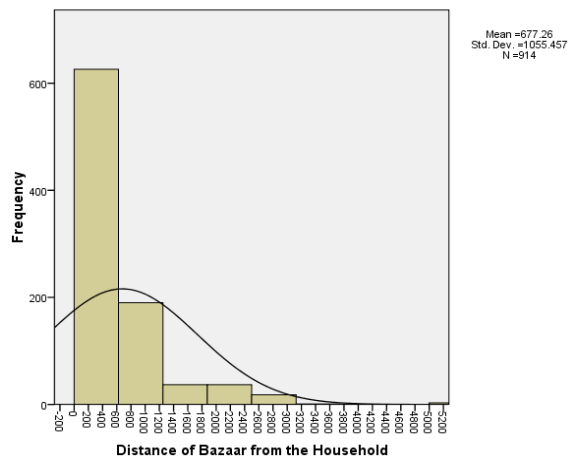
Figure 15 Travel Distance from household to different places (ft)

Cost

A household level interview suggested that for everyday trips (work, school and shopping trip) people in the MSDP area spend BDT 30 on an average.

Table 3 Average Cost/ week for Trip Purpose

Average Cost for Trip Purpose	Urban (BDT)	Rural (BDT)
Cost For Work Trip Purpose	37.46	29.32
Cost For Shopping Trip Purpose	21.4	30.89
Cost For Educational Trip Purpose	26.17	32.95
Cost For Social Trip Purpose	31.67	62.92
Cost For Other Trip Purpose	66.24	213.33

Source: Field Survey, 2014

Transport Related Proposals and Future Directions

Footpath Zone

More than one third of the total trips are performed by walking, which is a good indicator to ensure sustainability for transportation and for the city. This also indicates the compact nature of the development. The travel pattern information also suggests a lower travel distance for everyday job, school and shopping. People can easily performed that by walking. However, we do not see much option for footpath in the area. This study suggest a network of footpath that can connect the public transport stoppage with the important activities such as commercial centers, schools, hospital etc.

Among many roads such as B K Ismail Road, Kristopur Road, C.K Ghosh Road , Durgabari Road, Kali Sangkar Ghoh Road, Ram Babu Road, Sarda Ghosh Road are on CBD area and some schools are situated beside these roads that have 22ft to 26ft width. Many School children use JC Guha Road and Shyamchoron Road, which have 32ft to 40ft width, owing to their location.

Generally for mixed traffic, 21ft is required for an effective road design excluding footpath. On the either side of the carriage way, footpath is recommended for those roads that serves activities situated in CBD area and schools. For footpath, 3 feet width for each side may be convenient for the pedestrian. Here a cross section of road and design is provided (Appendix-C). For JC Guha Road and Shyamchoron Road traffic lanes can be 24ft and each footpath will be 4ft.
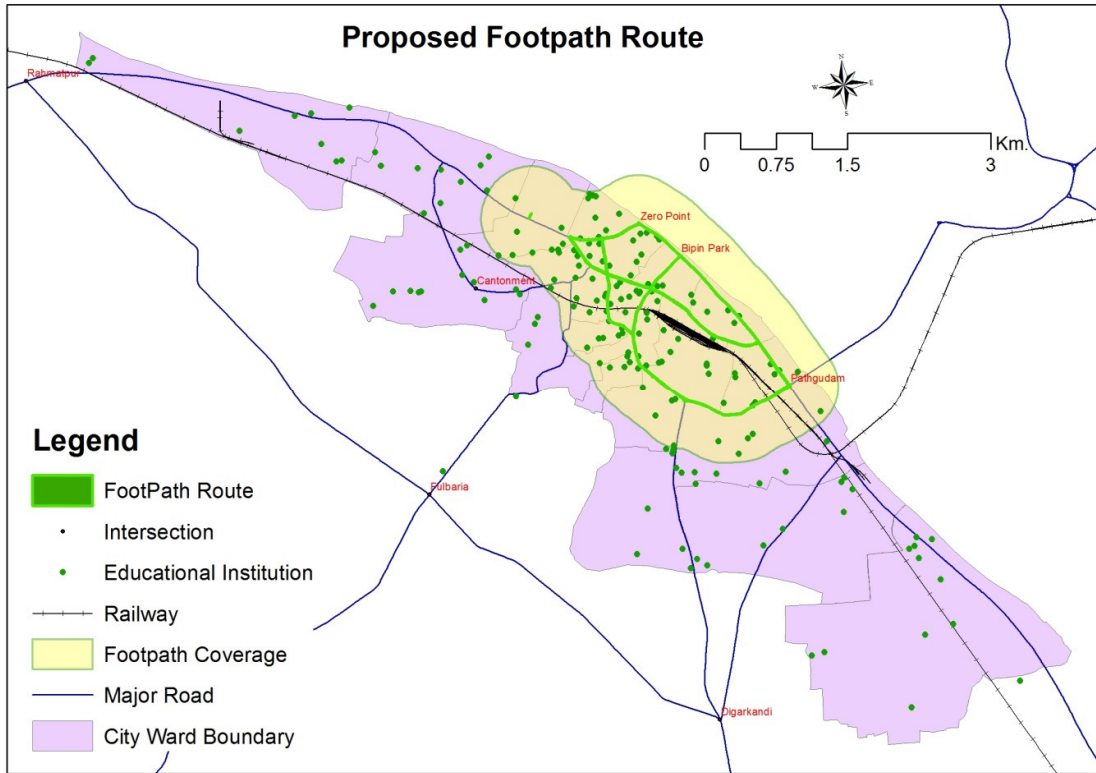
Figure 16: Proposed Footpath Network in Mymensingh City

Fire Route and Road Widen

Existing route that fire brigade use has been identified through the following map (Figure 16). Fire Brigade usually use these routes due to their free accessibility on that roads.

According to Fire Protection section of BNBC fire apparatus access road shall have required 14.7ft (4.5 Meter) width for free access of fire brigade vehicles and the hosepipe can cover 50m surrounding the road. It is assessed that fire brigade covers only 4.1635 Sq.Km of Mymensinsh Pourashava which is 21.30% of total area. However significant number of Kutcha houses are located outside the reach of the fire fighters hose pipe (Figure 17).
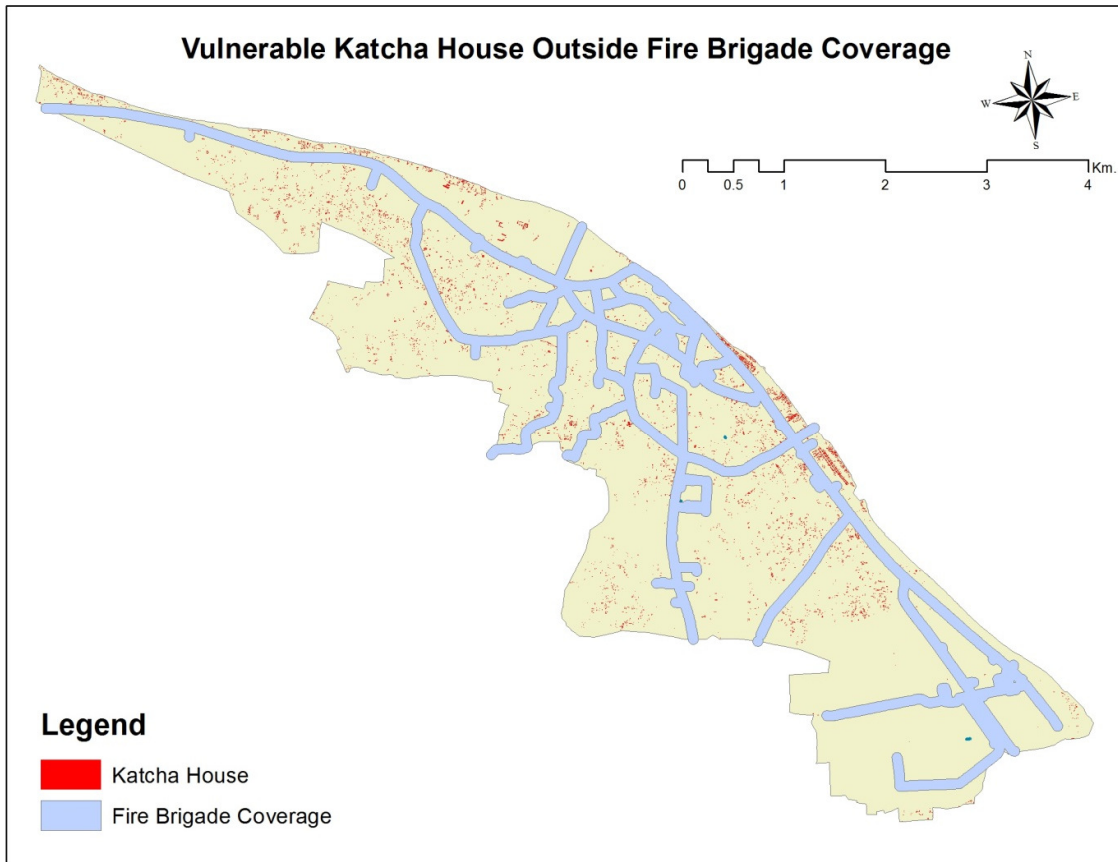
Figure 17 Vulnerable Katcha House Outside Fire Brigade Coverage

It has been observed that several kutcha houses are located outside the area where fire brigade hose pipe can reach. So, several roads have to be widened to make it accessible for fire fighters (List the road at annex-B) and several small link roads need to construct to ensure through fare. It has been suggested that several existing roads need to widen from 10 to 15 feet to increase to ensure access to vulnerable inhabitants. After assessing the vulnerable settlement, width of existing road and others crucial issues an inference can draw that nearly 50Km of roads needed to be widen. In addition 6.4 Km link roads in 18 segment need to built (Figure 18).

Table 4 Initiative Nave to take of mitigate Fire Hazard

Initiative	Length (Km.)
Widening Required	48.94
New Link road	6.4
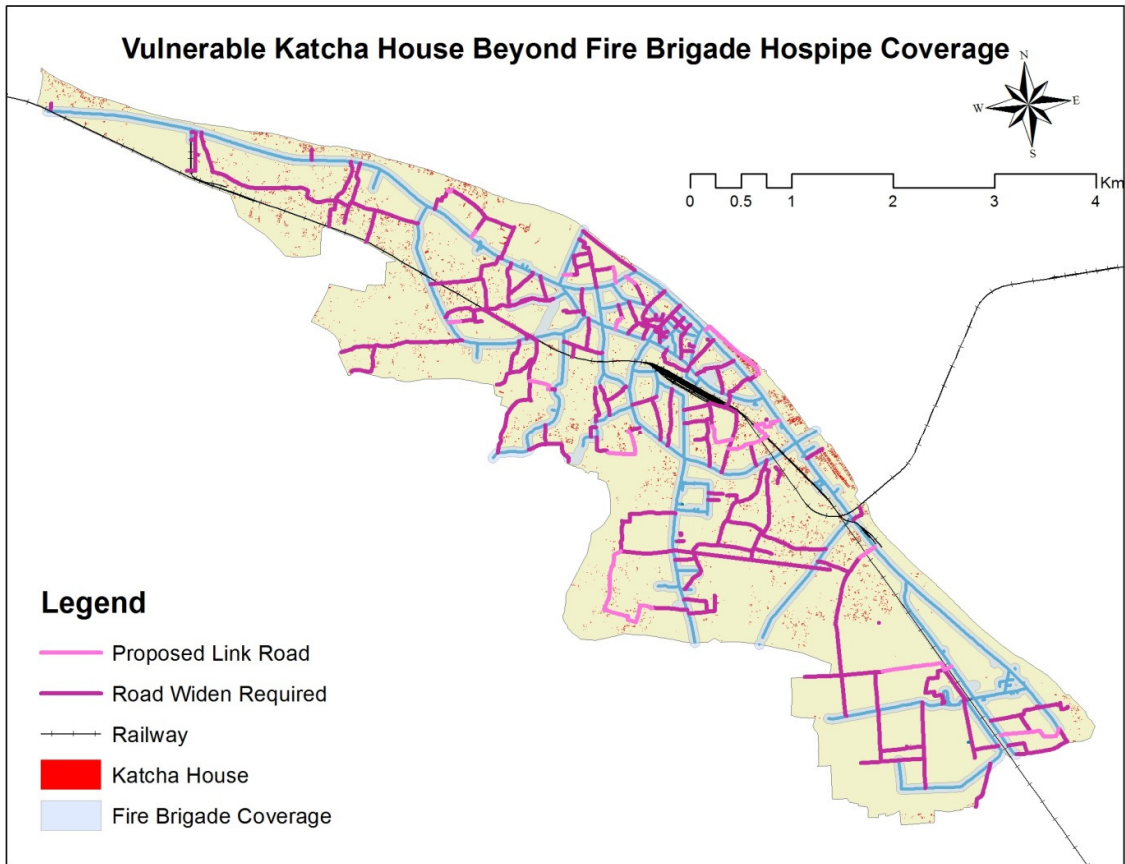
Figure 18 Vulnerable Katcha Houses Beyond Fire Brigade Hosepipe Coverage

% with Comparing Total MSDP Road	% with Comparing Total Urban Road
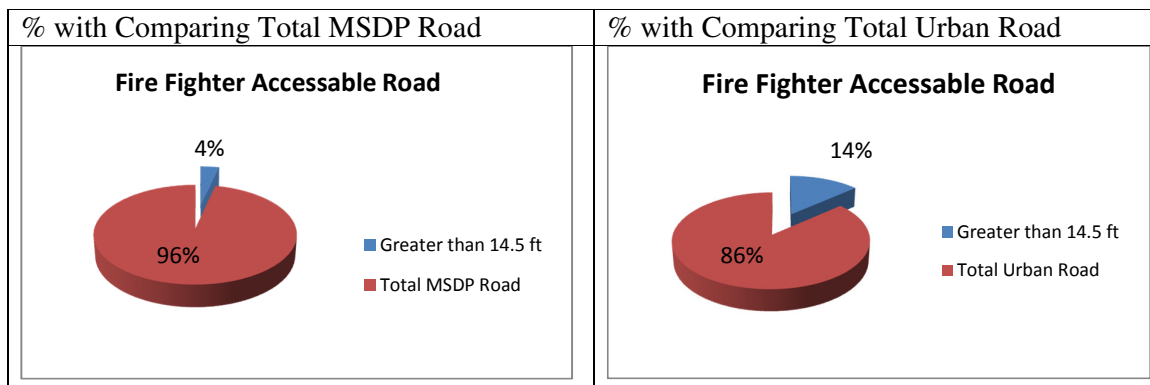
Figure 19 Percentage of Road Width Greater than 14.5 ft

Bus Rapid Transit:

Mymensign city is organically grown city—the physical growth is neither dictated nor promoted by planning initiatives. As a result, the busy area is still served by crowded narrow road which does not have space left for increasing traffic, pedestrian. However, the urbanization requires a transit line (preferable by bus or tram) that can make quick connect between residences and important employment/economic zones. Along with serving the commuters, 'Bus Rapid Transit' (BRT) can aid the urbanization process.

Several Bus Transit line has been proposed for the Mymensingh city (Figure 20). Our traffic study at important intersections does not suggest that the city requires a dedicated corridor – demand has not reached at that level. A road lane connecting the important business hub with priority for BRT transit line can be an option to start with. With the increase in demand and based on urban growth's strategic decision, it can be upgraded from priority to dedicated line.

Figure 20: Proposed Bus Rapid Transit

- Line 1: this line is proposed along the current rail corridor. On the either side of the rail line, around 20 meter service road or left over space is available. This can be utilized.

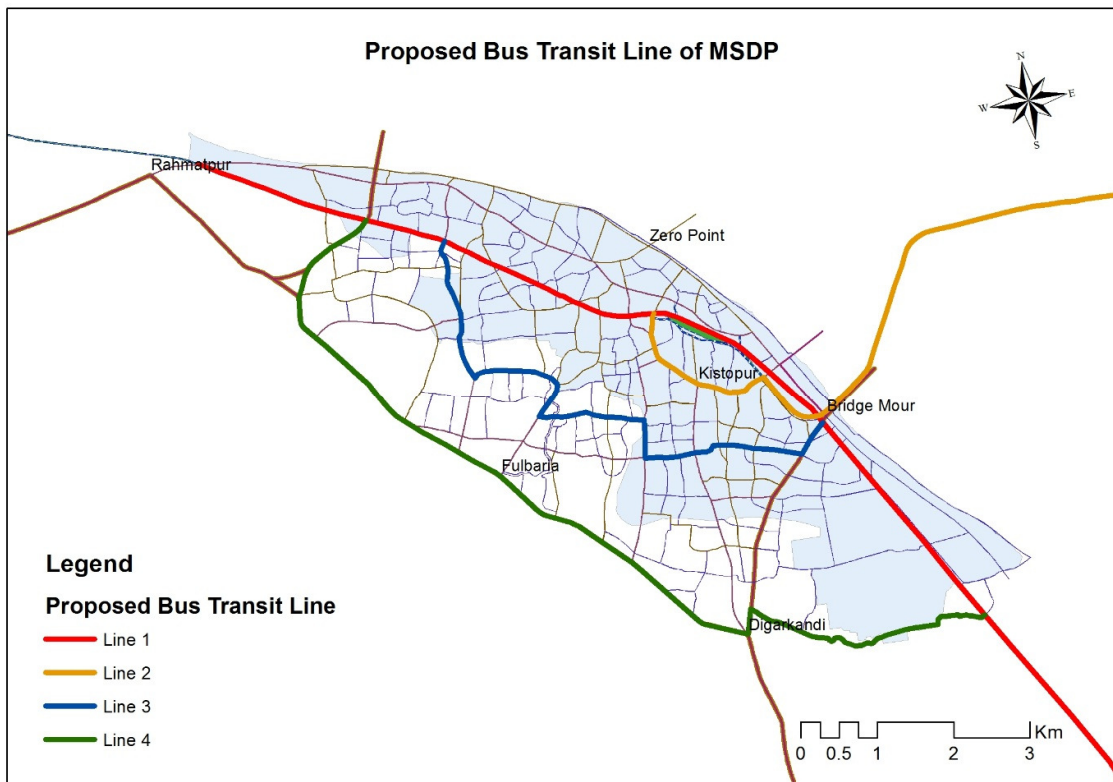- Line 2: is an extension of line 2 to business hub Shomvuganj bazar. This line will be critically essential if and when the proposed Industrial area north to the Shomvuganj bazar will be developed. It will be a hub for manufacturing job and requires a quick connection with the existing city and its neighboring suburbs. The proposed alignment has 20 ROW and can easily accommodate a priority lane for BRT.

- Line 3: It is a proposed loop – inner ring for BRT. Implementing this will help in withdrawing congestion from present city center to the outer ring. By providing this BRT service, new economic activities will be emerged in the areas enclosed by line 1 and line 3. At the same time, it will boost up the local real estate and building industry which has many spin-off for local economy and employment.

  The proposed alignment is tentative. Depending on the feasibility of land acquisition it can be smoothen. In the proposed line, there are segments with 12 meter ROW. For these, (comparatively) narrow lane, road side acquisition may require. This alignment is currently of low density. So, acquisition initiative can be taken before the rapid growth takes place.

- Line 4: Outer ring. This can be implemented in long run. However it will be effective once the city is expanded up to the outer ring.

Role of BRT in urban sustainability is nothing to establish. But to make it an urban management agent, requires strong implementation of urban governance and growth control.

Airport:

A domestic airport has been suggested at Rahmatpur (North-West of Mymensign City) (Figure 21, Circle 1). Being close to Dhaka a complete airport won't be feasible in Mymensingh. However, it's an option to facilitate in emergency situation.
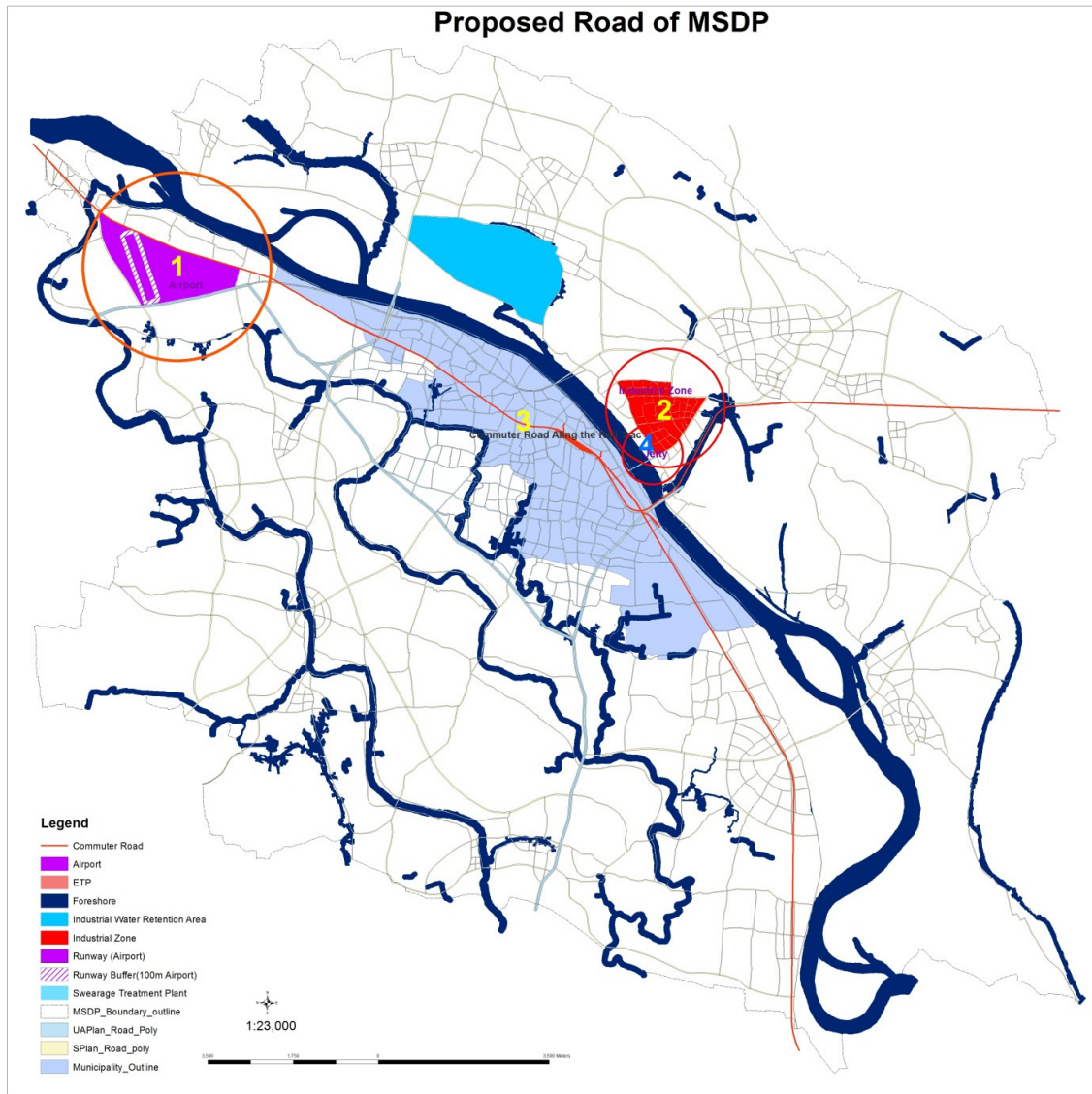
Proposed Road of MSDP

Figure 21: Proposal

Jetty:

Jetty has been proposed near Shomvuganj on under utilized land which has been used for jute mills (Figure 21, Circle 4). Implementing an effective jetty on this location will facilitate the transportation of goods for the business around Shombhuganj Banjar and the proposed manufacturing zones on its north.

Summary of Recommendation and Conclusion:

Recommendation

Urban Form and Urban development

The landuse, buildings and the street pattern suggests that settlements in the Mymensingh has compact nature with mixed urban functions. These urban forms are appreciated to consider as sustainable. Survey on travel behavior also support the assumption by revealing short travel distance for commuting, schooling, shopping and everyday job. If appropriate transport connections are made, walk ways are created, footpaths are ensured and city governances are enforced, this city can accommodate its growth for coming days without much expanding urban boundary (Mymensingh City Bypass Road) or without creating any satellite towns. Several blocks of residential and commercial areas are underutilized due to access: insufficient road width or no road at all. These blocks are proposed to connect the missing links and provide sufficient width of the access/service roads to ensure mobility and flow of traffic.

MSDP structure plan has proposed a hierarchy of road network which ensures accessibility across the area. Effort has been given to complete the loop of the local urban road network that ensures shortest mobility between two points in a neighborhood. At the same time it has proposed to create several center for growth concentration (Figure 22).

Using road hierarchy, a system of block has been proposed. For currently developed city, average block size is 500x500 meter. However, south to the Phulbari road, a low density development is proposed with a regularly spaced road network. The proposed block size is 2x2km on the low density rural land.

Before starting to implement road hierarchy, few decision need to confirm:

What is the growth that we are planning to accommodate with that time frame?

What type of growth we want? Do we want spillover growth or sprawling? Or we want some satellite growth center based, which is commonly called "polycentric'.

Being compact in nature like any other city in Bangladesh, it looks decentralized growth is suitable. However, every growth center required to have an economic base or concentration of economic activities. In cases, connection to any job or any industry seems missing [circle 1 to 4]. There is a local market, however those may not enough to keep the growth required to maintain the infrastructure investment. There must be a reason that the growth will go to those area.
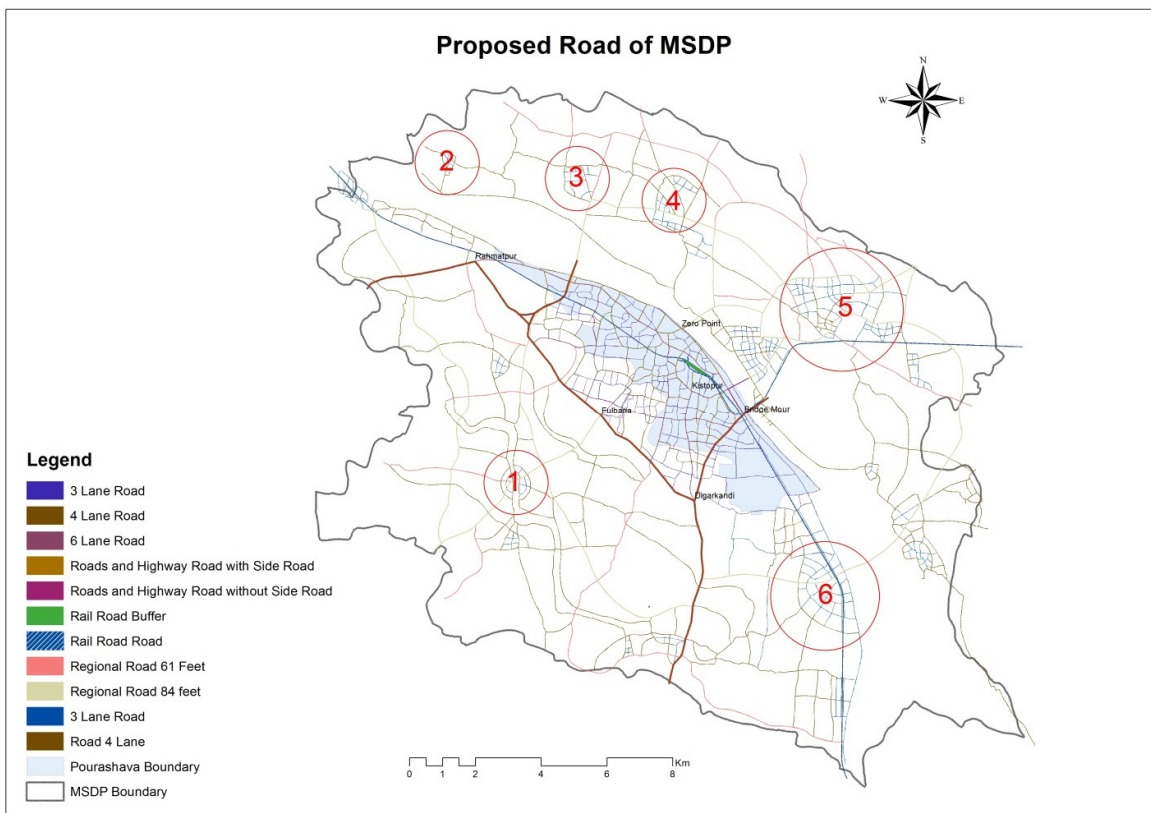

Figure 22: Growth Centers Outside Existing City

Landuse intensity and proposed landuse plan need to be evaluated along with proposed road hierarchy. In the proposed plan, it appears that several hubs has been created (Figure 22).

- [circle 1]. It looks a small hub/growth center has been created around an intersection. Don't know the reason or economic magnet for that. But looks it has market, commercial and schools in that area. Investment in road infrastructure in that area will enhance the local growth and might convert to a small center away from main town and might serve as a satellite between Phulbari and Mymensingh.

- [circle 2]. This area already seems to have rural residential area and local market. It will be difficult to attract growth to this area. This is merely a rural settlement with concentration of commercial activities. To convert an area into a center we need to convert them to a business or employment hub.

- [circle 3/4: Char Gobindopur]. It already has rural settlements and administrative offices. It is not clear about the average plot size in those area but seems pity large. Proposing a center will need an intervention like land readjustment. Also to make it attractive for housing or business, some intervention is needed.

However, the growth of this area will largely depends on the proposed bridge. If a bridge can be build at Taltola (as proposed in the structure plan), Char Gobindopur will thrive quickly.

- [circle 5: Shombuganj]. Shombugang is already a prominent center for business and industries. Structure plan suggests expansion of this trade center towards north and along the north side of the rail alignment. This proposed location need administrative support to establish leather industries and trade center. Having adjoin rail line will ensure movement of goods.

- [circle 5: Beltoli]. A larger area has been proposed for expansion for Beltoli. To make it center it requires to have a good transport connection with Mymensingh city. Good highway network (Mymensingh-Sutiakhali highway) is already there but good public

transport would encourage many people to live there and commute to main city or other growth center.

Several missing links have been treated to complete the loop (inside Mymensingh City bypass). This may require some land acquisition and participatory land readjustment. Area between rail road and Mymensingh City bypass is characterized by low density residential area (sardar para, vatikshor, aqua uttor para, maddha dakhin para, kewatkhali). The proposed roads will increase the local accessibility of the area and potential for price hiking once the plan is released. At the same time, if development can be controlled, this could be extension of the city.

It appears that effort has been made to contain the urbanization within Mymensingh City bypass. To accommodate growth, several center has been proposed for development and good road network has been proposed. However success of this plan depends on the governance of the implementation of the infrastructure specially the roads. To sustain those decentralized centers, some administrative or economic activities may need to transfer to those locations or incentives should be arranged as growth occurs or concentrates.

New Roads, Connectivity and Improved Accessibility

The city is growing following the availability infrastructure, suitable land and closeness to economic activities. However in a much scattered way. One of the important strategy is to identify the area to be developed or allowed to build for the next 20 years. It shows that southern area of the current city up to Fullbari road has scattered development, which are often not connected. Making connections to this missing links will enhance the accessibility of the area. If new development can be contained within this area than other areas could be restricted for agriculture and natural use. Based on current geometry of roads, a road hierarchy is proposed (Figure 20). Emphasis has been given to ensure maximum accessibility and land locked plot do not exit. At the same time, several roads are proposed for widen as it can accommodate increasing number of traffic and decrease delays in travel time. Implementing this proposed road network will enhance the overall connectivity of Mymensingh city and its role as the regional hub for economic activities.

For future road classification several indicators were considered. Major considerations were function of any particular road and types of vehicles that will ply on it. Width of different vehicle has been collected from field survey

- Truck - 8 ft 4 inch
- Bus - 8 ft 3 inch
- Microbus - 5 ft 6 inch
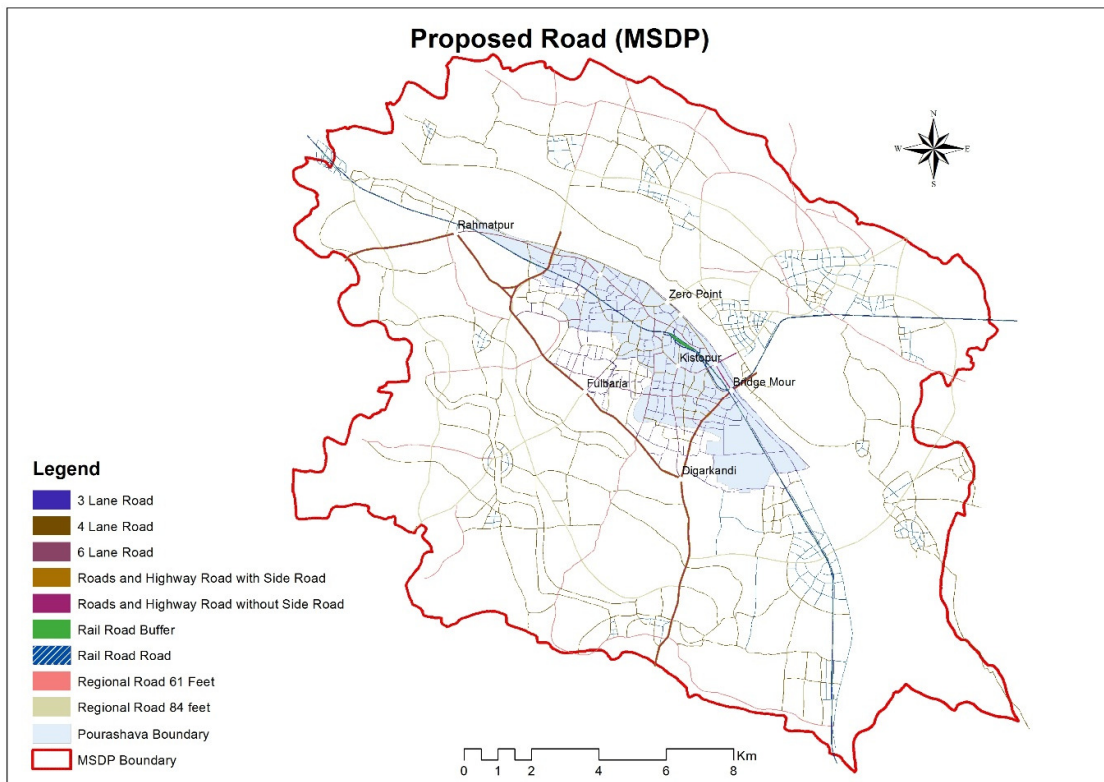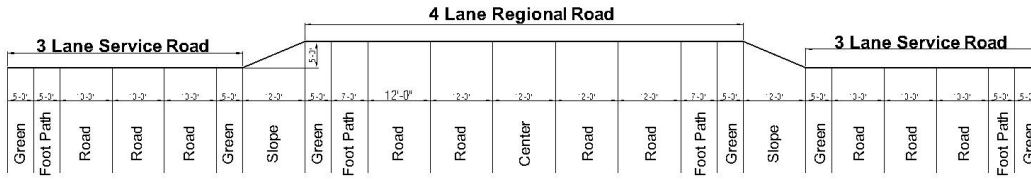- Car - 5 ft 5 inch
- Rickshaw - 3 ft 11 inch

Figure 23: Proposed Road Network in MSDP Area

Regional Road:

4 Lane (12ft per lane) Regional Road with 3 Lane (10ft per lane) Service Road

84 ft Regional Road

45 ft Service Road with Footpath

4 LANE REGIONAL ROAD
WITH 3 LANE SERVICE ROAD

Figure 24: Cross Section of Regional Road

Primary Road:

6 Lane (8 ft per lane) Road

3 ft Divider on Center and 5 ft Footpath both side

total 61 ft Primary Road

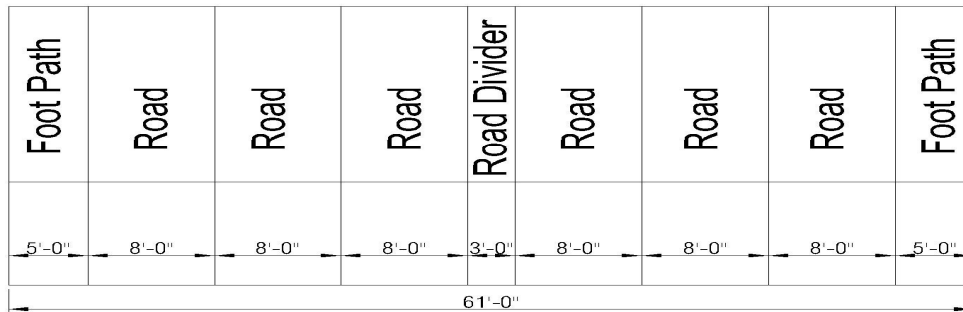**Figure 25: Cross Section of Primary Road:**

Secondary Road:

4 Lane (8 ft per lane) Road

3 ft Divider on Center and 5 ft Footpath both side
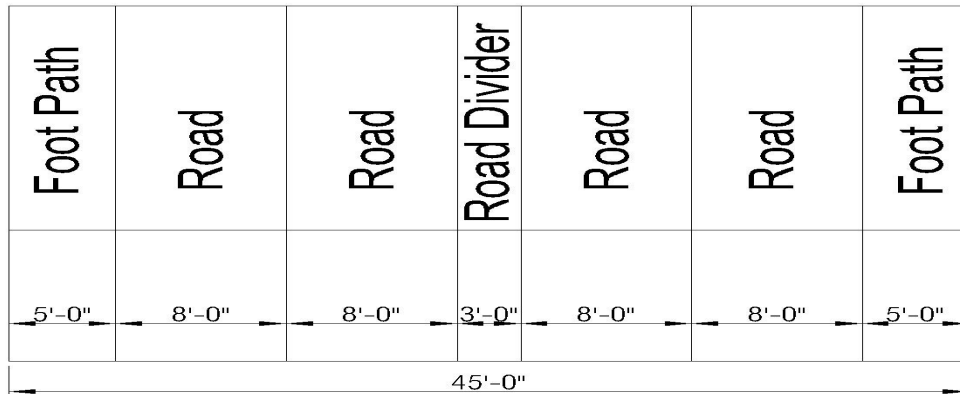
total 45 ft Secondary Road

Figure 26: Cross Section of Secondary Road

Local Road:

3 Lane (8 ft per lane) Road

5 ft Footpath both side

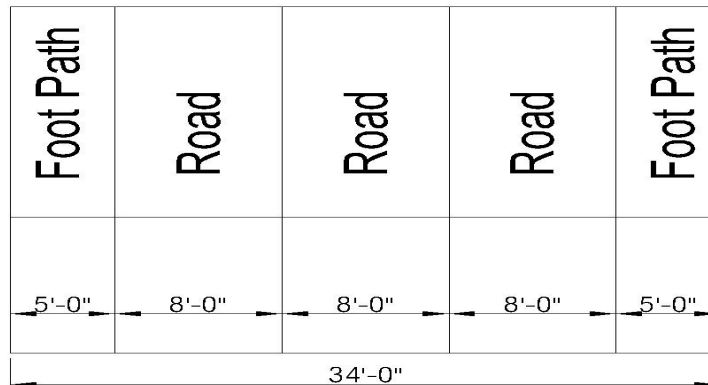total 34 ft Local Road

Figure 27: Cross Section of Local Road:

Rail Road:

20 ft Rail Buffer

2 Lane Road on both side of Rail Track

5 ft Footpath both side

total 62 ft Rail Road
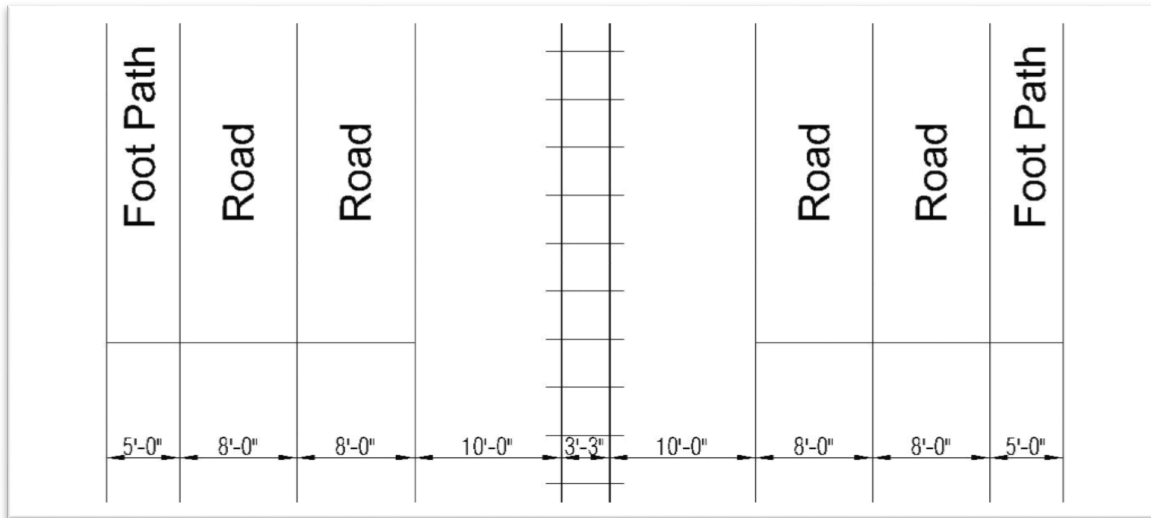
Figure 28: Cross Section of Rail Road:

Improving Public Transportation System

There are both governance and management issues that need to address for the improvement of the public transport services and its performances. Important issues in this aspect are:

- Public transport governance. In term of easy bike and mahindar our regulatory institutes are yet to finalize their policy and control mechanism. Certain numbers of easy bikes are licensed by the Mymensigh city corporation and in reality the numbers of vehicles operating are manifolds. So, it should be first stage to decide its governance issue. Who will control the licensing and hence number, who will take care their fitness and policing their driving behavior. There should be provision and practice to apply fines (with impact on license) to all for violating prevailing rules.

- Driving license. Public transport drivers require advanced training or requirement as they have greater responsibilities on public safety. But it is found that most small public transport or paratransit drivers do not have driving licensing nor any training. As a result they are causing accident and congestion in road.

- Stoppage. As most paratransit operates, there is no fixed stoppage for the easybike. However there are few key locations for each of the routes. Along the whole city, stoppage location can be determined (connecting points to job and schools) and guideline can be developed for the public transport. In figure 14 a schematic guideline for stop locations are illustrated.

Buildup Foot Path

Generally for Traffic Lanes (10.5ftX2) total minimum 21ft is required for an effective road design excluding footpath. Outside of the carriage way we can provide footpath of those roads carry large amount people mainly situated in CBD area and beside schools. For Footpath 3ft with for each side may be convenient for the pedestrian. Here a cross section of road and design is provided (Appendix-c). For JC Guha Road and Shyamchoron Road traffic lanes can be 24ft and each footpath can be 4ft.

Identify fire route

According to Fire Protection section of BNBC fire apparatus access road shall have required 14.7ft (4.5 Meter) width for free access of fire brigade vehicles and the hosepipe can cover 50m surrounding the road. It is assessed that fire brigade facilities covers only 4.1635 Sq.Km of Mymensinsh Pourashava which is 21.30% of total area. However significant numbers of Kutcha houses are located outside area in where it is difficult to reach the fire fighters hose pipe (Figure 17). So, it is very much crucial for widening road width so that there have had free access for fire brigade vehicles and the hosepipe can cover the whole area of Mymensingh.

Road Widening

It has been suggested that several existing roads need to widen from 10 to 15 feet to increase to ensure access to vulnerable inhabitants. After assessing the vulnerable settlement, width of

existing road and others crucial issues an inference can draw that nearly 50Km of roads needed to be widen. In addition 6.4 Km link roads in 18 segments need to build (Figure 18).

Intersection Improvement

It has been observed that several major intersection in the Mymensingh city is congested. However, using the given geometry of the roads and its rights of way, it can be improved. Geometric illustration in Figure 21 and Figure 22 shows a barrier can be given to keep the left turning lane. Analysis on traffic volume of the corresponding intersection supports the argument that congestion is not for the volume but due to haphazard movement of the vehicle, encroachment by hawkers and parking (Appendix C).

Figure 29: Intersection of Kristopur road, K B Ismail Road and Shomboganj Bridge Road

However, for several roads, installing a median strip can help (Figure 30). However, it is to ensure that traffic movement at the intersections should controlled either by electric signaling or by traffic police.

Figure 30: Intersection of K B Ismail Road and Dhaka-Mymensingh Highway

Conclusion

This study examines the transport and travel behavior of MSDP area and identifies severe negligence for its transport sector. Critical points to ponder on:

- No effective public transport system exists nor is such initiative visible. There is no option for public bus to run within the city. Easy bike and alike mode of paratransit exist on selected route but no effective management regulation applied to them to control their number, route, fare, stop location, headway and safety measures.
- Road width is not sufficient compare to increasing traffic and the nature of traffic.

- Travel behavior shows a huge number of shorter trip which can be easily converted to walking trip by ensuring pedestrian facilities and safety. Pedestrian mobility needs to ensure specially in busy commercial area, and in link between stoppage and school, urban services

- Walking accounts for one third of trips. However, proportion amount of space is not allocated for it. As a result, walking people occupy the road space which has been designed for vehicles. Footpaths are provided only with few sections of roads which are often encroached by adjoined business or my informal business. The informal activities sometimes even occupy a section of the road and cause congestion.

- Road geometry is insufficient specially to function in emergency situation. Approximate 70.17% Urban and 78.42% Rural of roads are narrow and emergency vehicles cannot operate on it.

- Traffic management specially around the commercial areas is poor. Governance is poorly visible. Due to regulatory ineffectiveness the busy areas looks crowded, and congested.

Appendix-A: House Hold Questionnaire

Questionnaire for Household Interview Survey

Mymensingh Strategic Development Planning

Holding No..................................
Road No.....................................
Ward no.....................................
Lat..
Long...

Personal Information				
Sex	Age	Income	Vehicle ownership	Family Member

Travel Pattern

Member	Trip Purpose	Major Mode*	Trip Rate (trip/week)	Destination (area/ward)	Cost (Tk.)	Travel Time (min)
1	Work					
	Shopping					
	Education					
	Social					
	Others					
2	Work					
	Shopping					
	Education					
	Social					
	Others					
3	Work					
	Shopping					

	Education					
	Social					
	Others					
4	Work					
	Shopping					
	Education					
	Social					
	Others					
5	Work					
	Shopping					
	Education					
	Social					
	Others					

*Travel Mode: 1= walking ; 2 = Bus ; 3 = Easy Bike ; 4= Taxi ; 5= Rickshaw ; 6 = Van

Appendix-B: Name of Road Required to Widen (m.)

Road Name (Required Widen)	Length (Meter)
Alia Madrasah Bypass	1310.012
Amritu Babo Road	119.9091
Baghmara Road	668.5259
BD Road	425.7921
Boundary Road	184.4266
College Road	688.7246
Datlat Munsi Road	176.1503
Doulat Munsi Road	1212.926
Durgabari Road	409.276
Eshan Chokroborti Road	222.677
Golapjan Road	719.1061
Hari Kishor Road	130.6948
Hisbullah Road	116.5582
K. B Ismail Road	638.3531
Kalibari Road	270.5079
Kewatkhali WAPDA Road	1633.405
Malgudam Road	375.5011
Maychuya Bazar Zillapi Potti Road	263.7867
Mir Bari Road	327.104
Moha Raja Road	325.5378
Monmohon Road	253.1349
Mritunjoi School Road	143.8634
Naha Road	309.5705
Natokghorlen C.K Ghosh Road	254.2648
Ramkrismno Mission Road	32.21533
Sakhari Potti Road	66.01243
Senbari Road	1325.188
Sohid Srity Sarak	733.5776
T.N Ray Road	672.7028

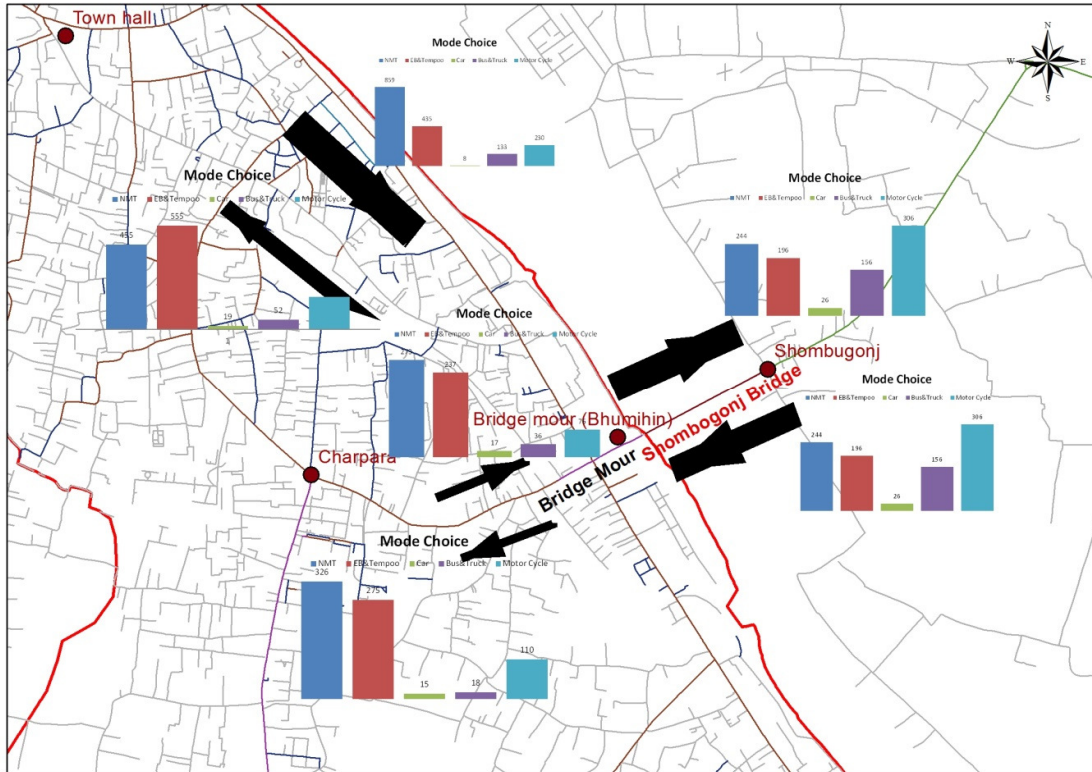# Appendix- C: Traffic Volumes at Intersections

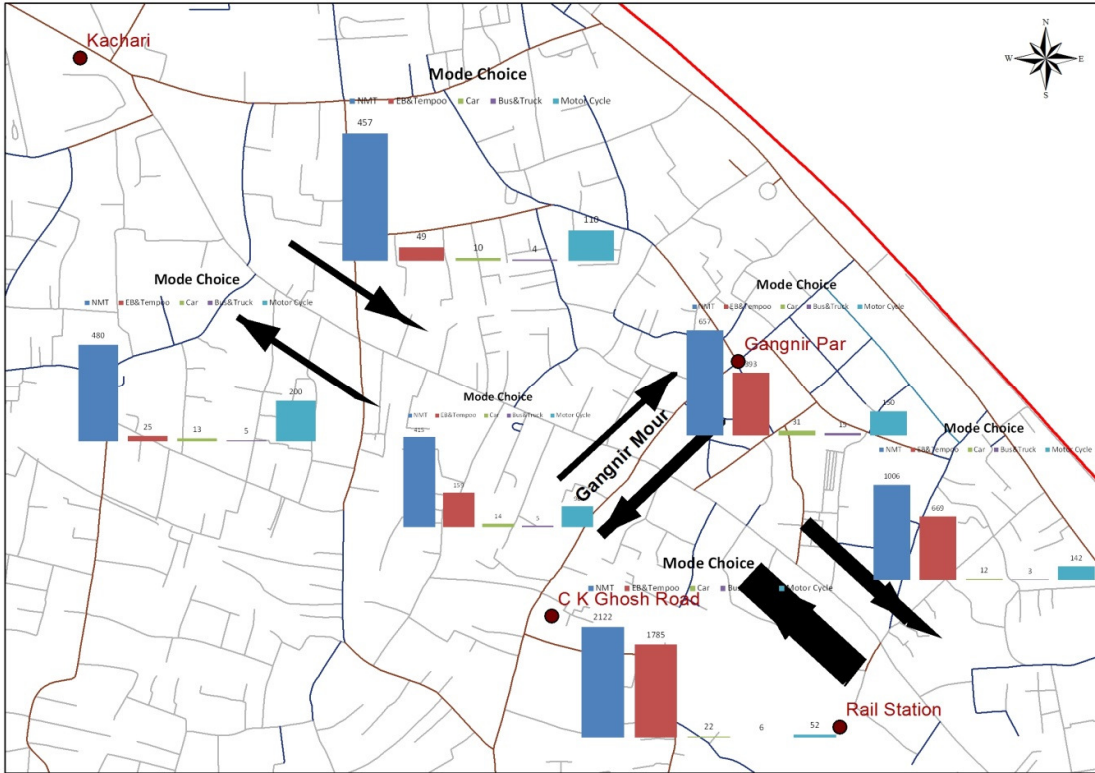**Figure 31 Bridge Intersection**

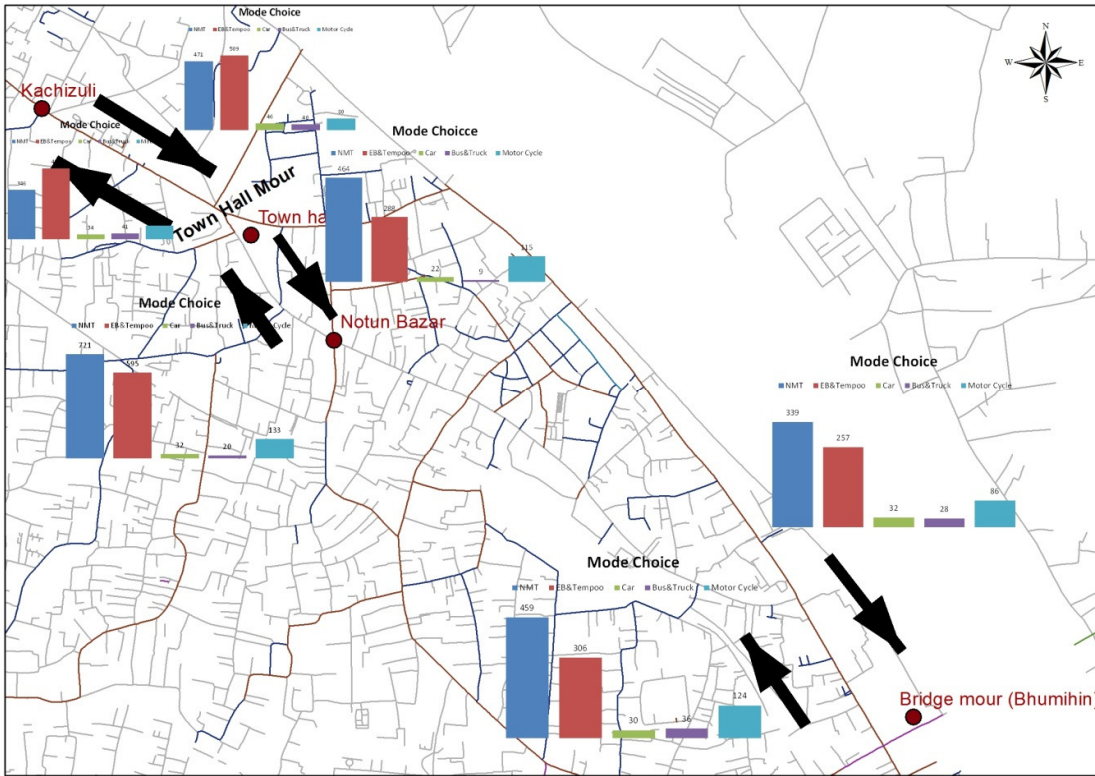**Figure 32 Gangnir Intersection**
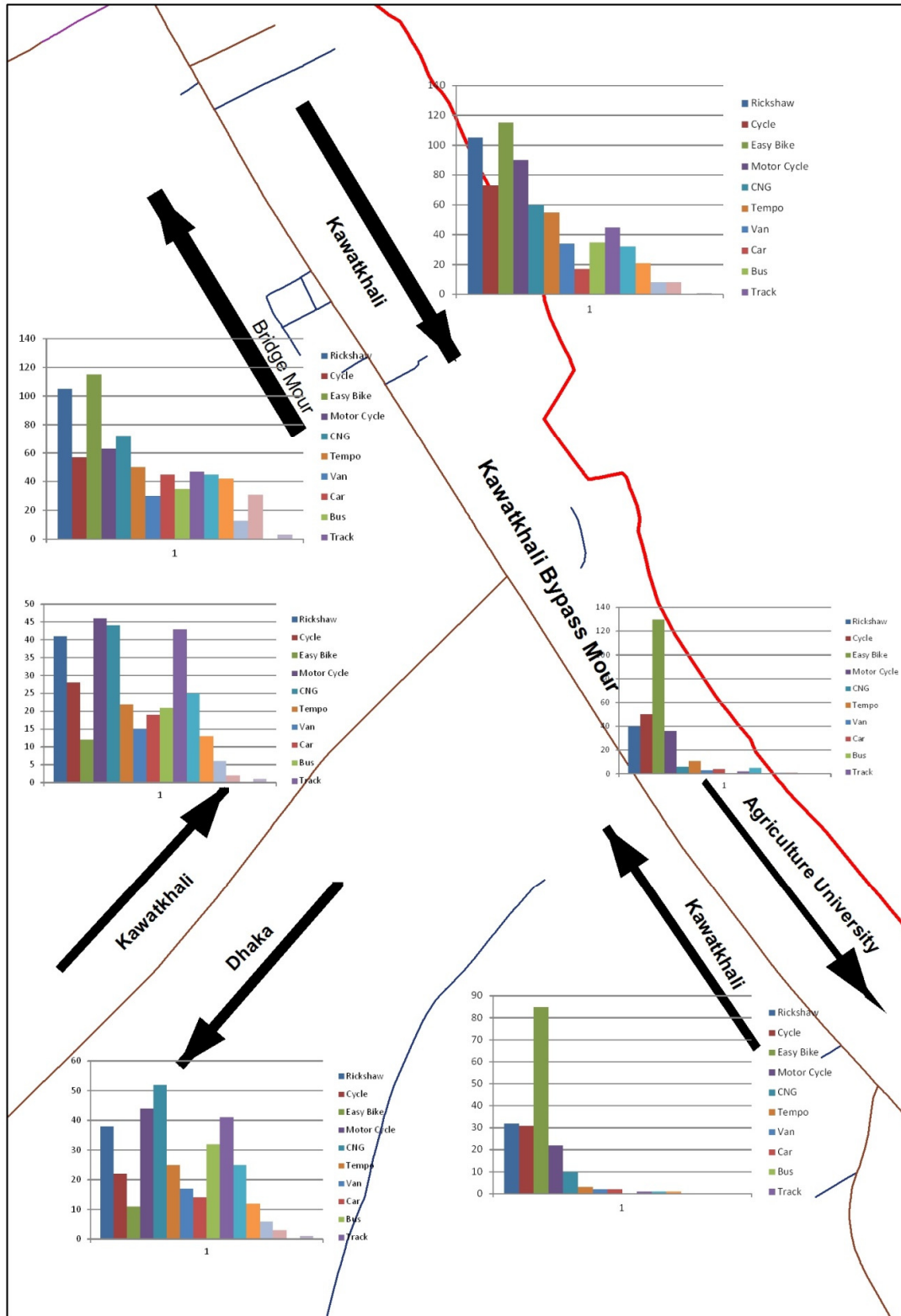

Figure 33 Townhall Intersection

Figure 34 Kawatkhali Bypass Intersection

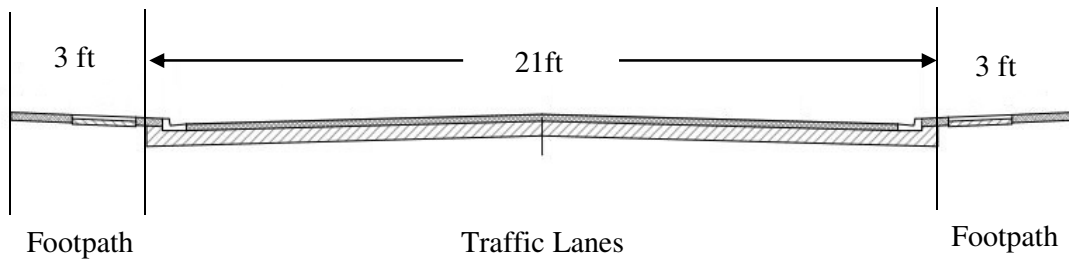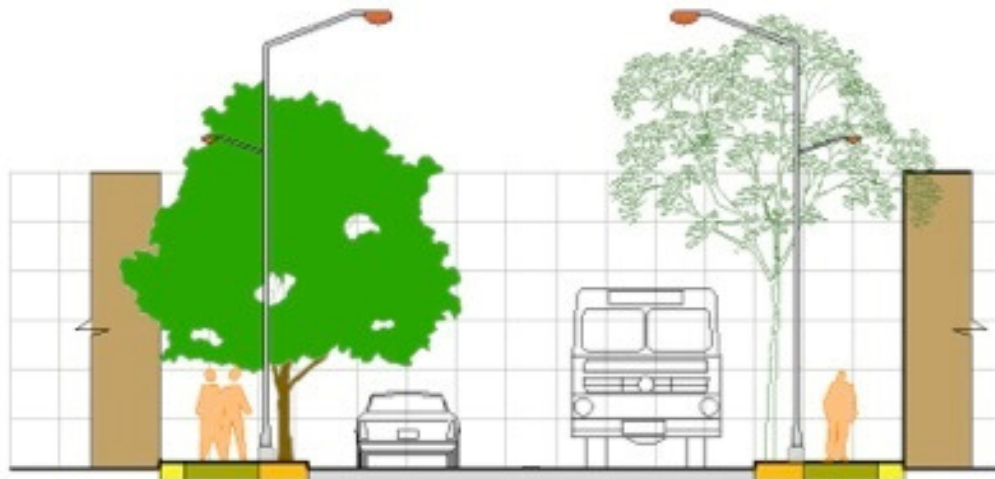# Appendix- D: Cross Section of Road with Footpath

Figure 35 Cross Section of Road with Footpath

Figure 36 Design of Road with Footpath