



Rural Road Planning and Prioritisation Model

User Guide

UPAZILA MAP
UPAZILA: MEDHURA

LEGEND

- Administrative Boundary
 - Upazila Boundary
- Core Network
 - UPAZILA ROAD (Pucca)
 - UPAZILA ROAD (Katcha)
 - UNDA ROAD (Pucca)
 - UNDA ROAD (Katcha)
 - VILLAGE ROAD A (Pucca)
 - VILLAGE ROAD A (Katcha)
 - VILLAGE ROAD B (Pucca)
 - VILLAGE ROAD B (Katcha)
 - National Highways

LOCAL GOVERNMENT AND ENGINEERING DEPARTMENT
Core Road Network

District: TANGAIL
Upazila: BASAL

Road Code	Road Name
19020001	RKD Road
19020002	RKD Road
19020003	Basal-Kancharpur CC Road
19020004	Nakpara N/A-Kancharpur CC via Kacrapara Road
19020005	Kancharpur CC-Chingapa-Gora-Statara-R/A-Patargata Road
19020006	Basal-Nakpara CC via Baura Road

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Rural Road Planning and Prioritisation Model ***User Guide***

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Key words

Bangladesh, Rural Road, Rural Road Prioritisation, Rural Road Network Planning, Core Road Network, Multi Criteria Analysis, Cost Benefit Analysis, Local Government Engineering Department.

Acronyms, Units and Currencies

AADT	Average Annual Daily Traffic
BC	Bituminous Concrete
BUET	Bangladesh University of Engineering and Technology
CBA	Cost Benefit Analysis
CC	Cement Concrete
CVD	Commercial Vehicles per Day
DURP	Department of Urban and Regional Planning
EIRR	Economic Internal Rate of Return
GIS	Geographical Information System
HBB	Herring Bone Bond (brick pavement)
HQ	Head Quarters
LGED	Local Government and Engineering Department
MCA	Multi-Criteria Analysis
RCC	Reinforced Cement Concrete
RDBMS	Road Database Management System
ReCAP	Research for Community Access Partnership
RHD	Roads and Highways Department
SDG	Sustainable Development Goal

Terms Used in the Guide

AADT	Average Annual Daily Traffic volume of a road.
Core Road Network	A network of important roads to maintain inter- and intra-upazila road connectivity. The activity centres form the nodes and roads connecting them are the links of the core network. In the prioritisation scheme used by RPPM all such roads are given additional importance. The core network comprises of RHD roads in an upazila (if any), all upazila and union roads and some village roads.
Cost Benefit Analysis (CBA)	A procedure for evaluating the economic desirability of developing a road by comparing its total benefits with total costs for development. Results of may be expressed in many ways including Economic Internal Rate of Return (EIRR), Net Present Value (NPV), and Benefit Cost Ratio (BCR).
Earth road	An unpaved road; also referred to as “Kutchha Road”.
Facility Score	The score of a road considering the facilities served by the road. It is determined by considering the weight and number of facilities served by a road.
High volume earth road	Earth road which have AADT value over 200.
Local Workshop	Workshop organised at the upazila level to collect some data for RPPM.
Low volume earth road	Earth road which have AADT value less than or equal to 200.
Multi-Criteria Analysis (MCA)	A prioritisation procedure for appraising the total effect of a number of criteria or factors considering their relative importance. RPPM uses a set of criteria for each type of road development.
Road database	The road inventory database maintained by LGED. It contains engineering survey data, traffic survey data, information on maintenance, socio-economic facilities and other information of roads developed and maintained by LGED.
Union road	Roads connecting Union HQ/s with Upazila HQs, growth centres or local markets or with each other.
Upazila road	Roads connecting Upazila HQs with growth centres or one growth centre with another growth centre by a single main connection or connecting growth centre to higher road system.
Village road A	Roads connecting villages with Union HQs, local markets, farms and <i>ghats</i> or with each other.
Village road B	Roads within a village.

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1 Introduction

1.1. Introduction

The **Rural Road Planning and Prioritisation Model (RPPM)** software has been developed for planning and prioritisation of rural roads developed and maintained by the Local Government Engineering Department (LGED). It is developed as a web-based application tool run from the GIS web portal of LGED. This guide is intended to assist LGED officials in using RPPM. It also provides guidance on how to prepare data for use by RPPM.

RPPM is based on the methodology developed for the project “Planning and Prioritisation of Rural Roads in Bangladesh”. The project was implemented under the ReCAP research programme funded by UK Aid. The details of the methodology may be found in the Final Report of the project (<http://www.research4cap.org/Library/DURP-BUET-2017-PrioritisationRuralRoads-FinalReportVolume1-AsCAP-BAN2072A-171105.pdf>).

RPPM can prioritise development for three types of road development works undertaken by LGED, namely, improvement, further improvement (upgrading of an existing paved road) and maintenance of rural roads. The definitions of these terms are as follows:

Improvement

- converting an earth road to a paved road i.e., from earth to BC/RCC in an existing alignment;
- converting a partly paved road to a fully paved road; and
- converting a HBB road to a fully paved road.

Further Improvement/Upgrading

- improvement of road geometric standards, raising of embankment and widening of pavement and/or road crest and raising of road embankments of an existing road.

Maintenance

- maintenance of an already paved or partly paved road (BC, RCC or HBB).

Using data from the road inventory and GIS databases of LGED, RPPM can perform the following tasks.

- Prepare prioritised lists of different types roads for improvement.
- Prepare prioritised lists of different types of roads for further improvement/ upgrading.
- Prepare prioritised lists of different types of roads for maintenance.
- Generate a score table with basic information, details of priority scores, and CBA and MCA results of a road, and generate their rankings.
- Generate the Core Road Network of an Upazila.

All lists are prepared both in tabular and in map form.

1.2. Intended Purpose

After using the Guide, a RPPM user will

- have understanding about RPPM and the tasks that it can perform
- learn how to use RPPM and generate outputs
- know how to save outputs and extract the required information to prepare reports
- learn the data requirements of RPPM, the sources of data and how to collect additional data that are not available in the road database.

1.3. Symbols Used in the Guide

Table 1.1: Meanings of different symbols used in the Guide

Symbol*	Means
Module	Modules of the Tool
Menu	Menu under module of the tool
<i>Submenu</i>	Submenu within Menu
<i>Button</i>	Button within program or Menu or drop-down menu
Procedure	Procedure for conducting any tasks in RPPM
<i>Table</i>	Table in Database or output
<u>Tab</u>	Tab in menu
<i>Field</i>	Field in a Table or in a Tab

*Throughout the User Guide symbols are presented/ written in the same way (bold, italic, underlined etc.) as shown in the table.

1.4. Organisation of the Guide

There are five chapters in this Guide. The first chapter provides a short description of the software (RPPM) and this Guide. The second chapter provides the description of the user interface of the software. The following two chapters provide the description of using the software in different operating modes. The fifth chapter provides the description of the required data and how to configure the tool. The first appendix provides the description of the method for collecting required data from local workshop, while the second appendix provides the data collection tool to be used in the workshop.

1.5. Target and users of the Guide

The User Guide is developed for the concerned LGED officials at Head Quarters and local levels who will consider and plan rural roads in Bangladesh for development based on their merits as reflected in the prioritised scores generated by Rural Road Planning and Prioritisation Model (RPPM).

2 Getting Started

Objectives of the Chapter

After reading the chapter a RPPM user will

- learn how one can access and use RPPM
- understand the user interfaces of RPPM
- be familiar with the main menus of RPPM and the tasks that it can perform.

2.1. User Type

RPPM is a web-based application, integrated as a tool within the GIS web portal of LGED. It has been developed for internal use of LGED and, therefore, its access is controlled. There are two types of RPPM users: privileged users and common users. A privileged user has access to the LGED server to configure some default parameter values used by RPPM, and run the program to generate outputs at upazila and district levels. It is expected that they will be officers at the Planning, Design and Procurement, and Maintenance, Asset Management and Road Safety departments at the LGED Head Quarters. A common user can see the outputs for an upazila or a district for which the program has already been run, and generate and print the output tables and maps as required. However, a common user will not be able to run the program or change the default parameter values used by RPPM.

2.2. Programme Loading

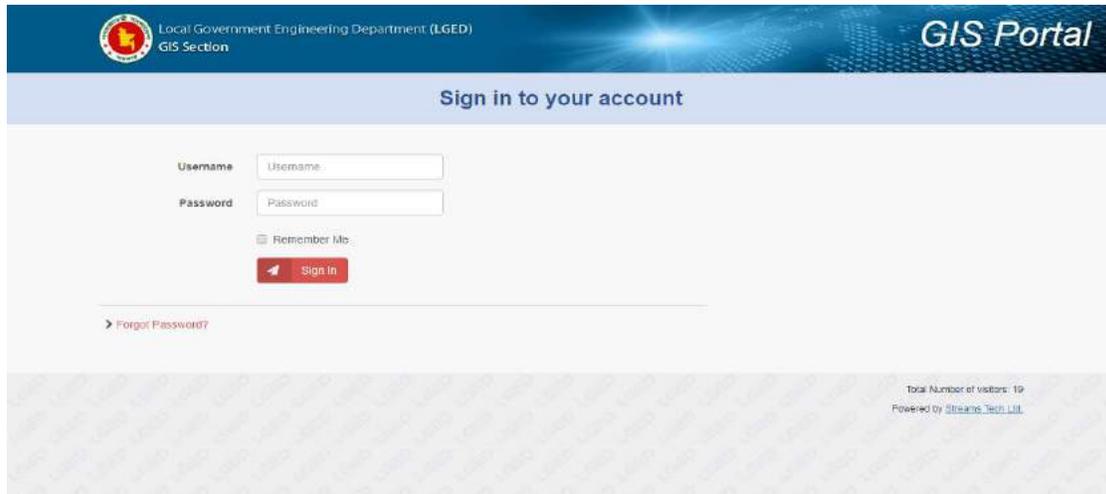
To use the application, enter into the GIS web portal (<http://www.gis.lged.gov.bd/>) of LGED (Figure 2.1). To get access to the web portal to run RPPM, one has to *login* (marked in red in Figure 2.1).

Figure2.1: GIS web portal of LGED



After entering the GIS web portal, the logon window appears on the screen (Figure 2.2). Type your user id and password to log into the system. If you want to avoid logging every time you want to be in the portal check *remember me*. However, for security reason, **checking *remember me* is not recommended.**

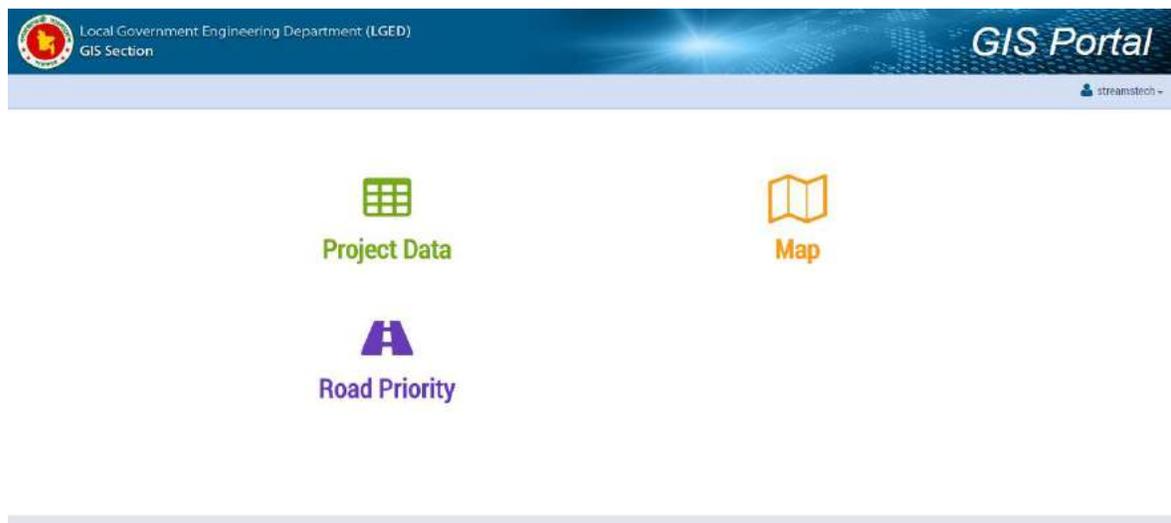
Figure 2.2: Log on Screen



2.3. User Interface

Once you are logged in the system, you can find the browser as shown in Figure 2.3. This is the home screen of RPPM. The three modules – “**Project Data**”, “**Road Priority**” and “**Map**” of the portal are located in this screen. **Road Priority** and **Map** contain all the features of RPPM. This chapter provides the detail descriptions of those features. The **Project Data** module is not part of RPPM and it performs tasks that are beyond the scope of RPPM.

Figure 2.3: Home Screen of RPPM

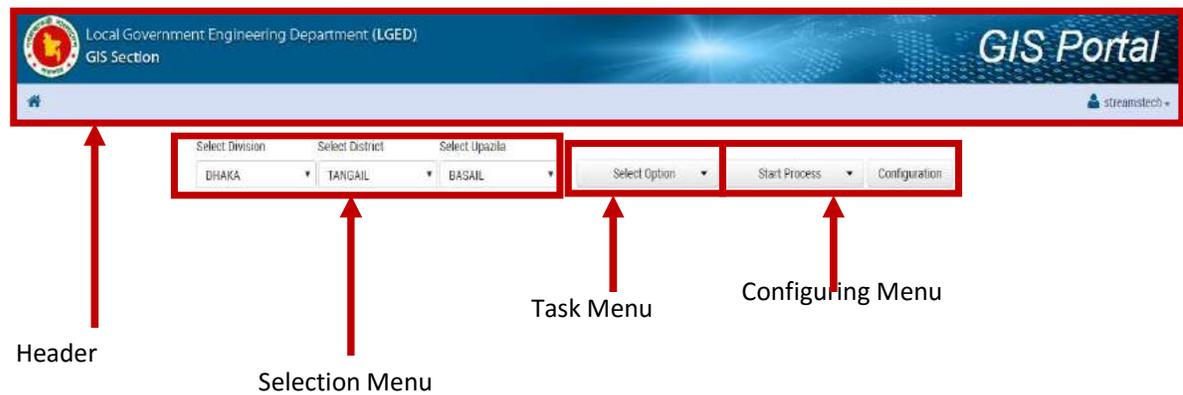


2.3.1. Road Priority Module

The **Road Priority** module generates prioritised lists of roads for improvement, maintenance and further improvement in tabular form. A privileged user can also change the default parameter values used by RPPM from this module.

Once you are in **Road Priority** module, the opening window appears as shown in Figure 2.4. It has four major blocks (**Header**, **Selection menu**, **Task menu** and **Configuring menu**) as marked in the Figure 2.4.

Figure 2.4: Opening Window of Road Priority



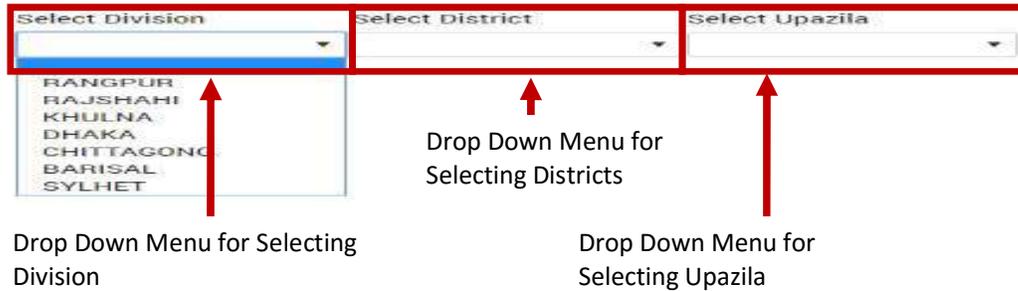
The **Header** has two buttons (Figure 2.4.1). The *home* button takes you to the home screen of RPPM (Figure 2.3). The user icon highlighted in green shows the name of the user who logged in the system.

Figure 2.4.1: Detail of Header



The **Selection menu** (Figure 2.4.2) helps the user to select the geographical entity (upazila or district) for which RPPM is to be run. There are interconnected drop down menus for selection of division, district and upazila. It may be noted here that after typing the first letter of the name of the geographic entity all the geographic entities which start with the same letter appear in the list.

Figure 2.4.2: Detail of Selection Menu



The **Task menu** contains four drop down *buttons* (Figure 2.4.3). Of these buttons, some contain further options which are discussed in chapter five. The Task menu is used for generating lists of roads for development.

Figure 2.4.3: Detail of Task Menu



The **Configuring menu** contains two options (Figure 2.4.4). *Start Process* is a drop-down menu where *configuration* is a single option tool. This menu is accessible only to the privileged users.

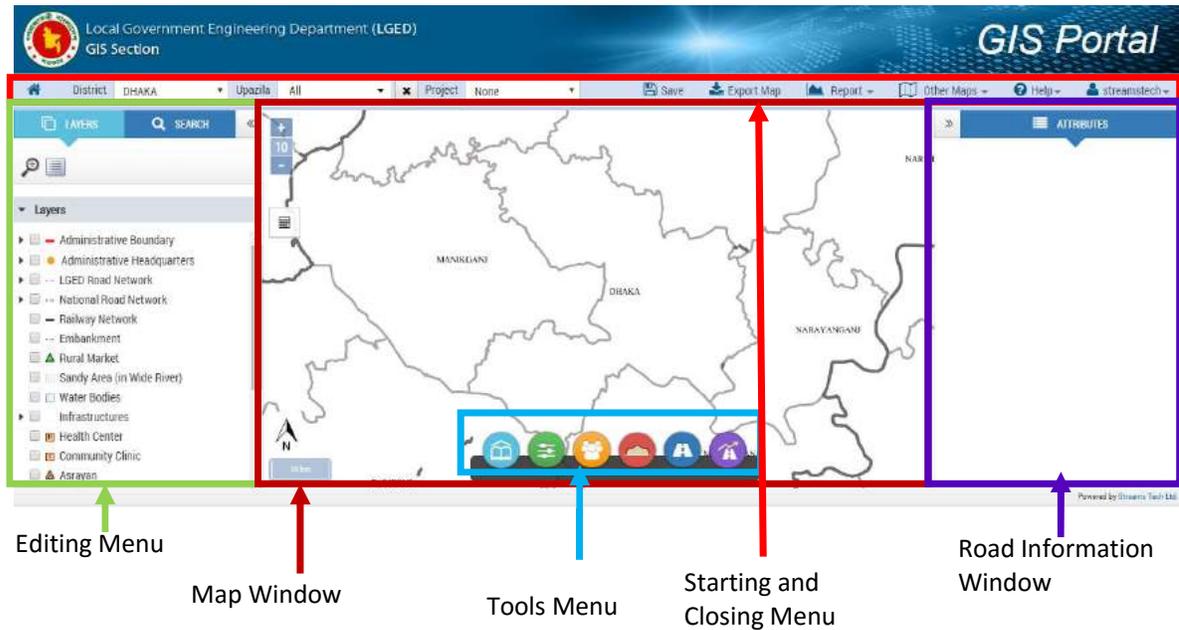
Figure 2.4.4: Detail of Configuring Menu



2.3.2. The Map Module

In the **Map** module a user can visualize the results of tasks performed by RPPM on a map. There are two features in the **Map** module which are not available in the **Road Priority** module. The first is needed to visualize the results; and the second is for viewing results for multiple upazilas. The **Map** module is divided into five major blocks as marked in figure 2.5.

Figure 2.5: The Map Module



The **Starting and closing menus** contain the title of the page and menu selection of the geographic unit and export options. There are three drop down menus (Figure 2.5.1) for selecting a geographic unit, and buttons for saving and exporting results (Figure 2.5.2). There are also buttons for returning to the opening screen of RPPM (Figure 2.5.1) and logger's information (Figure 2.5.2).

Figure 2.5.1: Drop Down Menu for Selection of Geographic Unit



Figure 2.5.2: Save and Export Button

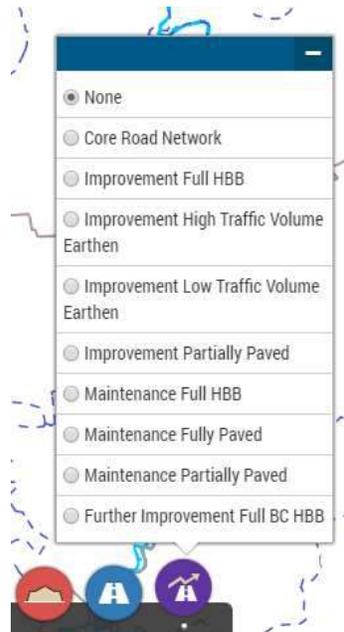


There are six tools in **Tools** menu of the **Map** Module. The *RPPM tool* is the rightmost tool in the tools menu (Figure 2.5.3). It gives ten options to display (Figure 2.5.4).

Figure 2.5.3: RPPM Tool in the Tools Menu of the GIS Portal



Figure 2.5.4: Sub Menus of RPPM tool



In the **Editing** menu there are two tabs (Figure 2.5.5 and Figure 2.5.6). In the Layer tab (Figure 2.5.5), you can select/deselect layers for display and edit display parameters. There are buttons for zooming and getting information on the active layer in this tab. You can select road(s) based on criteria by using Search tab (Figure 2.5.6). The result of the search is shown at the bottom of the Search tab.

Figure 2.5.5: Layer Tab of Editing Menu

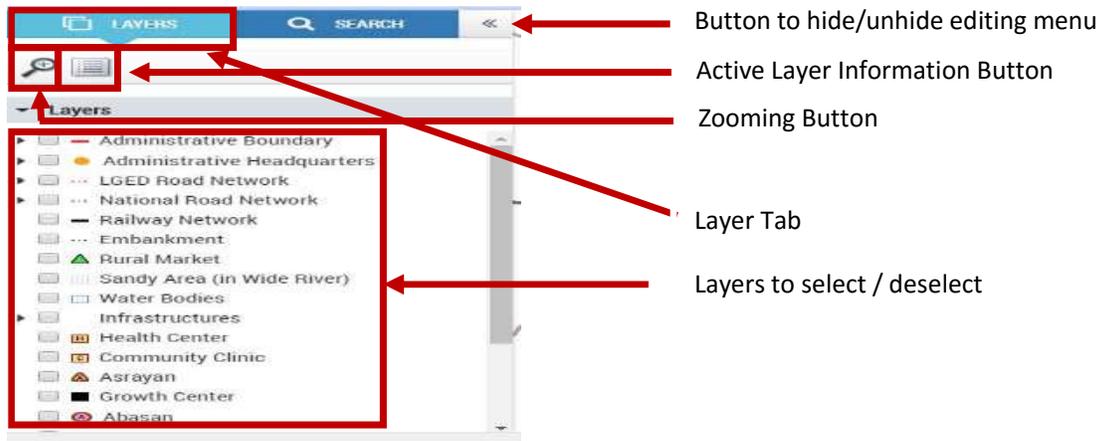
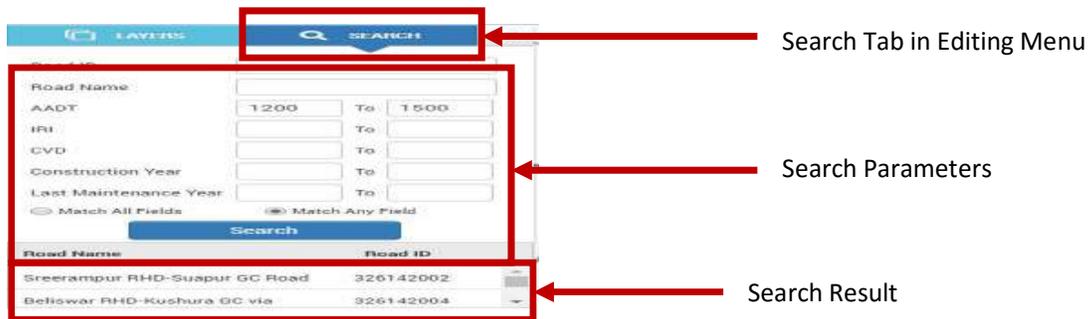
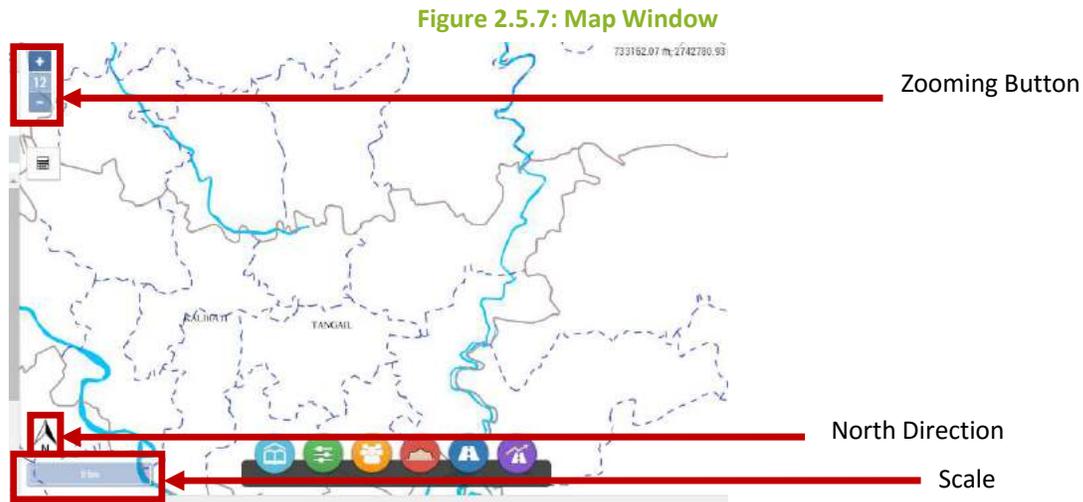


Figure 2.5.6: Search Tab in Editing Mode

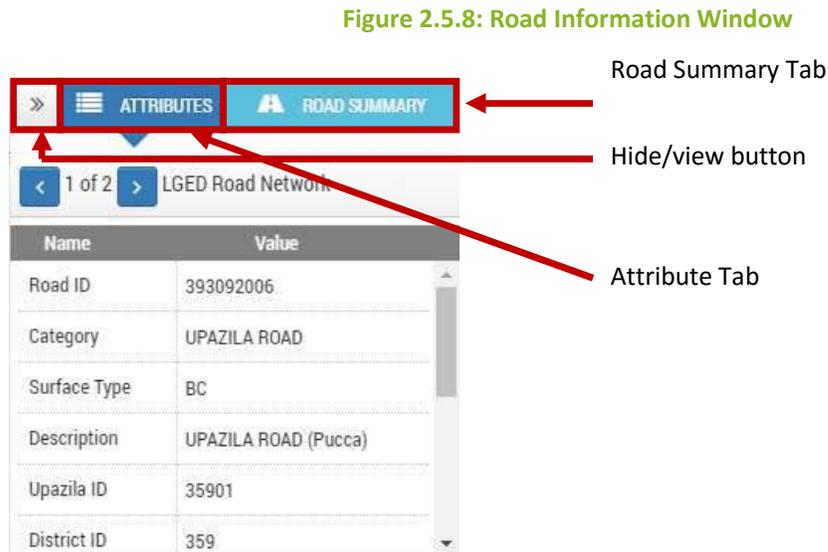


The map window is for viewing the results with the information in the desired layer(s). The window has *zooming* options (Figure 2.5.7). The window also shows scale and north direction of the map.



There are two tabs in the road information window (Figure 2.5.8). The Attributes tab shows the data (for example, road id, road name, road type, road surface, EIRR value etc.) of the selected road for a particular type of development. The Road Summary tab provides some of the most important data for the selected road.

You may note that the editing tool window and road information windows can be viewed using the arrow button.



3 Generating RPPM Outputs in Tabular Form

Objectives of the chapter

After reading the chapter a RPPM user will learn:

- about the tools used in generating priority lists of roads for development
- to generate roads included in the core network of an upazila
- to generate prioritised list of different types of road development (improvement, further improvement/upgrading or maintenance).

3.1. Introduction

RPPM generates prioritised lists of roads for development both in i) tabular and ii) graphical (map) forms. For generating output in tabular form, you have to be in the **Road Priority** module. You can generate the following outputs in tabular form (Table 3.1).

Table 3.1: Prioritised list of roads by development and surface type

Priority list	Development Type	Surface Type
1	Improvement	Low Traffic Volume Earth Roads
2		High Traffic Volume Earth Roads
3		Partially Paved
4		Fully HBB
5	Maintenance	Partially Paved
6		Fully HBB
7		Fully Paved
8	Further Improvement/upgrading	Fully paved (Full BC/RCC, HBB + BC/RCC)

3.2. Generating the Lists of Roads

To generate the prioritized list of roads, you have to select **Task menu** (Figure 2.4). There are four drop down submenus in the **Task menu** (Figure 2.4.3). There are sub-menus in three of the four drop down submenus of the **Task menu** (Figure 3.1.1 to Figure 3.1.3). The submenus initially dictate the development type then the surface type. For earth road, two lists are generated for improvement on the basis of AADT.

Figure 3.1.1: Submenu of Improvement

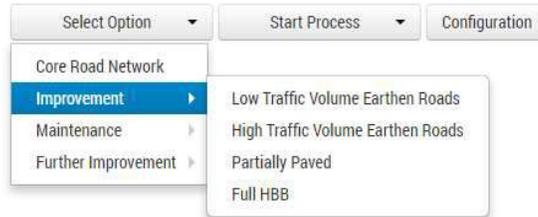


Figure 3.1.2: Submenu of Maintenance

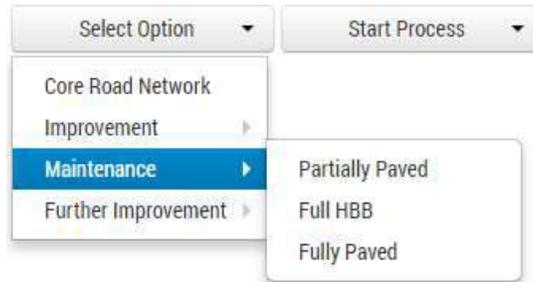


Figure 3.1.3: Submenu of Further Improvement



Once you choose any of the options the browser window appears like Figure 3.2. The description of *Header* is already provided in section 2.3.1. The window contains the **selection menu**, **configuring menu** and **task menu** which are described in sections 2.3.1. The title shows the task performed by the *select option* while output window shows results of the task.

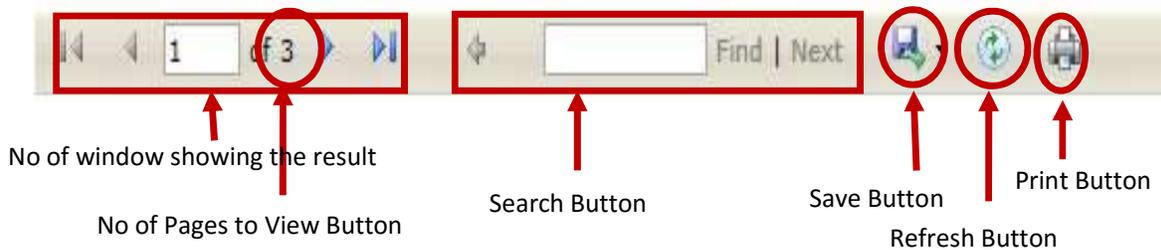
Figure 3.2: Window after activating option for generating list for Improvement



Support tools are used to perform some other related tasks. The following paragraphs provide description of these tasks. It should be mentioned here that an upazila must be selected from the selection menu before selecting any options of the *select option* menu.

There are five tools (Figure 3.2.1) in the **support** tools. The leftmost one is for viewing the number of pages. If the output size is too long to show in one output window at a time, it shows the total number of output windows RPPM needs to show all results. The number in the box shows the serial number of the window it is showing.

Figure 3.2.1: Support Tool



The next one is a **search** tool that you may use to search by road code or road name. The third tool is to **save** the results. It is a drop-down tool (Figure 3.2.2). It can save the results of the task either in a word (*.docx), spreadsheet (*.xlsx) or portable document (*.pdf) format. The fourth one is the **refresh** button. This button is useful for privileged users to check the variations resulting from changes, made during configuration (Chapter Five), in the default parameter values. The fifth and rightmost tool is the **print** tool for printing the results.

Figure 3.2.2: Save Tool



It may be noted here that if there is no output for a particular task, RPPM provides message “There is no road in this category” in the browser window (Figure 3.2.3).

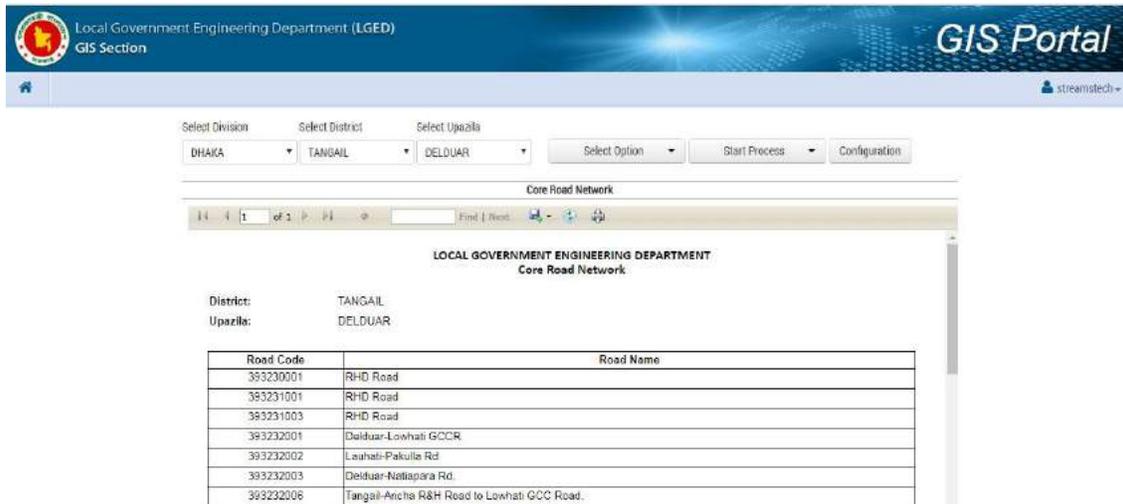
Figure 3.2.3: Screen of Browser if there is no road for selected type of development



3.3. Generating List of Roads in Core Network

Selecting the *Core Road Network* from *Select Option* provides the list of roads which constitute the core road network of an upazila (Figure 3.3). The list shows the road code and name of the road along with the district and upazila name.

Figure 3.3: Core Road Network



3.4. Generating Lists for Improvement of Roads

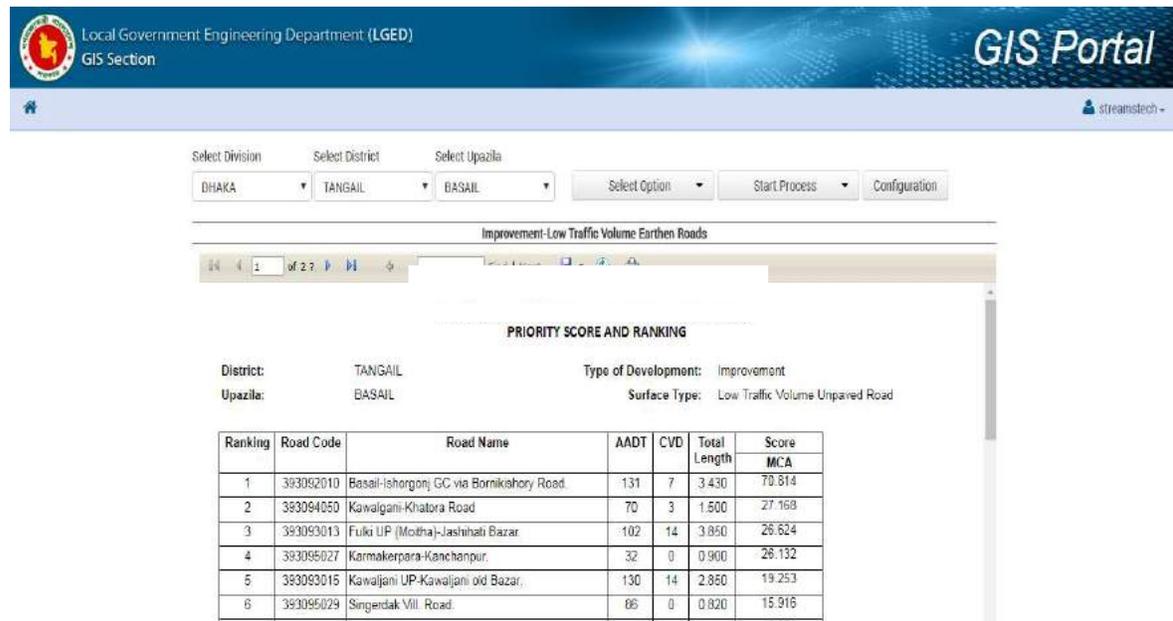
Four prioritised lists of roads for improvement can be generated depending upon road surface type and traffic volume. The generated lists (Figure 3.4.1 – Figure 3.4.4) show priority ranking, road code, road name, and other related information of the road that has been used for producing the list. In addition, the output window provides the information on district, upazila, surface type and type of development.

It may be noted here that for low traffic volume earth roads the ranking is based on MCA scores.

Procedure for identifying low traffic volume earth road for improvement is as follows (Output window is shown in Figure 3.4.1).

Select Option > Improvement > Low Traffic Volume Earth Roads

Figure 3.4.1: Output Window Showing Priority List for Improvement of Low Traffic Volume Earth Road



Procedure for identifying high traffic volume earth road for improvement is as follows (Output window is shown in Figure 3.4.2).

Select Option > Improvement > High Traffic Volume Earth Roads

Figure 3.4.2: Output Window Showing Priority List for Improvement of High Traffic Volume Earth Road

The screenshot displays the GIS Portal interface for the Local Government Engineering Department (LGED) GIS Section. The main content area shows the results of a search for high traffic volume earth roads for improvement in the Tangail district, Basail upazila. The results are presented in a table titled "PRIORITY SCORE AND RANKING".

Search Parameters:

- Select Division: DHAKA
- Select District: TANGAIL
- Select Upazila: BASAIL
- Select Option: [Dropdown]
- Start Process: [Dropdown]
- Configuration: [Dropdown]

Improvement: High Traffic Volume Earthen Roads

14 | 1 | of 1 | [Navigation icons]

PRIORITY SCORE AND RANKING

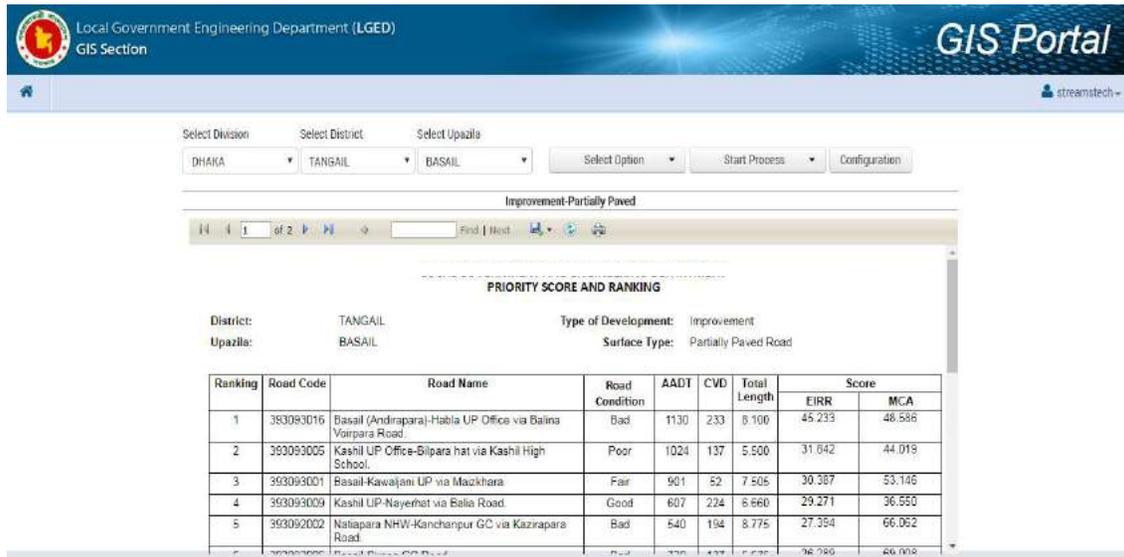
District: TANGAIL Type of Development: Improvement
 Upazila: BASAIL Surface Type: High Traffic Volume Unpaved Road

Ranking	Road Code	Road Name	AADT	CVD	Total Length	Score	
						EIRR	MCA
1	393093011	Kanchanpur UP Office-Pathorghata hat via Tarabari Road.	434	48	8.700	14.631	28.612
2	393092009	Ishorgonj GC-Surma GC Road.	388	30	3.000	14.386	75.874
3	393093008	Basail-Kanchanpur UP office Road.	344	48	3.920	8.071	41.303
4	393093014	Fulkihat(Janjania)-Kawaljani UP via Bodajon.	238	10	4.000	5.757	28.741
5	393094024	Karalia-Sayaata via Sonalia Road.	202	19	2.700	2.760	6.538
6	393094001	Singerdak-Saydampur-Halupara.	350	7	8.410	0.000	2.319

Procedure for identifying partially paved road for improvement is as follows (Output window is shown in Figure 3.4.3).

Select Option > Improvement > Partially Paved

Figure 3.4.3: Output Window Showing Priority List of Improvement for Partially Paved Road



Procedure for identifying Fully HBB road for improvement is as follows (Output window is shown in Figure 3.4.4).

Select Option > Improvement > Fully HBB

Figure 3.4.4: Output Window Showing Priority List for Improvement for Full HBB Road



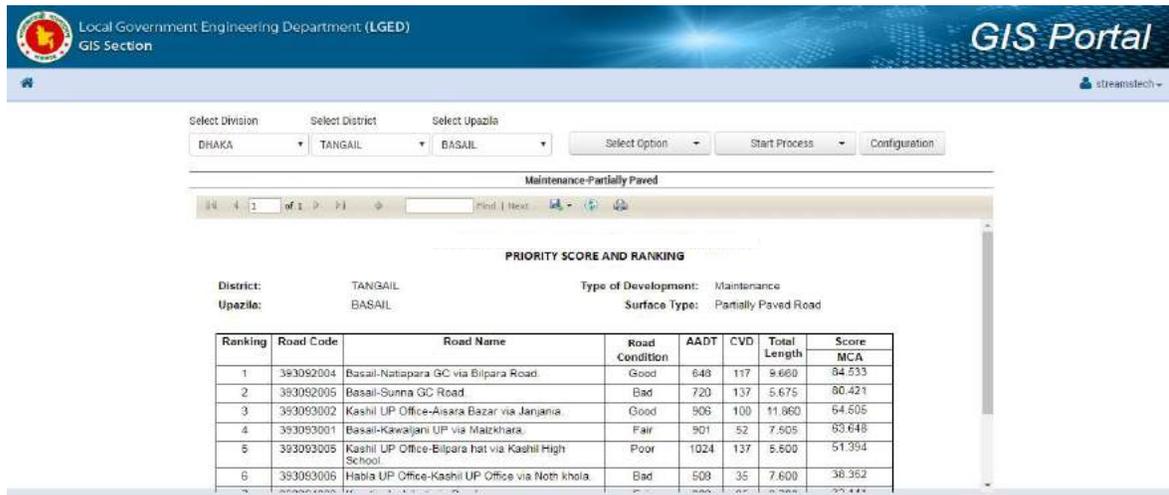
3.5. Generating Lists for Maintenance of Roads

For paved, partially paved and HBB roads, RPPM generates outputs with list of roads for maintenance from **select option menu** (Figure 3.1.2). The output window shows Ranking, Road Code, Road Name, and other information (Figure 3.5.1-3.5.3). Information on district, upazila, surface type and type of development are shown at the top of the lists for maintenance. The ranking is done on the basis of MCA scores.

Procedure for identifying partially paved roads for maintenance is as follows (Output window is shown in Figure 3.5.1).

Select Option > Maintenance > Partially Paved

Figure 3.5.1: Output Window Showing Priority List for Maintenance of Partially Paved Roads



Procedure for identifying HBB roads for maintenance is as follows (Output window is shown in Figure 3.5.2).

Select Option > Maintenance > Fully HBB

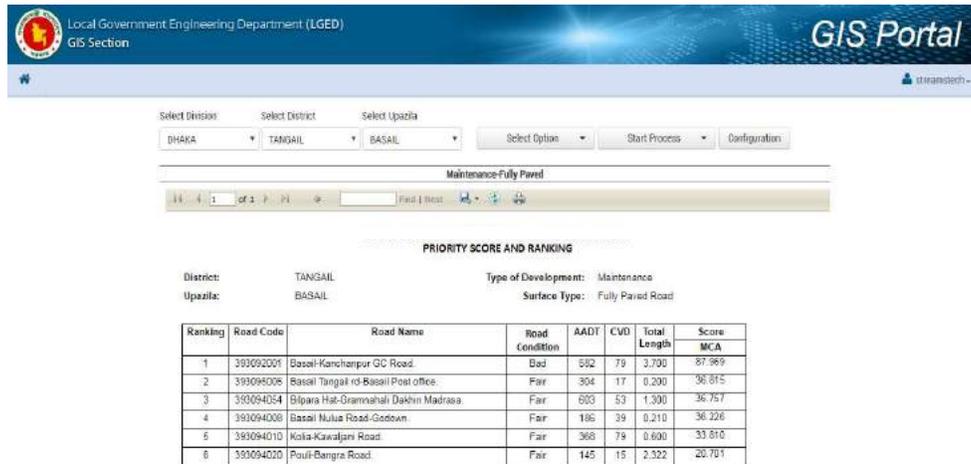
Figure 3.5.2: Output Window Showing Priority List for Maintenance of Fully HBB Roads



Procedure for identifying paved roads for maintenance is as follows (Output window is shown in Figure 3.5.3).

Select Option > Maintenance > Fully Paved

Figure 3.5.3: Output Window Showing Priority List for Maintenance of Fully Paved Roads



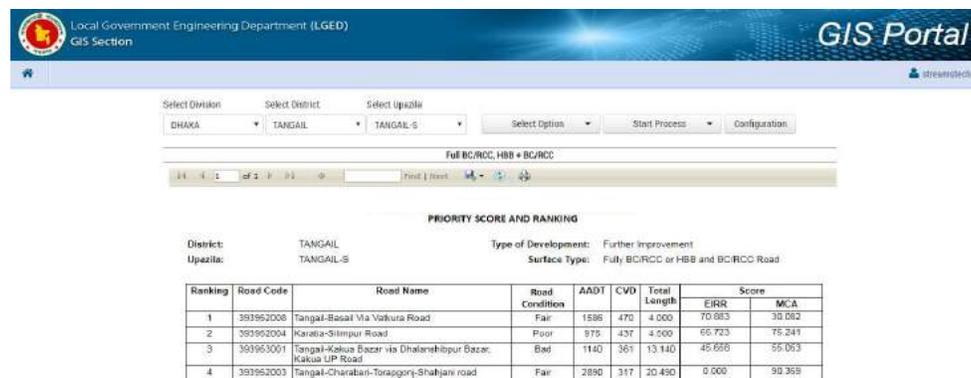
3.6. Generating Lists for Further Improvement/Upgrading

RPPM can generate output with list of roads for further improvement/upgrading from the **select option menu** (Figure 3.1.3). The browser window looks like figure 3.6 when further improvement is selected from the **select option menu**.

Procedure for identifying roads for further improvement is as follows (Output window is shown in Figure 3.6).

Select Option > Further Improvement> Full BC/RCC, HBB+BC/RCC

Figure 3.6: Output Window Showing Priority List of Roads for Further Improvement



4. Generating Map Output

Objectives of the Chapter

After reading the chapter a RPPM user will learn

- about the tools in the Map Module used to generate priority lists of roads
- to generate Core Road Network of an upazila or some selected upazilas
- to generate maps for different types of road development (improvement, further improvement/upgrading or maintenance).

4.1. Introduction

RPPM can show the generated prioritised list of roads on a map. The **Map** module is open for all. Any user can see the outputs. However, only privileged user can edit maps.

4.2. Mapping the Roads for Development

RPPM is available from the tools menu of the **MAP** module (Figure 2.5) of the GIS web portal. As mentioned earlier, the module has 10 radio buttons (Figure 2.5.4), which help you to choose the map to be generated. Once you select the RPPM, the other tools of the web portal become inactive. To deactivate RPPM tool, select *none*. For visual clarity, after selecting the option of development, close the menu which pops up after selecting the RPPM application. Similar to the **Road Priority** module, the **geographical unit must be selected before activating RPPM tool**. A geographical unit of interest can be selected from *selection menu* (Figure 2.5) located at the top half of map window.

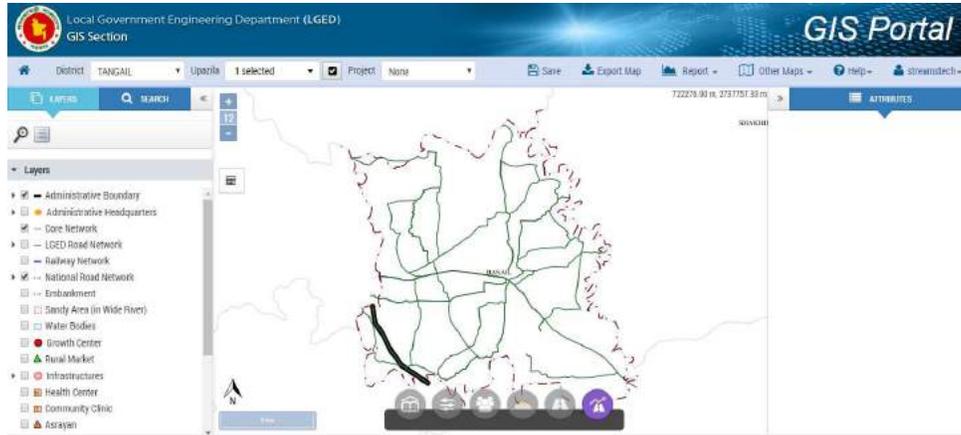
You can view the map outputs for multiple upazilas in a single window (Figure 4.1) in **Map** module unlike the **Road Priority** module which can show the output of a single upazila in a window.

There are six tools in the **Tools** menu of **Map** module – **RPPM tool** is at the rightmost tool. From the submenu of **RPPM tool** maps of Core Road Network, different types of roads considered for different types of development can be selected.

Procedure for mapping the Core Road Network is as follows (Output window is shown in Figure 4.1.1).

RPPM Tool > Core Road Network

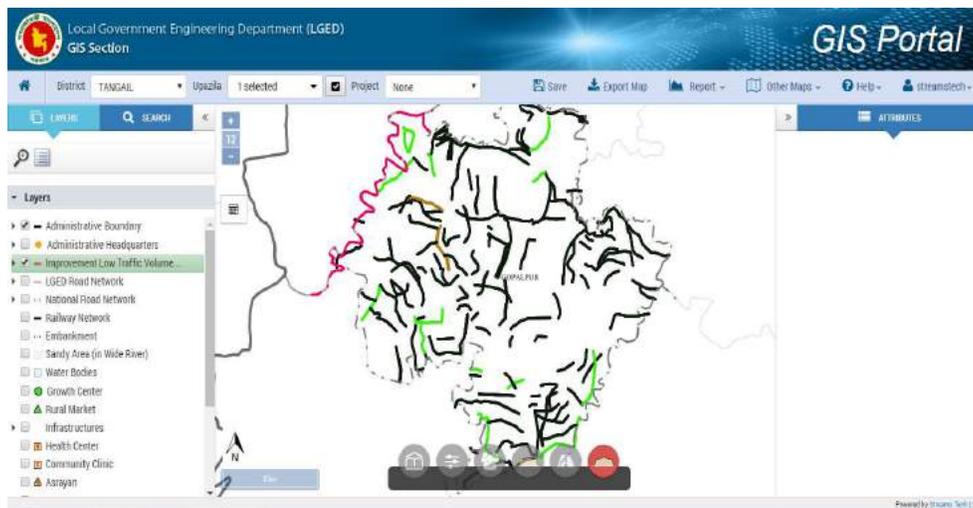
Figure 4.1.1: Map Window Showing the Core Roads Network



Procedure for mapping the Low Traffic Volume Earth Road for Improvement is as follows (Output window is shown in Figure 4.1.2).

RPPM Tool > Improvement > Low Traffic Volume Earth Road

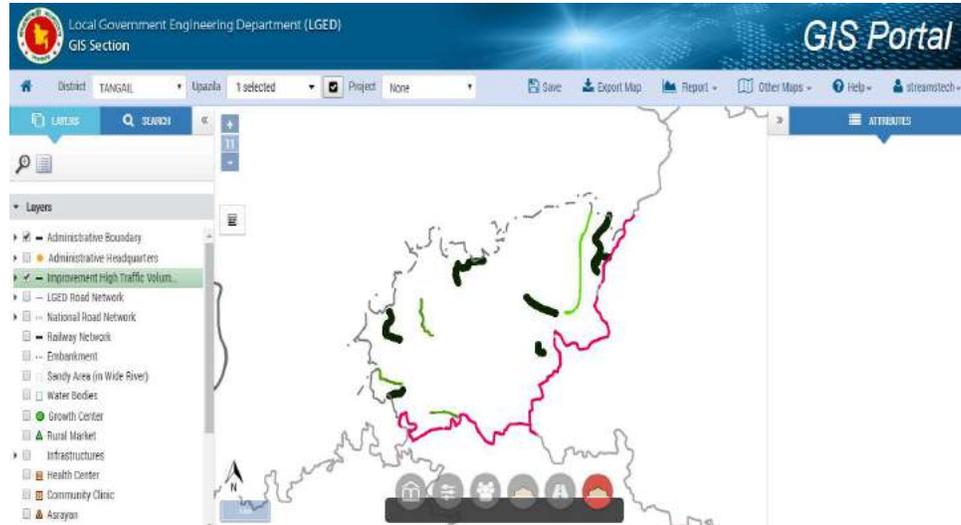
Figure 4.1.2: Map Window Showing the Low Volume Roads for Improvement



Procedure for mapping the high traffic volume earth road for improvement is as follows (Output window is shown in Figure 4.1.3).

RPPM Tool > Improvement > High Traffic Volume Earth Road

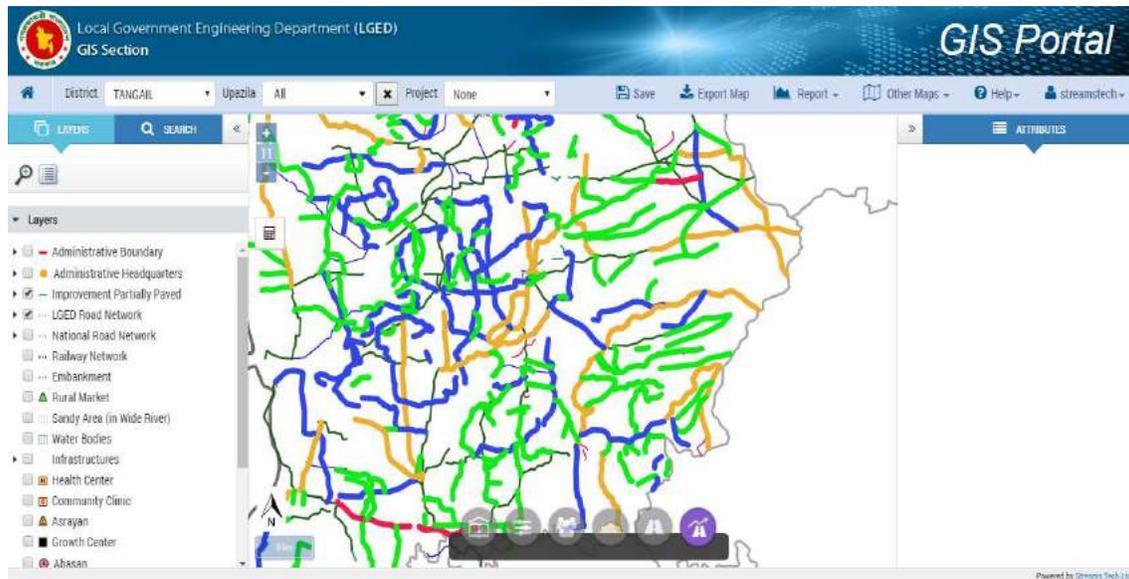
Figure 4.1.3: Map Window Showing the High Traffic Volume Earth Road for Improvement



Procedure for mapping the partially paved roads for improvement is as follows (Output window is shown in Figure 4.1.4).

RPPM Tool > Improvement > Partially Paved Road

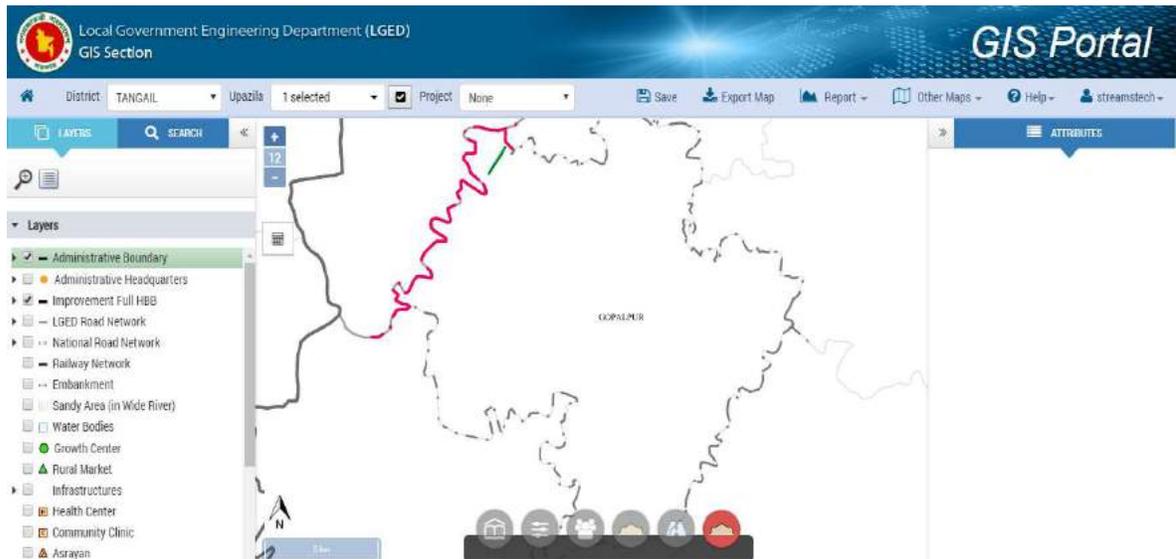
Figure 4.1.4: Map Window Showing the Partially Paved Roads for Improvement



Procedure for Mapping the HBB roads for improvement is as follows (Output window is shown in Figure 4.1.5).

RPPM Tool > Improvement > HBB Roads

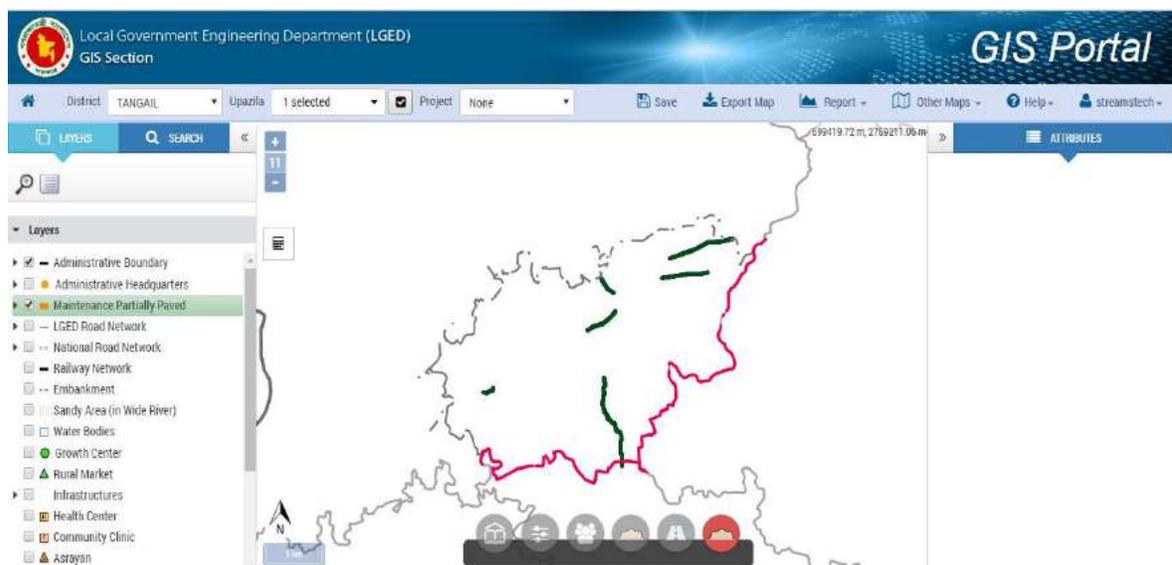
Figure 4.1.5: Map Window Showing the HBB Roads for Improvement



Procedure for mapping the partially paved roads for maintenance is as follows (Output window is shown in Figure 4.1.6).

RPPM Tool > Maintenance > Partially Paved Roads

Figure 4.1.6: Map Window Showing the Partially Paved Roads for Maintenance



Procedure for mapping the HBB Roads for maintenance is as follows (Output window is shown in Figure 4.1.7).

RPPM Tool > Maintenance > Full HBB Roads

Figure 4.1.7: Map Window Showing the HBB Roads for Maintenance



Procedure for mapping the paved roads for maintenance is as follows (Output window is shown in Figure 4.1.8).

RPPM Tool > Maintenance > Paved Roads

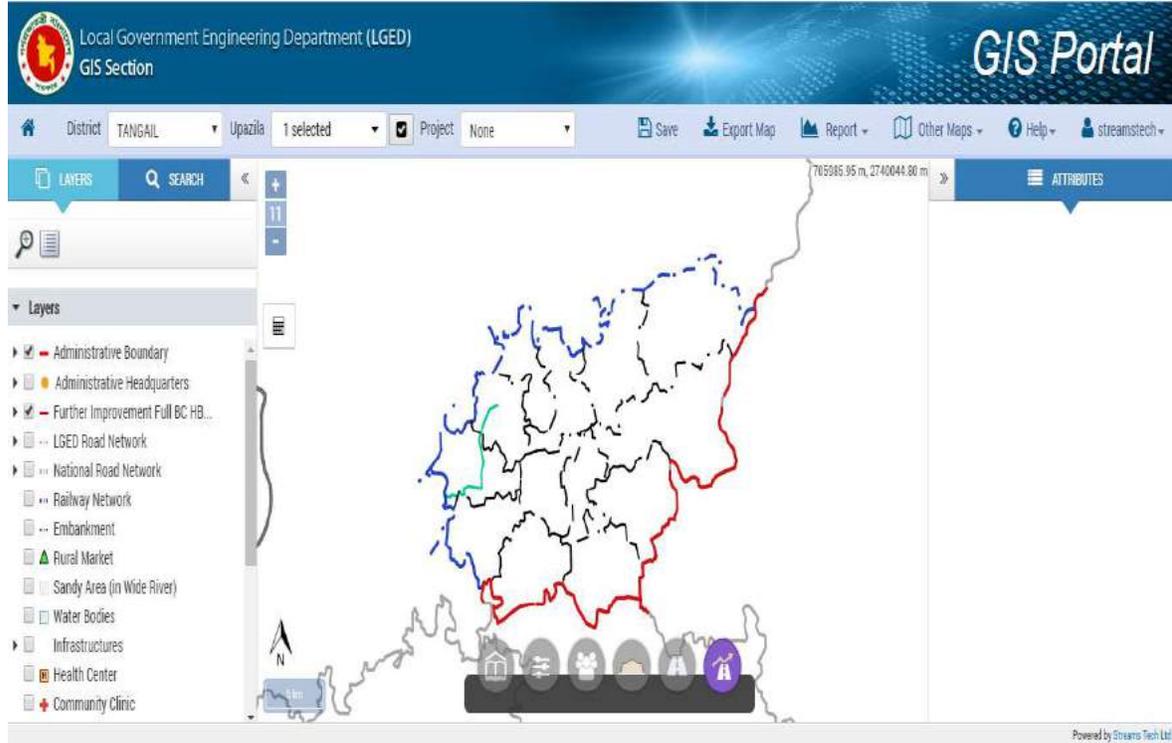
Figure 4.1.8: Map Window Showing the Paved Roads for Maintenance



Procedure for mapping the Roads for Further Improvement is as follows (Output window is shown in Figure 4.1.9).

RPPM Tool > Further Improvement > Full BCC HB Roads

Figure 4.1.9: Map Window Showing the Roads for Further Improvement



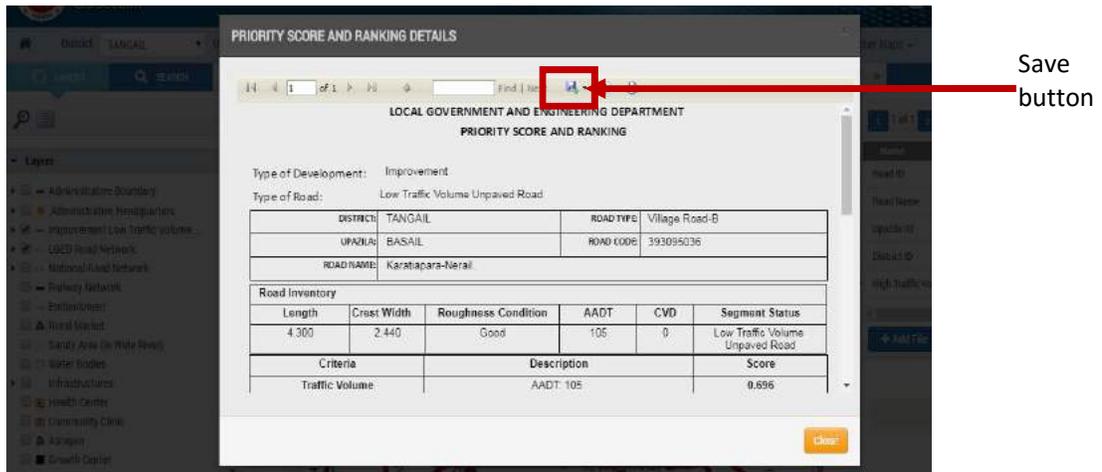
In the map window, roads are grouped according to their EIRR values or MCA scores. Maps showing roads identified for improvement or further improvement/upgrading (High Traffic volume earth road, HBB road and partially paved roads, and paved roads), the grouping of roads are according to their EIRR values. In maps for maintenance and Low Traffic Volume Earth Roads, the grouping of roads is based on their MCA scores.

4.3. Extracting Data of Mapped Road

A user has two options to extract data of roads shown in a map: view the data in road information window (Figure 2.5.8) or in a .pdf file (Figure 4.2.1). The first option is applicable when RPPM is not in active mode, while the second option is available when RPPM is activated. It should be mentioned here that these options are not applicable in case of *core road network*.

When a road is selected on a map, you can see its information in a road information window. Depending upon the type of road, several tabs may be available under the attribute tab. The road summary provides detailed data on the road, which can be exported as an excel sheet and saved. When RPPM is activated, selecting a road on map results in a pop-up (Figure 4.2.1). The pop up shows the value of different parameter values used in EIRR and MCA calculations and physical and traffic data of the selected road. The information on the pop-up window can be saved (the save button is marked in Figure 4.2.1) in .pdf, .xlsx or .docx format.

Figure 4.2.1: Pop-up of Priority Score and Ranking Detail of Road



A user with access to the GIS server (that is a privileged user) can use this modality to extract and use the detailed data of a road to generate a report. The contents of the generated report are shown in Fig. 4.2.1

Procedure for generating priority score and ranking of a single road is as follows (Output window is shown in Figure 4.2.2).

Select Road >Double Click

Figure 4.2.2: Report of Priority Score and Ranking of a Road Generated by RPPM

PRIORITY SCORE AND RANKING					
Type of Development:	Improvement				
Type of Road:	High Traffic Volume Unpaved Road				
DISTRICT:	TANGAIL	ROAD TYPE:	Upazila Road		
UPAZILA:	BASAIL	ROAD CODE:	393092009		
ROAD NAME:	Ishorgonj GC-Sunna GC Road.				
Road Inventory					
Length	Crest Width	Roughness Condition	AADT	CVD	Segment Status
3	3	Good	388	30	High Traffic Volume Unpaved Road
Criteria		Description		Score	
Traffic Volume		AADT: 388		2.57	
Socio-economic Facilities	Types		Number		4.10
	Primary School		2		
	Secondary School		1		
	College		0		
	Madrasa		1		
	Industries		0		
	Health Center		0		
	Community Clinic		0		
	Non Government Clinic		0		
	Upazila Health Complex		0		
Other Centers		0			
GC/RM	Types		Number		29.20
	Growth center		2		
	Rural market		0		
Connectivity				35.80	
Road Type		Upazila Road		0.00	
Surface Type		% of paved segment: 0%		0.00	
Road Safety		No		0.00	
Local Priority		Medium Priority		4.20	
Total					75.87
MCA Score		75.87			
EIRR		14.39			
Ranking		2			

4.4. Editing the Maps

You can change the display or printing features of maps by adding/removing layer(s), change of colour and appearance of map features. You can also save and export the generated results.

4.4.1. Adding/Removing a Layer

The default setting of display in **Map** module is the last active layer(s). Running RPPM adds one added layer showing the results. If a user wants some additional layer(s), they can be added. Similarly, some active layer(s) can be removed if desired (Figure 4.3.1)

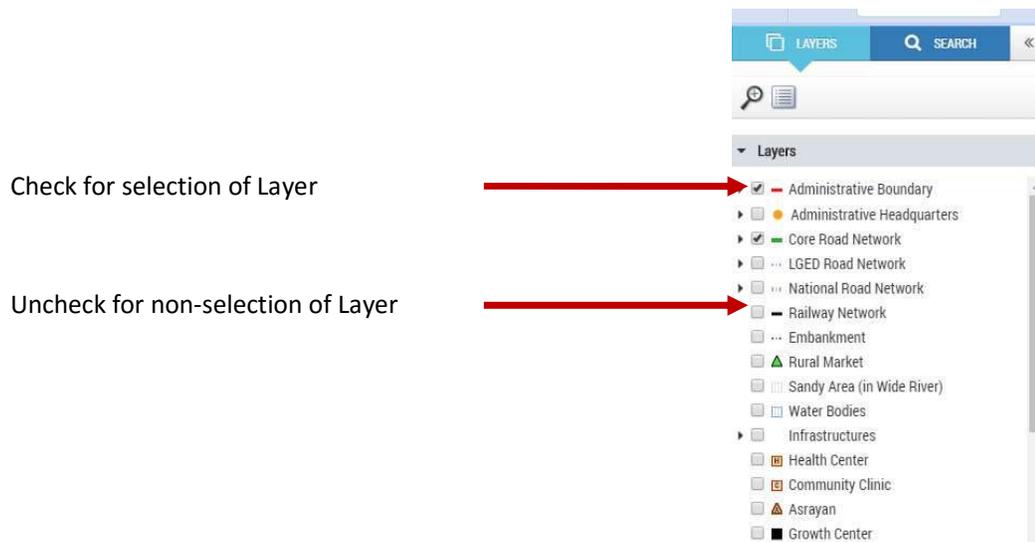
Procedure for Adding Layer

From the **Editing Menu** check the *layer* to add

Procedure for Removing Layer

From the **Editing Menu** uncheck the *layer* to add

Figure 4.3.1: Adding/ Removing Layer



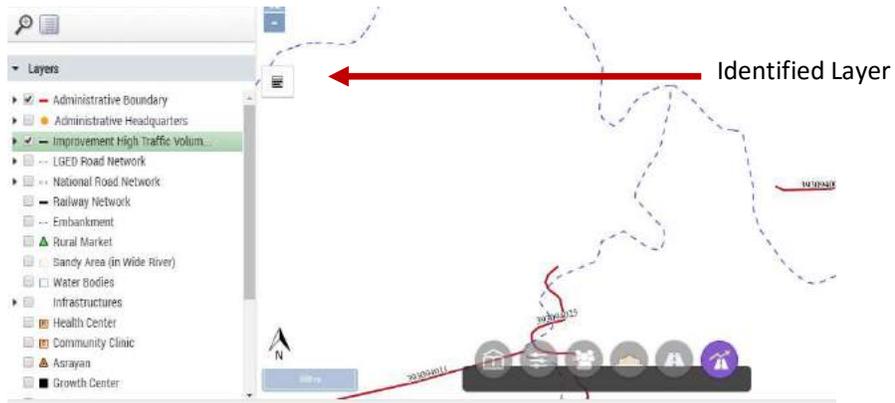
4.4.2. Editing the Display Properties of Map Feature

RPPM shows the roads in core road network according to official categorization of roads by LGED. In addition, it shows the road code. RPPM categorizes selected roads for any type of development according to their MCA scores or EIRR values that has been used for ranking. A user can change the appearance of map features.

Procedure for changing the properties of map features

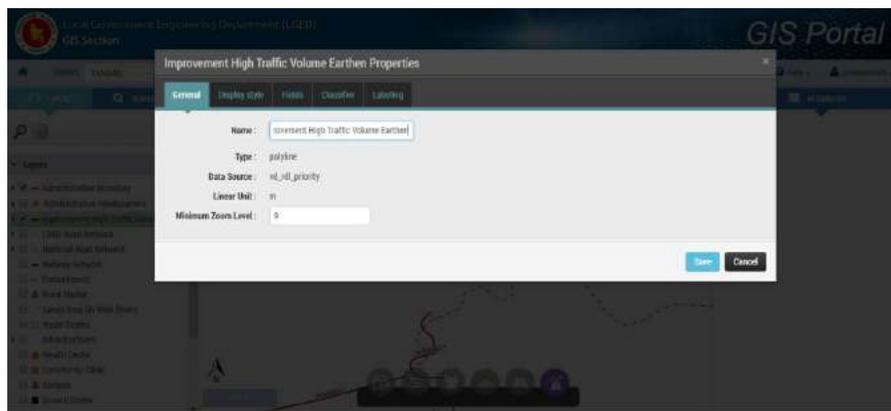
1. Select the layer. The layer would be highlighted (Figure 4.3.2)

Figure 4.3.2: Identifying layer



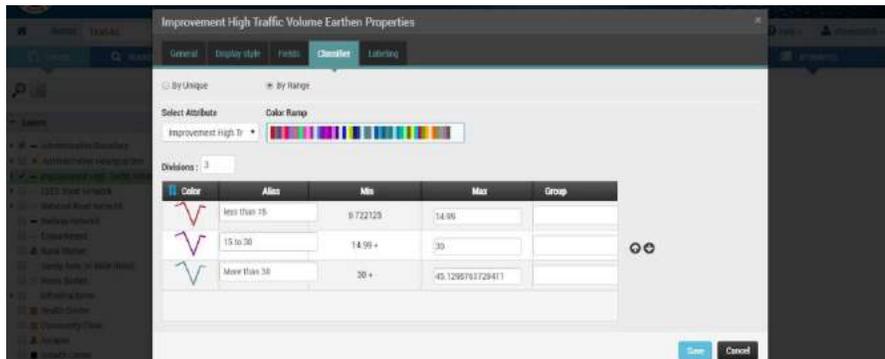
2. Double clicking the layer will show a popup window with display property (Figure 4.3.3). Select classifier tab (Marked in Figure 4.3.3).

Figure 4.3.3: Display Property Popup



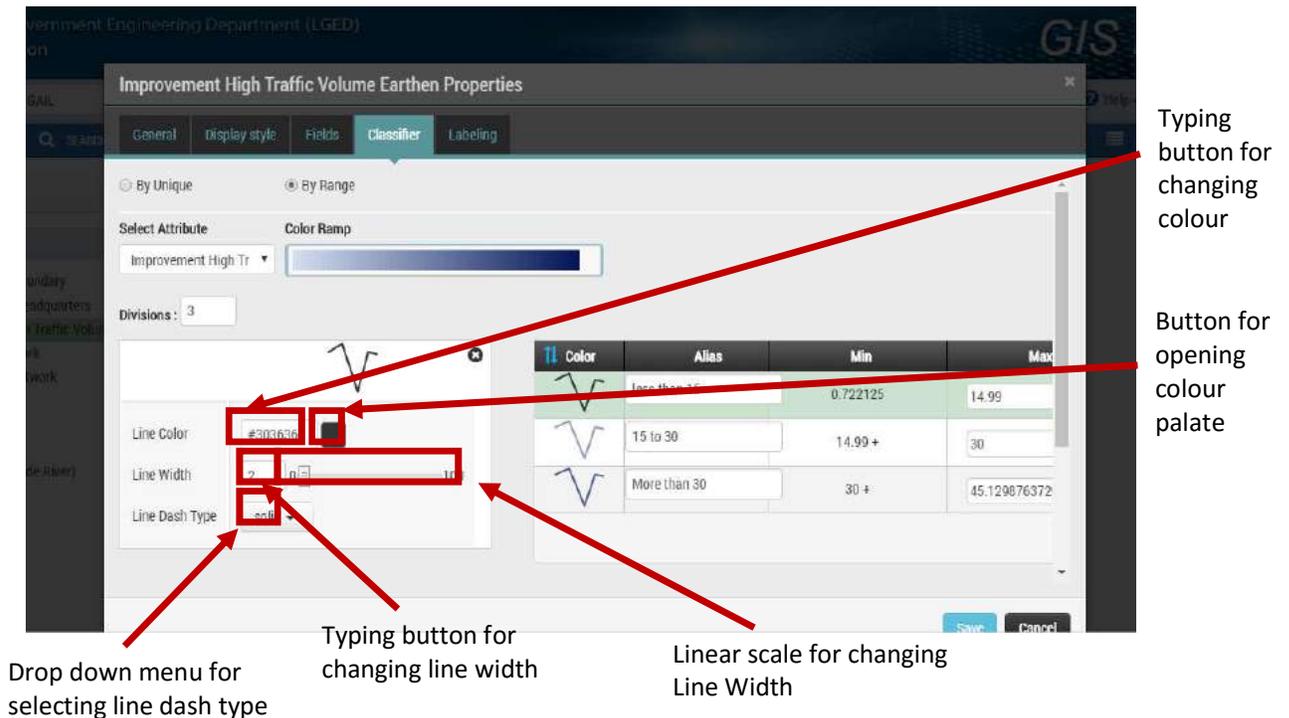
- Depending upon the variable by which map the feature is displayed, in classifier tab there may be a division field (Marked in Figure 4 .3.4).

Figure 4.3.4: Properties of Classifier Tab



- A user can increase or decrease the value of division which will change number of classes in the displayed map.
- The *alias* field will display the title of the class while the *Min* and the *Max* are the minimum and maximum values of the class. Minimum and maximum values can be changed either by typing the value or using the up or down arrows.
- Double clicking the colour of any class change the display of classifier tab (Figure 4.3.5). A user can change the colour by typing *color* code (marked) or from *color* palate (by double clicking the *color*). Similarly, change the width by typing (marked) or changing the value in linear scale (marked). For changing the line dash type there is a drop-down menu.

Figure 4.3.5: Properties of Classifier Tab after double clicking colour of any class



- d. Once you are satisfied with the display settings choose the save button to bring the changes in display.

4.4.3. Exporting and Saving Map

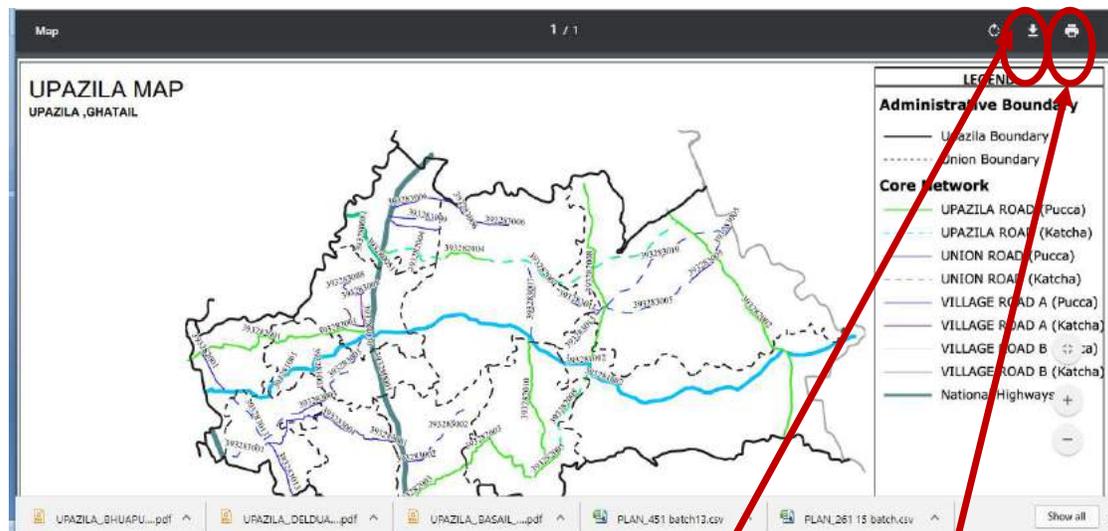
You can export the generated maps in pdf format from the GIS Portal by selecting *Export Map* from **starting and closing menu**. A preview of the map layout will open in a separate tab as a pdf file in the browser (Figure 4.4). If acceptable, then download the file and save it or alternatively selecting save button from starting and closing menu will save the map in jpeg format.

It may be mentioned here that if the browser blocks the popup window the export map option will not function.

Procedure for exporting and saving map

starting and closing menu > *Export Map* > *Download*

Figure 4.4: Saving and Exporting Map



Download
Button

Print Button

5. Data Requirements for RPPM

Objective of the Chapter

After reading this chapter a RPPM user will

- understand the types of data required to run RPPM
- know the source of data and their storage in the road database
- learn how to prepare data for RPPM
- learn how to change/configure the default parameter values of RPPM

5.1. Data Requirements for Running RPPM

RPPM uses data from the road database of LGED to calculate MCA and EIRR values. Table 5.1 shows the required data for RPPM including the mode for data collection and updating. The information available in the GIS database is used for generating maps.

Table 5.1: Required Data for RPPM

Data on	Mode of Data Collection/Updating
Growth Centre and Rural Markets	Regular updating process of LGED
Position of Growth Centre and Rural Markets on Roads	
Physical and Traffic Features of Road	
Socio-Economic Facilities (except market and growth centre) along the road.	
Segment-wise Physical Feature Information of Road	
Segment-wise Physical Condition Information of Road	
Mode-wise Traffic Volume Data on the Road	
Local priority	Local Workshop
Connectivity	
Road Safety	
Vehicle Operating Cost, Standard Speed (km/hour), Value of Time (Tk/hour) in different roughness conditions	GIZ, 2009
Road Construction Cost, Routine Maintenance Cost and Periodic Maintenance Cost of Roads	Planning, Design and Procurement, and Maintenance Department of LGED; Asset Management and Road Safety Department of LGED
Consumer Price Index	Statistical Yearbook published by the Bangladesh Bureau of Statistics

The existing road database contains most of the required data in different tables. Table 5.2 provides the list of tables that hold the data. However, two new tables (**Vehicle Attribute** and **Road field data**) are to be created and appended to the Road database before running RPPM. These two tables contain data that are not available in the existing road database.

The **Vehicle Attribute** table contains values of vehicle operating cost, standard speed (km/hour) and Value of Time (Tk/hour) in different roughness conditions for 15 types of vehicles that operate on rural roads of Bangladesh. These values are used for CBA calculation. The values for this table are extracted from a GTZ study for LGED (GTZ, 2009). These values need not to be changed in the near future. The values in this table can be changed when new values are available.

In the **Road field data** table there are 12 fields (Figure 5.1). Of these 12, six fields (the six left most columns of the figure) are identifiers for the road while for the five right most fields data have to be collected from local workshops. No action is needed on field 7. The five right most fields contain the data on connectivity; local priority and road safety (see details in Appendix A). After collecting data on these items from local workshops in a district, this table has to be created and appended to the database before running RPPM for the district.

Figure 5.1: Structure of Road Field Database

ID	RoadID	ThanaID	RdSINO	RdTypeCode	RdName	Neighboring	UpazilaLeve	UnionLevelK	LocalPriority	VillageLevel	RoadSafety
1	12	35901	1	2	Basail R&H (UP	1	1	0	1	0	1
2	15	35901	2	2	Natiapara NHW	1	1	0	1	0	0
3	16	35901	3	2	Kanchanpur GC	1	1	0	2	0	0
4	17	35901	4	2	Basail (UP2HQ)	1	1	0	1	0	0
5	19	35901	5	2	Basail R&H (Gr	1	1	0	1	0	0
6	21	35901	7	2	Basail R&H (Sat	1	1	0	3	0	0
7	22	35901	8	2	Kanchanpur GC	1	1	0	3	0	0
8	23	35901	9	2	Ishorgonj GC-S	1	1	0	2	0	0
9	24	35901	10	2	Basail-Ishorgor	1	1	0	2	0	0
10	57	35901	1	3	Basail GC-Kawc	0	0	1	1	0	0
11	58	35901	2	3	Kashil UP Offic	0	0	1	1	0	0
12	60	35901	3	3	Kashil UP Offic	0	0	1	3	0	0
13	63	35901	4	3	Kashil UP Offic	0	0	1	3	0	0
14	71	35901	5	3	Kashil UP Offic	0	0	1	2	0	0
15	72	35901	6	3	Habla UP Offic	0	0	1	3	0	0
16	80	35901	7	3	Habla UP Offic	0	0	1	2	0	0
17	89	35901	8	3	Basail (Mohila	0	0	1	1	0	0
18	90	35901	9	3	Kashil UP-Naye	0	0	1	3	0	0
19	91	35901	10	3	Basail (Sata Mc	0	0	1	1	0	0
20	93	35901	11	3	Kanchanpur UP	0	0	1	3	0	0
21	94	35901	12	3	Nayerhat-Kawc	0	0	1	2	0	0
22	95	35901	13	3	Fulki UP (Mott	0	0	1	2	0	0
23	96	35901	14	3	Fulkihat (Janja	0	0	1	3	0	0
24	98	35901	15	3	Kawaljani UP-K	0	0	1	1	0	0

Source: LGED, 2017

RPPM uses seven tables of the existing road database (Table 5.2). These tables contain engineering survey data, traffic survey data, maintenance information and information on socio-economic facilities. The data listed in this table are regularly collected by LGED.

Table 5.2: Table of the Road Database Used by RPPM

Contains Data On	Data Table	Data Field Used in RPPM
Data on Growth Centre and Rural Markets	GC_SM_List	<ul style="list-style-type: none"> Gc_SM_ID, GC_SM_Tag
Data on Position of Growth Centre and Rural Markets on Roads	RoadGC_SM_Position	<ul style="list-style-type: none"> GcOrHatID
Data on Physical and Traffic Features of Road	RoadInventory	<ul style="list-style-type: none"> RdTypeCode, AADT_MT, AADT_NMT, CVD, IRI
Data on socio-economic facilities (except market and growth centre) along the road.	RoadSocioConn	<ul style="list-style-type: none"> Socio_SI, S_Type_ID
Segment wise physical feature information of road	RoadSegments	<ul style="list-style-type: none"> SurfType
Segment wise physical condition information of road	RoadSegCond	<ul style="list-style-type: none"> Rutting_L, Rutting_H, Depression_L, Depression_H, Ravelled_L, Ravelled_H, Crack_L, Crack_H, PotHole_L, PotHole_H, EdgeDistress_L, EdgeDistress_H E_Date
Mode wise Traffic Volume data on the road	RoadTrafficCount	<ul style="list-style-type: none"> VehiID, CountHatDay, CountNonHatDay

5.2. Data Preparation

RPPM uses data from both the road and GIS databases. The data mentioned in Table 5.1 are regularly collected by LGED. But data for the two tables (**Road field data** and **Vehicle Attribute**) need to be prepared before RPPM can be run for a district/upazila. Of these two, data for the **Vehicle Attribute** table may remain the same for all districts for some years and may not need updating. However, the **Road field data** table has to be created after organising local workshops (see Appendix A) for a district before RPPM can be run for that district.

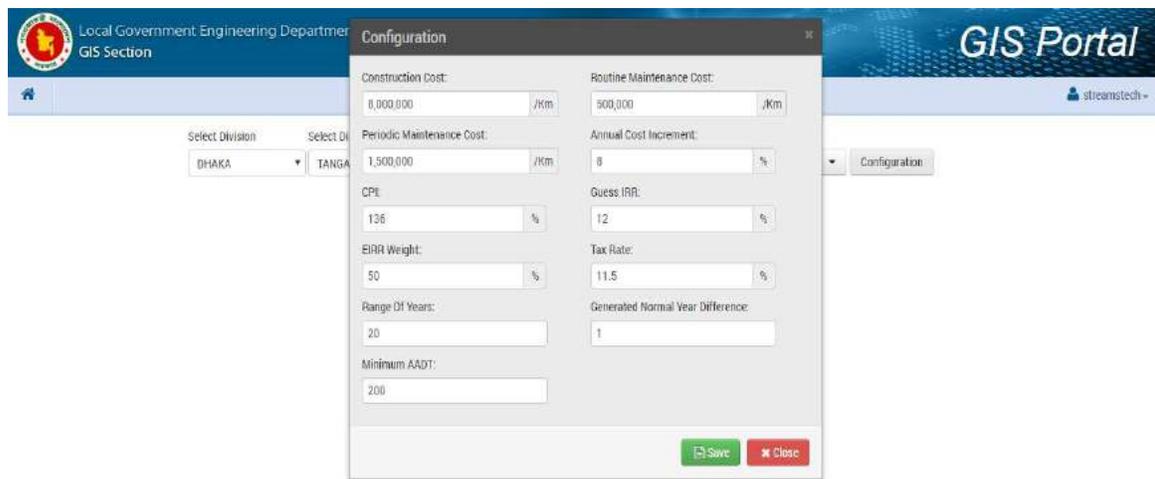
5.3. Editing/Changing Default Parameter Values

A privileged user, if necessary, can change the default parameter values using the **Configuration Menu** (Figure 2.4.4). The **Configuration** menu has two buttons: i) *start process* and ii) *configuration* to run the application.

Some parameter values used in CBA may vary by district or upazila. They may also vary over time. For example, road construction and maintenance costs may vary by district. They are also expected to change over time. The Consumer Price Index (CPI) value, tax rate and annual cost increments may also change from year to year. Before running RPPM, the default/current values for all such parameters should be reviewed by the user and changed, if necessary.

If any of the default values need to be changed, select configure button (Figure 2.4.4). A window would pop up (Figure 5.2). The values displayed in the pop up window are the default/current values.

Figure5.2: Pop-up Window for Changing Parameter Values



Once the new parameter values are available for a district or an upazila, select Start process (marked in red in Figure 5.3) to initiate the application. However before initiating the program choose the district and upazila from selection menu (Figure 2.4.4) for which the application is to be run. You can run the application at upazila or district level by selecting Upazila or District from Start process.

Figure 5.3: Starting the Process



5.4. Data Quality

The quality of outputs is dependent upon the quality of data as well as how recent the data is. The current practice of LGED is that data on different parameters of road is updated at different time intervals. It is recommended that all data are updated concurrently. Special care should be taken to update traffic data as both the CBA and MCA analyses use traffic data. RPPM uses two databases of LGED – road database and GIS database. However, these two are not fully integrated. At present, there are limitations in displaying information of all the features contained in the road database. It is recommended that steps should be taken for the full integration of the two databases to overcome the present limitations.

References

GTZ. 2009. Road User Cost Study For LGED Roads, Final Report, Rural Infrastructure Improvement Project (RIIP) RDP-25, Institutional Support and Training Component, Ministry of Local Government, Rural Development and Cooperatives, Government of Bangladesh.

LGED. 2017. Road Database, Local Government Engineering Department, Local Government Division, Ministry of Local Government, Rural Development and Cooperatives

Appendix A: Local level workshop

A.1 Introduction

Most of the data required to run RPPM are available from the road and GIS databases of LGED. However, for generating priority lists for road development and core road networks some additional data on connectivity, local priority and road safety are needed. Currently these are not available in the databases. Local workshops are to be organised to collect these data and facilitate the participation of local leaders and other stakeholders in the road planning process.

A.2 Objectives of local workshop

Local workshops are to be conducted at the upazila level. The specific objectives are:

- to validate and finalize the preliminary core networks at upazila and union levels
- to identify local priorities of road development considering SDG 9.1 targets
- to collect data on connectivity and road safety.

The local level workshops complement the technical process of planning; show transparency in the decision-making process, ensure local ownership of the output and overcome the limitations of data available in the databases.

A.3 Organisation of workshop

The initiative for organising local workshops may be taken by the concerned office at the LGED HQs or by the Executive Engineer (XEN) at the district level. The XEN may advise Upazila Engineers of the district on the purpose and tasks to be undertaken at the workshops, and logistic support required. The Upazila Engineer in coordination with the XEN will take the main responsibility for organisation workshops, one for each upazila in the district.

The Upazila Engineer will fix a date for the workshop in consultation with the local M.P., Upazila Chairman, the Upazila Nirbahi Officer (UNO) and the XEN. The XEN/Upazila Engineer in consultation with Upazila Chairman will send letters of invitation to workshop participants. Local MP, Upazila Chairman and Vice Chairmen, UNO, Chairmen of unions under the upazila, councillors of Upazila Union Parishads, concerned officials and other stakeholders may be invited to participate. The UP Chairmen and at least one male and one female member from all Union Parishads should be present at the workshop. If possible, the XEN of the district should be present.

Prepare all workshop materials in advance and make them available to workshop participants. Give due care and consideration in conducting the workshop so that the participants can freely discuss and undertake the tasks. The Upazila Engineer and his staff will help the participants to understand and to do the tasks.

The workshop venue should hold about 30 people; preferably at the premise of Upazila Parisad. If available, arrangements can be made for a computer and projector for easy deliberations. There

should be arrangements to hang large size maps. Where possible, consider alternative power supply arrangements and facility for printing and photocopying.

A.4 Workshop materials

The Upazila Engineer will prepare the following workshop materials:

- a (power point) presentation on objectives and tasks of workshop;
- preliminary maps of Core Road Network at upazila and unions levels;
- a list of all Upazila and Union roads, and lists of village roads by union; and
- data collection forms.

A large upazila map showing roads and other features, if available, can be very helpful for the participants to understand the overall context of the upazila especially connectivity with neighbouring upazilas.

The power point presentation should focus on the objectives and tasks to be performed in the workshop. The content of the slides should be in Bangla with necessary pictures and maps.

Core road network

Two sets of printed copies of preliminary core network maps are required:

- i. map of preliminary core network for the upazila
 - at least one A0 size map in the scale 1:150,000, and
 - copies of same map on A4 size paper.
- ii. map of preliminary core network for each union
 - at least three maps printed on A4 size paper in the scale 1:45,000.

Road lists

Two sets of printed road lists using information from the road inventory database will be necessary.

- i. two copies of a union wise road list for each union
- ii. three copies of an upazila wise road list.

A.5 Activities in the workshop

Before the start of the workshop, the XEN/Upazila Engineer should brief the M.P., Upazila Chairman and UNO the purpose and tasks to be undertaken at the workshop.

The Upazila Engineer may consider to distribute (a folder with) the following materials to each workshop participant.

- An A4 size map of core road network of the upazila
- A list of roads of the upazila
- An A4 size map of a union core road network to the concerned participants of the union
- A list of village roads in a union to the concerned participants of the union

The first two items may be given only to the Honourable MP, Upazila chairman, vice chairmen and other members of the Upazila Parishad.

There can be a short opening session. At this session the XEN/Upazila Engineer will make a short presentation on the purpose and tasks to be undertaken at the workshop.

The next session will be the working session. The concept of core road network is to be explained by the Upazila Engineer using a presentation. After the presentation the following tasks are to be conducted:

- addition or removal of roads in the preliminary core network and validation of core network
- identifying the level of local priority considering SDG 9.1 target set by LGED and other local matters for all roads in an upazila.

Any proposal for addition or removal of a road from the core networks should be discussed by the participants and agreed. Concerned participants may put their stamp of approval to their respective finalised core networks.

The MP (if present), Upazila Chairman and Upazila Vice Chairmen and Upazila Parishad members may be given the list of upazila and union roads to consider the local priority for the development of these roads. The Union Parishad Chairman and members are given the list of village roads for their respective unions.

Participants will determine priority for each of the roads. They put a value (3 for the highest, 2 for medium and 1 for the lowest priority) for each road in the list given to them. They may consider factors such as SDG 9.1 target, their perception, local knowledge and any other matter of local importance.

Once the tasks are completed, LGED officials will ensure that all lists are collected.

A.6 Other activities

At the workshop, the Upazila Engineer and his staff in consultation with concerned participants will fill the checklist (Appendix B) to determine connectivity status of all roads. If an Upazila road is directly connected to national and regional highways of RHD, zila and upazila headquarters it would be given a value of 1 (One); if not it would get 0 (Zero). Similarly, if a Union road connects the upazila headquarters it would be given 1 (one); if not it would be given value of 0 (zero). If a village road is considered as part of core network, then it gets value of 1(one) otherwise a village road would be given value 0 (zero).

RPPM needs road safety data in the form of whether the design of road is safe or unsafe. This data would be provided by the Upazila Engineer. However, consultation with concerned participants may be necessary. The format of data collection for this item is also provided in Appendix B. If the road is safe then a value of 0 (zero) and for unsafe road 1(one) would be given.

The Upazila Engineer will ensure the following outcomes of the workshop.

- Verified Upazila and Union core road networks
- Identified Upazila, Union and village roads that have local priorities for development,

- Required additional data to update the road database for running RPPM.

The Upazila may also prepare a workshop report. The report along with the information collected/verified at the workshop are to be sent to the LGED headquarter/XEN's office for follow-up actions for including them in the road database.

Appendix B: Survey forms to be Used Data Collection

Survey form for Connectivity and Prioritization of Upazila Road

Date: _____

Name of the Union: _____

Name of the Upazila: _____

Name of the Districts: _____

Road Id	Road Name	Connectivity Score		Priority Score [‡]	Is the road safe?		Remark
		Is the Upazila road directly connects to national and regional highways of RHD, zila and upazila headquarters*			Yes (0)	No (1)	
		Yes (1)	No (0)		Yes (0)	No (1)	

*Yes (1) refers to a connectivity score of 100 and No (0) refers a score of 80. In the form as applicable only '1' or '0' should be recorded

[‡] Value to be put for Priority Score
 3 for highest priority
 2 for medium priority
 1 for low priority

 Name with Seal

Survey form for Connectivity and Prioritization of Union Roads

Date: _____

Name of the Union: _____

Name of the Upazila: _____

Name of the Districts: _____

Road Id	Road Name	Connectivity Score		Priority Score [‡]	Is the road safe?		Remark
		Is the Union Road connects upazila headquarters? *			Yes (0)	No (1)	
		Yes (1)	No(0)				

*Yes (1) refers to a connectivity score of 50 and No (0) refers a score of 40. In the form as applicable only '1' or '0' should be recorded

[‡] Value to be put for Priority Score

3 for highest priority

2 for medium priority

1 for low priority

Name with Seal

Survey form for Connectivity and Prioritization of Village Roads

Date: _____

Name of the Union: _____

Name of the Upazila: _____

Name of the Districts: _____

Road Id	Road Name	Connectivity Score		Priority Score [‡]	Is the road safe?		Remark
		Is the road part of core road network?			Yes (0)	No (1)	
		Yes (1)	No (0)		Yes (0)	No (1)	

*Yes (1) refers to a connectivity score of 35 and No (0) refers a score of 0. In the form as applicable only '1' or '0' should be recorded

[‡] Value to be put for Priority Score
 3 for highest priority
 2 for medium priority
 1 for low priority

 Name with Seal

