



# HDM-4 Deterioration Model Calibration & Migration Tool Software User Guide

**Local Government Engineering Department**

Local Government Division

Ministry of Local Government, Rural Development, & Cooperatives

Government of the People's Republic of Bangladesh

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## Local Government Engineering Department

### HDM-4 Deterioration Model Calibration & Migration Tool

The software interface is divided into several functional areas:

- Dashboard:** Features a road graphic and navigation menus for Road Network, Configuration & Calibration, and Asset Catalog.
- Vehicle Fleet:** Allows for the management of vehicle types and their characteristics, including a detailed configuration panel for selected vehicles.
- Road Network Preparation & Export Dataset for HDM4:** Provides tools for preparing road network data and exporting it for use in HDM4.
- Deterioration Data Transfer to HDM4:** Facilitates the transfer of deterioration data to HDM4, including a data table and a graph showing estimated annual damage over time.

## Software User Guide

June 2021





This Software User Guide is a useful resource for the Local Government Engineering Department (LGED) in the roll out of training courses as well as operation of HDM-4 Deterioration Model Calibration and Migration Tools (HDM CaliMiT), which acts as an interface between LGED’s Road and Structure Database Management System (RSDMS) and Road Deterioration and Works Effects (RDWE) of HDM-4.

HDM CaliMiT has been designed and developed as a decision support tool that would ultimately become an integral subsystem of the overall Asset Management System, one of the deliverables of LGED and United Nations Office for Project Services (UNOPS) Sub-project, under the Joint National Resilience Programme (NRP) for the Government of Bangladesh. UNOPS is provided technical assistance and advisory support to LGED in the implementation of the Sub-project.

The NRP is a joint programme of UNOPS, UN Women, and UNDP in partnership with the Local Government Engineering Department, Department of Disaster Management, Department of Women Affairs and Programming Division of the Government of Bangladesh (GOB). The Programme is funded by the governments of the UK, Sweden, and Bangladesh.







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## Abbreviations

AIS	Asset Information Strategy
AMP	Asset Management Plan
AMS	Asset Management System
BC	Bituminous Carpeting
CC	Cement Concrete
HDM-4	Highway Development and Management (a software application)
HDM CaliMiT	HDM-4 Deterioration Model Calibration and Migration Tools
IRI	International Roughness Index
LGED	Local Government Engineering Department
MT	Motorized Traffic
NMT	Non-Motorized Traffic
NRP	National Resilience Programme
RCC	Reinforcement Cement Concrete
RD	Road Deterioration
RDWE	Road Deterioration and Works Effects
RSDMS	Road and Structure Database Management System
UNOPS	United Nations Office for Project Services
UNR	Union Road
UZR	Upazila Road
VR-A	Village Road Type-A
VR-B	Village Road Type-B



## 1. Background

Under the National Resilience Programme (NRP), UNOPS in particular is providing technical assistance to Local Government Engineering Department (LGED) and other public institutions to achieve resilience outcomes through designing and constructing risk-informed, gender responsive infrastructure systems and lay the foundations for long-term resilience actions in socially inclusive infrastructure systems in Bangladesh. In particular, UNOPS will contribute to the achievement of the overall programme by:

- Establishing an Asset Management System (AMS) in LGED aligned with ISO 55000 to induce a process of managing its assets encompassing policy, strategy, decision making, lifecycle, asset information, leadership, risk and resilient elements.
- Improving the road design standards of LGED for new assets and developing tools for Failure Analysis to adopt a build-back-better approach in reconstruction and rehabilitation works to ensure infrastructure systems are resilient and gender responsive.
- Strengthening capacity of other local institutions to adapt risk informed and gender responsive resilient infrastructure approach through building knowledge and sharing of best practices and lessons learned.
- Strengthening capacity of LGED leadership, policy and compliance around risk informed and gender responsive resilient infrastructure approach with a focus on asset management system.

LGED's AMS aims to guide improved and sustainable management of infrastructure assets through the systematic and coordinated activities to maximize service and resilience potential. The AMS management is aligned with the ISO55000 Asset Management suite of standards and requires a framework hierarchy of policies, strategies and plans. An AMS consists of several key components, such as – Asset Management Policy, long-term Strategic Asset Management Plan, Asset Management Plan, Asset Information Strategy, and so on. Guiding documents on these key components has already been developed.

The Asset Management Plan (AMP) outlines several Asset Management practices. Among others, some of the intended practices are: asset management decisions to complement strategic planning objectives; empower LGED to start proactively managing their assets; ensure road networks are managed at optimum cost over the longer term; asset management decisions adopt risk-based maintenance approaches.

The Asset Information Strategy (AIS) has assessed the current situation of asset information management for roads and structures (bridges/culverts). It reveals that a significant amount of work has already been completed within LGED over many years with the development of road and structure asset information database. However, AIS recommends that LGED should move forward making improvements of the existing information system for good asset management.

Considering intention and recommendations of AMP and AIS, it is felt that a road deterioration model would be an enabler tool for road asset management planning, decision making and performance monitoring. Took the initiative under NRP and explored HDM-4 is the most appropriate as its deterioration model covers road deterioration and after works

effect, and can predict the decline incrementally over the time, which is reliable and widely used in different road agencies and research institutes. LGED can adapt it with minor customization by developing an interface.

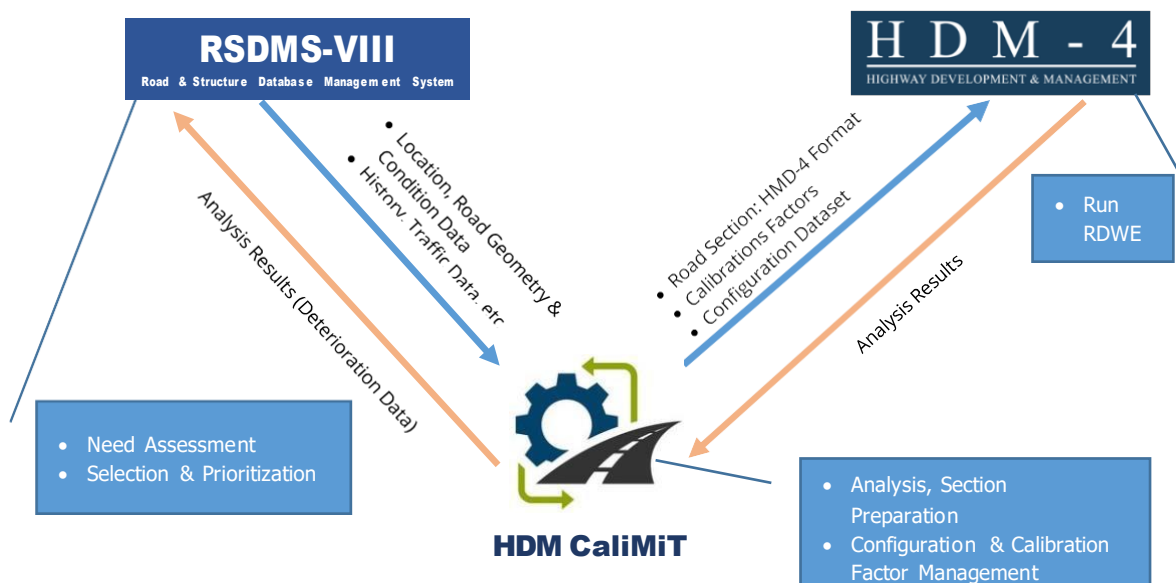
## 2. Introduction to HDM CaliMiT

**HDM-4 Deterioration Model Calibration and Migration Tools (HDM CaliMiT)** has been designed and developed with the aim to enhance the LGED’s existing database management system by incorporating a road deterioration model. The software application acts as an interface between LGED’s Road and Structure Database Management System (RSDMS) and Road Deterioration and Works Effects (RDWE) of HDM-4.

Pavement deterioration model helps in predicting predated pavement condition at current date while it also helps in forecasting the condition of the pavement at a future date, and provide advantage for selecting the optimal maintenance and rehabilitation strategies. Development of deterioration model from scratch would require specialized inputs over longer period of time.

HDM CaliMiT tool helps to use Deterioration and Works Effects (RDWE) of HDM-4 for predicting pavement condition and transfer the results obtained from HDM-4 to LGED’s RSDMS, resulting in improved performance the reliability in selection and prioritization of roads following the current practice of the organization.

System design architecture and dataflow of the software is as below:



### Data needs from RSDMS and transfer to HDM-4 to run the RDWE module

In order to run the RDWE module of HDM-4, primarily a dataset consisting of 112 data fields to be prepared for each section of the road. In an ideal situation, all these data fields can be provided to HMD-4, however, all of them are not mandatory and default value of HDM-4 can

be used in some cases. It is possible to transform existing data of RSDMS into the minimum required dataset for RDWE module of HDM-4, which can be gradually enriched over time when more data will be available. Considering large number of rural roads (and numerous sections against each road) under LGED, multiple Road Networks need to be prepared since HDM-4 has limitation of processing number of records. It appears that LGED's region wise Road Network dataset may be suitable to carry out analysis in HDM-4.

Road Network dataset has also dependency with other associated dataset, such as -

- Vehicle Fleets
- Traffic Growth
- Traffic Flow Patterns
- Speed Flow Types
- Accident Classes
- Climate Zones
- Currencies
- RD Calibration Sets
- Section Configuration Parameters

It is required to prepare and transfer the above dataset to HDM-4 before run the RDWE module since they are associated with road section data.

Initially, roughness (IRI) data will be considered for determination of pavement condition. It is possible to do analysis in HDM-4 using only roughness data, however, its prediction would be more accurate if visual condition distress data (such as – pothole, crack, rutting, ravelling, edge break) is available.

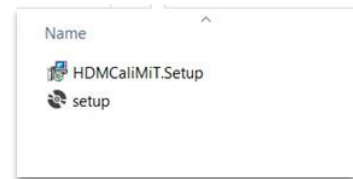
Option to input visual condition data is available in RSDMS. But, collection of detail distress data for the huge rural road network is merely impossible by the existing workforce of LGED. Thus, these data are not being collected regularly. Since visual condition data are enabler for providing closer prediction, LGED may consider to collect these data initially for a few selected roads, number of which can be increased gradually.

### 3. Installation of HDM CaliMiT

This section describes how to install the HDM CaliMiT software on your PC. The installation process is comparatively easy as installation of any other windows based desktop application. The recommended minimum platform requirements for running HDM CaliMiT are as follows:

- Microsoft Windows Operation System (version 7 or newer)
- Microsoft .NET framework 4.6.1
- 1GB RAM
- Super VGA (1024 x 768) or higher-resolution display
- 50MB of free disk space for program files and documents
- Additional free disk space for data transfer (varies based on size of road network)
- RSDMS database should be available either in the same PC/Laptop (recommended) or in the shared folder within the local area network.

You may have obtained the software on CD-ROM, or on USB drive, or via Internet download. Open the folder contains the software. You will see the two files within the folder (see right hand side). Double-click the "**setup**" file to start installation, and then follow the installer guidance. Typically, 4 clicks will be required to complete the installation process, which are illustrated below:

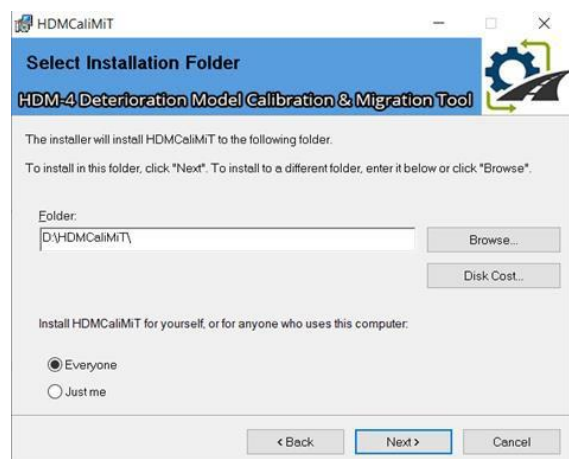


- 1 At first, the welcome window is appeared (see right hand side). Click "**Next>**" button to proceed with installation.



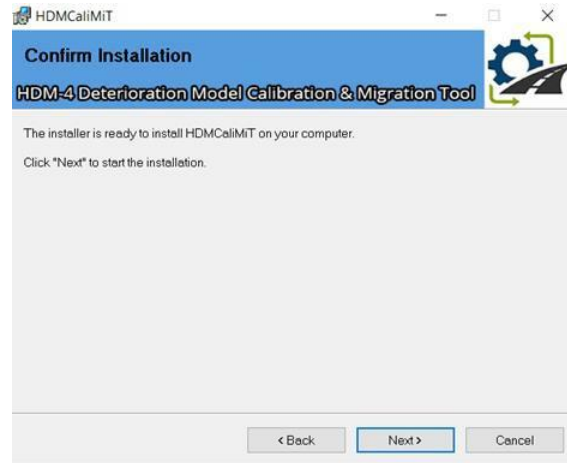
- 2 In the next window (see right hand side) you can choose the folder in which the software will be installed. By default, the software will be installed in the "D:\HDMCaliMiT" folder. However, you may opt to install the same in different folder, which can be selected by clicking "**Browse**" button.

Here, "Everyone" installation option is recommended. Click "**Next>**" button to proceed with the installation.



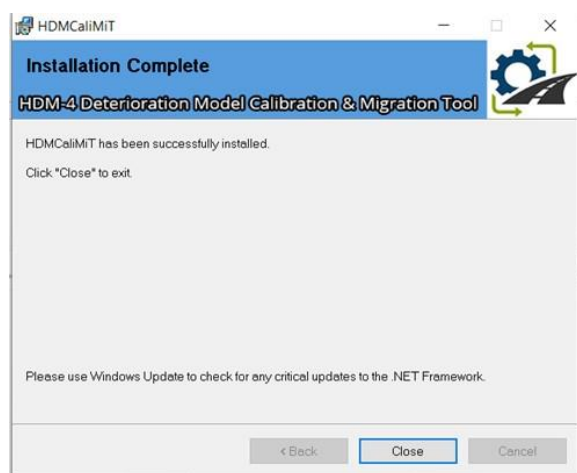
- 3 In the next window (see right hand side), click "**Next>**" button again to confirm installation the software in your PC.


You can postpone installation at any stage by clicking the "**Cancel**" button.



- 4 This is the final stage while the installer will display the status of installation. Click "**Close**" button to finish the installation.

Shortcut of the software will be appeared in your desktop (see below) once the installation is complete.

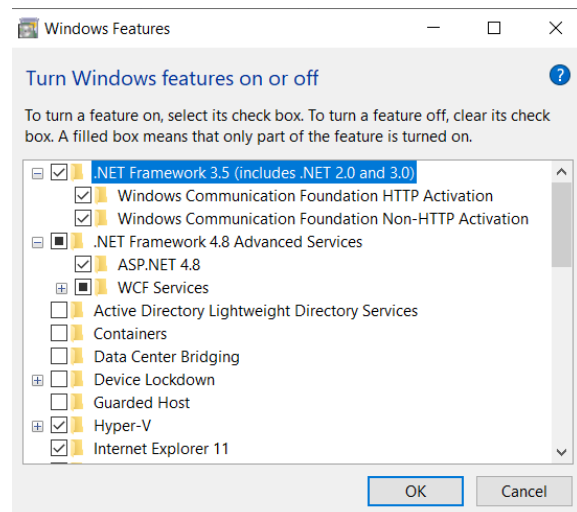


-  Microsoft .NET framework is installed by default during installation of windows. However, there might be situation where .NET framework is not properly installed on your PC. As such case, follow below steps to install .NET framework.

- Go to **Control Panel**, then **Programs and Features**
- Click **Turn Windows features on or off**
- Put **tick mark** in the .NET framework related check boxes
- Click **OK** button

However, in case of any difficulties, you can download the .NET framework from the web address as given below:

<https://dotnet.microsoft.com/download/dotnet-framework>



## 4. Running HDM CaliMiT


To run the HDM CaliMiT:

- Click the shortcut placed at the desktop, or
- Click the Windows Start menu, then select the HDMCaliMiT application item from the HDMCaliMiT program group.

Initially, the software is appearing in inactive mode, means all the menus and buttons (except Log-In and Exit) will remain disabled.

It is required login to the software to bring the same in active mode.




 “HDMCaliMiT\_Database.mdb” is the backend database of HDM CaliMiT, which will automatically be copied at “Database” sub-folder under the folder where the software is installed. Whilst running, it will prompt for providing location of the valid database if the software does not find the database in the given path, or if the database version varies from the software version. The process for providing location of the database is described at the *Database Management* sub-section under *System Settings* section of the document.

### 4.1. Log In to HDM CaliMiT

To log-in:

- Click the “Security” menu.
- Click the “Log In” sub-menu.
- Enter valid user name and password.
- Click “Log In” button.



 During first time, it is required to login to the software using “**Administrator**” as user name. Default password for the user “Administrator” is “**Asdf1234**”, which is case sensitive. It is recommended to change the password immediately. Once logged in to the software as Administrator, you can create users for the software application, process of which is described at the *Access Control* section of the document.



## 4.2. Switchboard and Menu

The switchboard is an interface that allows user to navigate around the software application. The switchboard is made of buttons that allows user interactions to locate the necessary tasks. The software also provides feature known as menu which can be used instead of switchboard to navigate around your software application. Interface of switchboard and menu are shown below:

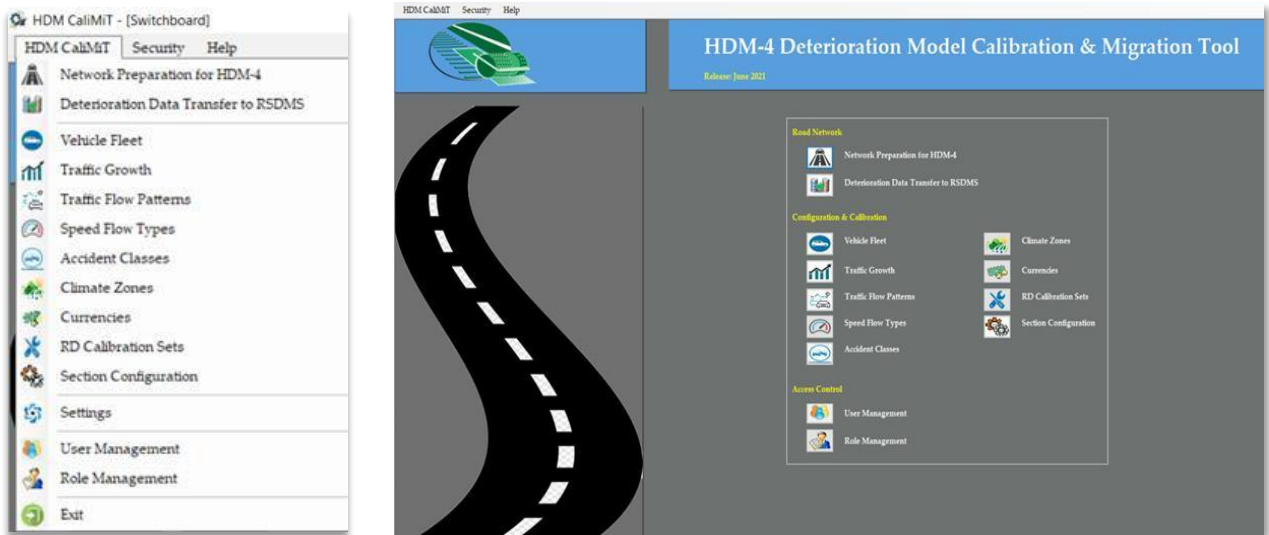


Figure-1. Interface of menu and switchboard

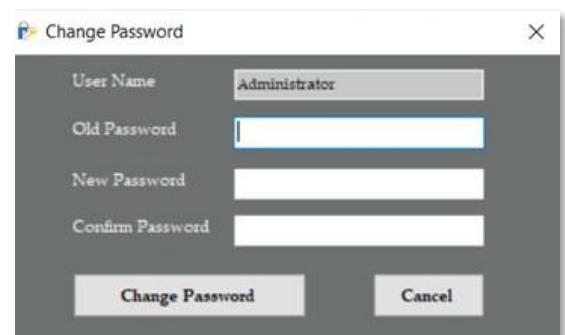
Name of the menus and switchboard buttons are self-explanatory to their purpose. Apart from the main menu, there is another menu namely Security from which user can log-in to the software, log out from the software, and change his/her own password.



## 4.3. Change Password

To change your own password:

- Click the "Security" menu.
- Click the "Change Password" sub-menu.
- Enter the old password in the respective text box.
- Enter the new password in the respective text box, and enter the same password again in the confirm password text box.
- Click "Change Password" button.



## 4.4. Log Out

Log out function will bring the software in inactive mode. To log out from the software, click the "Security" menu, then click the "Log Out" sub-menu.

## 5. Configuration & Calibration

Several configuration and calibration datasets, such as - vehicle fleets, traffic growth, traffic flow patterns, speed flow types, accident classes, climate zones, currencies, RD calibration, section configuration parameters, and work standards, need to be included in HDM-4 analyses. These datasets need to be assigned to the road sections. Most of the datasets are static in nature, but some of them are need to be adjusted over time.

These datasets can be prepared and updated directly in the HDM-4 software interface. But, provision for preparation and updating of these data sets are being considered within the software due to:

- Among others, each of these datasets to be assigned to the respective road sections during preparation of road network for HDM-4 analyses. Accordingly, these datasets are essentially to be available within the database of the software.
- This feature enables the designated user for preparation and updating these datasets without having the HDM-4 software in the same computer, and without having experience in operation of HDM-4 software.

The software provides facility to export these datasets, which can be easily imported in the HDM-4.

Steps for preparation and updating the configuration and calibration datasets are described in the subsequent sections of the document.

### 5.1. Vehicle Fleet

Vehicle Fleets are used to store details of the Vehicle Types to be included in HDM-4 analyses. A Vehicle Fleet consists of a number of Vehicle Types. Each Vehicle Type represents a category of vehicles in the traffic mix being modelled (e.g. small car, large truck, etc.). When creating a Vehicle Fleet, you should include one Vehicle Type for each vehicle category in the traffic mix being modelled.

HDM-4 includes 20 default Vehicle Types. The models for vehicle speed, road user effects, and social and environmental effects have been developed for these default types. The default Vehicle Types fall into the following two categories:

#### **Motorized category**

- Motorcycle
- Small Passenger Car
- Medium Passenger Car
- Large Passenger Car
- Light Delivery Vehicle
- Light Goods Vehicle
- Four Wheel Drive
- Light Truck
- Medium Truck
- Heavy Truck
- Articulated Truck
- Minibus
- Light Bus
- Medium Bus
- Heavy Bus
- Coach

## Non-motorized category

- Pedestrian
- Bicycle
- Rickshaw
- Animal Cart

Vehicle Types available in the RSDMS to be used to prepare vehicle fleet for LGED. During preparation of vehicle fleet using the software, RSDMS vehicle type must be linked to the default type so that HDM-4 can determine which models to use for analysis.



All the vehicles currently available in the RSDMS have already been included within the software backend database along with their necessary attributes data. It is recommended **not to delete** any vehicle from the list here, but, **update their attributes** data when it is necessary.

## Viewing / editing / creating Vehicle Fleet

Click the “*Vehicle Fleet*” button from the switchboard or select the same from the menu. The interface for managing vehicle fleet is appeared in the screen (see below).

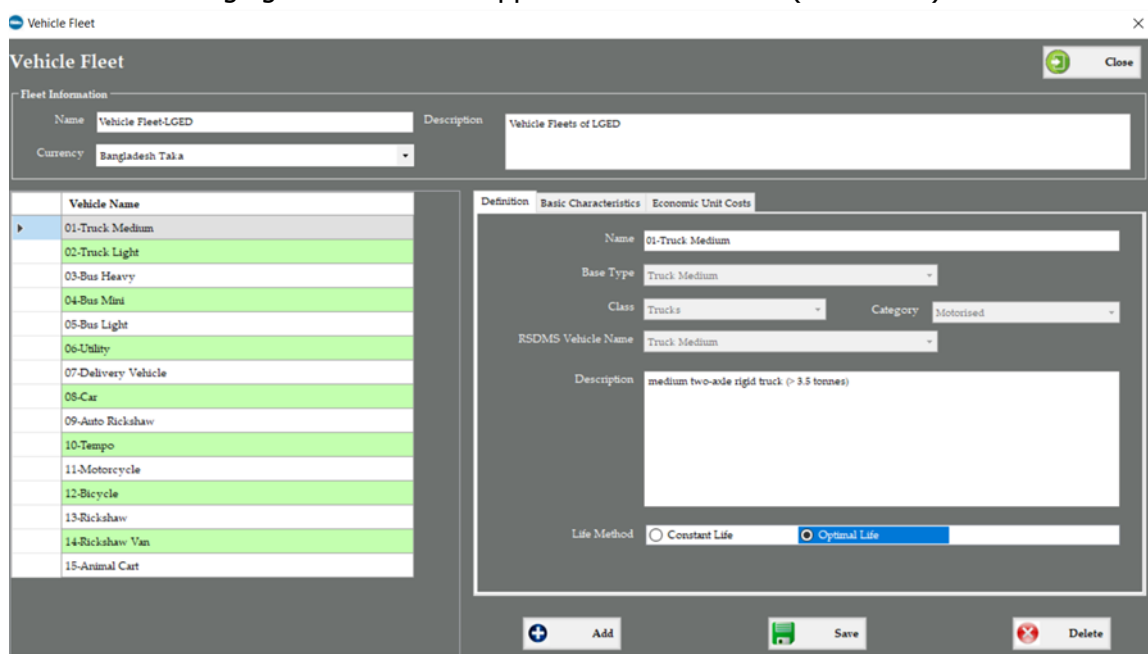


Figure-2. Interface for management of vehicle fleet

The interface consists of information on vehicle fleet (e.g. name, description and currency) along with list and attributes vehicles under the fleet.

Information on vehicle fleet is available at the top most section of the interface, which can be modified as appropriate. Apart from name and description, a currency data field is available here, unit costs for all Vehicle Types in the Vehicle Fleet are specified in this Currency.

List of Vehicles under the Vehicle Fleet are displayed in the grid (see above). While selecting a vehicle from the list, detail attributes of that vehicle is displayed at the right pane of interface. To make the interface user friendly, attributes are clubbed into 3 separate tab pages (i.e.

1. Definition, 2. Basic Characteristics, and 3. Economic Unit Costs). Attributes also differ according to the category of the Vehicle Type (i.e. motorized or non-motorized). Data entry interface for each tab page is shown below:

The screenshot shows the 'Definition' tab page for a motorized vehicle. The interface includes the following fields and options:

- Name:** 01-Truck Medium
- Base Type:** Truck Medium
- Class:** Trucks
- Category:** Motorised
- RSDMS Vehicle Name:** Truck Medium
- Description:** medium two-axle rigid truck (> 3.5 tonnes)
- Life Method:**  Constant Life  Optimal Life

Figure-3. Interface for Definition tab page for motorized vehicle

The screenshot shows the 'Basic Characteristics' tab page for a motorized vehicle. The interface is divided into several sections with the following fields and values:

- Physical:**
  - Passenger Car Space Equiv: 1.4
  - No. of Wheels: 6
  - No. of Axles: 2
- Tyres:**
  - Tyre Type: Bias Ply
  - Base No. of Recaps: 1.3
  - Retread Cost: 15 %
- Utilization:**
  - Annual km: 40000 km
  - Working Hours: 1200 hrs
  - Average Life: 12 years
  - Private Use: 0 %
  - Passengers: 0 persons
  - Work related Passenger-trips: 0 %
- Loading:**
  - ESALF: 1.25
  - Operating Weight: 7.5 tonnes

Figure-4. Interface for Basic Characteristics tab page for motorized vehicle

Definition	Basic Characteristics	Economic Unit Costs																
<p><b>Vehicle Resources</b></p> <table> <tr> <td>New Vehicle</td> <td><input type="text" value="0"/></td> <td>Maintenance Labour</td> <td><input type="text" value="0"/> per hour</td> </tr> <tr> <td>Replacement Tyre</td> <td><input type="text" value="0"/></td> <td>Crew Wages</td> <td><input type="text" value="0"/> per hour</td> </tr> <tr> <td>Fuel</td> <td><input type="text" value="0"/> per liter</td> <td>Annual Overhead</td> <td><input type="text" value="0"/></td> </tr> <tr> <td>Lubricating Oil</td> <td><input type="text" value="0"/> per liter</td> <td>Annual Interest</td> <td><input type="text" value="0"/> %</td> </tr> </table>			New Vehicle	<input type="text" value="0"/>	Maintenance Labour	<input type="text" value="0"/> per hour	Replacement Tyre	<input type="text" value="0"/>	Crew Wages	<input type="text" value="0"/> per hour	Fuel	<input type="text" value="0"/> per liter	Annual Overhead	<input type="text" value="0"/>	Lubricating Oil	<input type="text" value="0"/> per liter	Annual Interest	<input type="text" value="0"/> %
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<p><b>Loading</b></p> <table> <tr> <td>Passenger Working Time</td> <td><input type="text" value="0"/> per hour</td> <td>Cargo</td> <td><input type="text" value="0"/> per hour</td> </tr> <tr> <td>Passenger Non-working Time</td> <td><input type="text" value="0"/> per hour</td> <td></td> <td></td> </tr> </table>			Passenger Working Time	<input type="text" value="0"/> per hour	Cargo	<input type="text" value="0"/> per hour	Passenger Non-working Time	<input type="text" value="0"/> per hour										
Passenger Working Time	<input type="text" value="0"/> per hour	Cargo	<input type="text" value="0"/> per hour															
Passenger Non-working Time	<input type="text" value="0"/> per hour																	

Figure-5. Interface for Economic Unit Costs tab page for motorized vehicle

Definition	Basic Characteristics	Economic Unit Costs
<p>Name <input type="text" value="12-Bicycle"/></p> <p>Base Type <input type="text" value="Pedestrian"/></p> <p>Class <input type="text" value="Pedestrian"/> Category <input type="text" value="Non-motorised"/></p> <p>RSDMS Vehicle Name <input type="text" value="Bicycle"/></p> <p>Description <input type="text" value="Bicycle"/></p>		

Figure-6. Interface for Definition tab page for non-motorized vehicle

Attribute	Value	Unit
Wheel Type	Pneumatic	
No. of Wheels	2	
Wheel Diameter	0.7	m
Operating Weight	100	kg
Payload	35	kg
Average Life	10	years
Working Hours	150	hours
Annual Km	2500	km/year
Passengers	1	

Figure-7. Interface for Basic Characteristics tab page for non-motorized vehicle

Attribute	Value	Unit
Purchase Cost	0	
Crew Wages	0	per hour
Passenger Time	0	per hour
Cargo Holding Time	0	per hour
Energy Used	0	per MJ
Annual Interest	0	%

Figure-8. Interface for Economic Unit Costs tab page for non-motorized vehicle

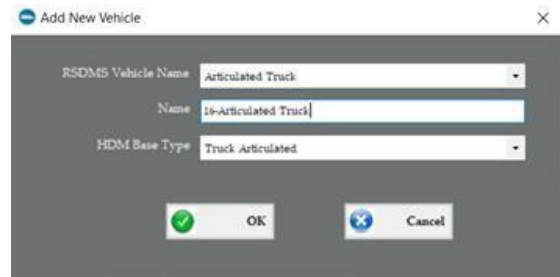
### Editing Vehicle Attributes

- Select the Vehicle from the list.
- Attributes of the selected vehicle is displayed in the respective tab pages.
- Update attributes.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

## Adding New Vehicle to the Fleet

Adding new vehicle into the fleet is possible when any vehicle is available in the RSDMS database, which is not included in the vehicle fleet under the software. Perform the following steps to add a vehicle into the fleet:

- Click **"Add"** button.
- A window is appeared (see right hand side).
- Select RSDMS vehicle name from the drop-down list.
- The software will put the selected RSDMS vehicle name with a prefix as its Name, which can be modified.
- Select respective HDM Base Type for the vehicle. It is not possible to change the Base Type in the future.
- Click **"OK"** button to add the Vehicle, or **"No"** to cancel the action.



## Deleting Vehicle from the Fleet

- Select the Vehicle from the list.
- Click **"Delete"** button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the Vehicle, or **No** to cancel the delete action.
- If you click **Yes**, the Vehicle is no longer displayed in the Vehicle Fleet window.



HDM-4 does not allow entering name of Vehicle same as its Base Type (i.e. Bus Heavy, Car, Motorcycle). Thus, different name of the vehicle should be maintained for HDM-4 in case the name is same as Base Type of HDM-4. To resolve this issue, a prefix or suffix word, or a serial number can be added with the vehicle name (e.g. 01-Truck Medium, 02-Truck Light).

## 5.2. Traffic Growth

The Vehicle Fleet is used to define traffic growth sets. Hence it is essential to prepare the vehicle fleet prior to define traffic growth sets. A traffic growth set defines how the traffic grows over time and is assigned to sections within an analysis. As traffic growths sets may be used to define the traffic growth characteristics of multiple studies, the periods are defined as relative years rather than absolute years.

### Viewing / editing / creating Traffic Growth Set

Click the "Traffic Growth" button from the switchboard or select the same from the menu. The interface for managing traffic growth set is appeared in the screen (see below).

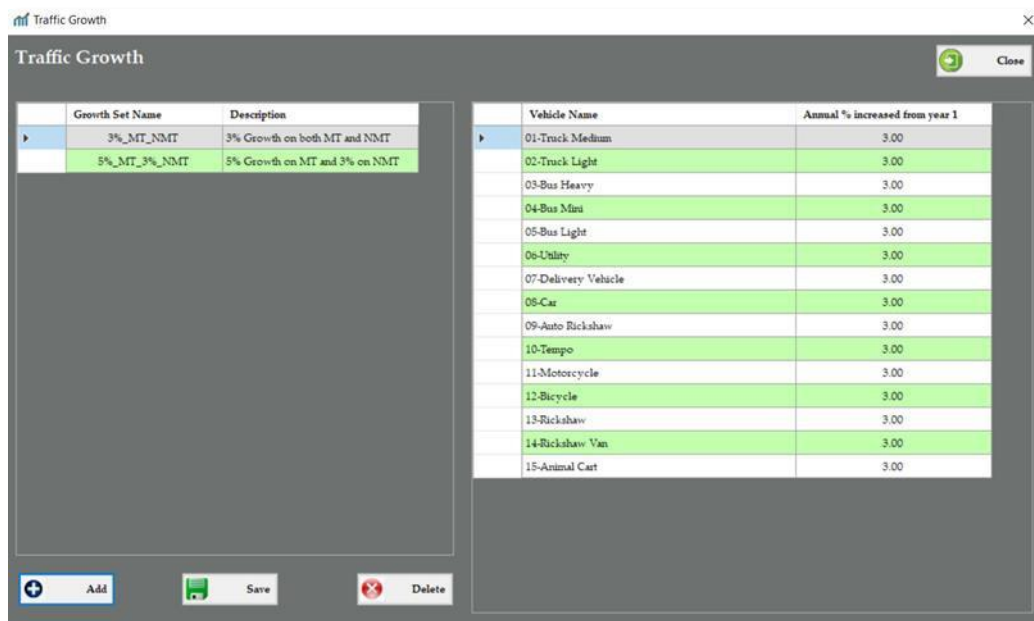


Figure-9. Interface for managing traffic growth set

### Adding Traffic Growth Set

Perform the following steps to add a traffic growth set:

- Click "Add" button.
- A window is appeared (see right hand side).
- Enter name of the growth set (e.g. 3%\_MT\_NMT).
- Enter description for the growth set (e.g. 3% Growth on both the MT and NMT).
- Input the value for annual % increased. This value will be copied to all the vehicles, which can be modified at later stage.
- Click "OK" button to add the traffic growth set, or "No" to cancel the action.





### Editing Traffic Growth Set

- Select the Traffic Growth Set from the list (left hand side grid).
- All the available vehicles under the vehicle fleet along with their annual percentage increased from year-1 is appeared in the right hand side grid.
- Update values for annual percentage increased.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Deleting Traffic Growth Set

- Select the Traffic Growth Set from the list.
- Click "**Delete**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the Traffic Growth Set, or **No** to cancel the delete action.
- If you click **Yes**, the Traffic Growth Set is no longer displayed in the list.

## 5.3. Traffic Flow Patterns

Traffic Flow Patterns are used to represent the varying traffic intensities that occur on roads throughout the day. Examples of Traffic Flow Patterns are: Seasonal, Commuter, Inter-Urban, and Other Use.

Traffic Flow Patterns are defined as a set of flow periods. A flow period represents the hours of the day (over the course of a year) with the same traffic flow. For each flow period p you should specify:

- Total hours per year (HRYRp) that the period occupies, and
- The amount of yearly traffic occurring during the flow period, as either:
  - The proportion of AADT (HVp) that occurs during each hour of the flow period, or
  - The percentage of AADT (PCNADTp) that occurs during each flow period

In HDM-4, multiple traffic flow patterns can be included as different road sections may exhibit different traffic flow patterns according to their use. However, LGED is currently conducting traffic survey by road, and hour wise traffic data is not available at present. Due to this reason, a single traffic flow pattern has been considered for the entire road network of LGED, which can be increased when LGED will collect hour wise traffic data in future.

## Viewing / editing / creating Traffic Flow Patterns

Click the "Traffic Flow Patterns" button from the switchboard or select the same from the menu. The interface for managing traffic flow patterns is appeared in the screen (see below).

The screenshot shows the "Traffic Flow Patterns" window. It has a "Definition" section with a "Name" field containing "LGED-Rural Roads" and a "Road Use" dropdown menu set to "Other Use". There are "Close" and "Save" buttons in the top right. Below is the "Flow distribution data" section with a "Select Method" radio button group (HV is selected, PCNADT is unselected). A table displays two periods:

	Traffic Flow Description (Period)	Hrs per year (HRYP)	Hourly Volume (HVp)	% of AADT (PCNADTp)
▶	Period 1 (8am-5pm)	4380.00	0.067	80.00
	Period 2 (5pm-8am)	4380.00	0.017	20.00

Summary values at the bottom of the table: 8760.00 and 100.00. A note at the bottom states: "Note: Sum(HRYP) must equal 8760, and Sum(PCNADTp) must equal 100". On the right side of the table, there are "Add New Period" and "Delete Period" buttons.

Figure-10. Interface for managing traffic flow patterns

## Adding Traffic Flow Period

Perform the following steps to add a traffic flow period for the traffic flow pattern:

- Click "Add New Period" button.
- A new row is created at the bottom of the grid.
- Enter description of the traffic flow period.
- If your selected method is HV, input the value for Hrs per year (HRYP) and Hourly Volume (HVp), otherwise input the value for Hrs per year (HRYP) and % of AADT (PCNADTp).
- When you have finished working, click "Save" button.

## Editing Traffic Flow Period

- Select the Traffic Flow Period from the list.
- Update necessary values.
- When you have finished working, click "Save" button. If you do not click Save before closing the window, your changes will be lost.

## Deleting Traffic Flow Period

- Select the Traffic Flow Period from the list.
- Click "**Delete Period**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the Traffic Flow Period, or **No** to cancel the delete action.
- If you click **Yes**, the Traffic Flow Period is no longer displayed in the list.



In case your selected method is HV,  $\text{Sum}(\text{HRYRp})$  must equal 8760, and  $\text{Sum}((\text{HRYRp} * \text{HVP})/365)$  must equal  $1.00 \pm 0.05$ . But, if your selected method is PCNADT,  $\text{Sum}(\text{HRYRp})$  must equal 8760, and  $\text{Sum}(\text{PCNADTp})$  must equal 100.

## 5.4. Speed Flow Types

The primary function of HDM-4 Speed Flow Types is to represent the capacity characteristics of different road types. Examples of Speed Flow Types are: Single Lane Road, Intermediate Road, Two Lane Road, Four Lane Road, etc. Capacity characteristics are defined in terms of the various parameters (such as ultimate capacity and free flow capacity) that constitute the HDM-4 speed flow curve model.

### Viewing / editing / creating Speed Flow Types

Click the "*Speed Flow Types*" button from the switchboard or select the same from the menu. The interface for managing speed flow types is appeared in the screen (see below).

Figure-11. Interface for managing speed flow types



- HDM-4 includes a set of default Road Types. Each Road Type has associated default values for the speed flow parameters.
- Selecting a Road Type from the drop-down list causes the speed flow parameters to be overwritten with the appropriate defaults. To reset the speed flow parameters to the defaults for the currently selected Road Type, click "**Load Defaults**".
- To relate Speed Flow Types with the road sections, input appropriate **range of Carriageway Width** for each speed flow type. During preparation of road network, speed flow type will automatically be determined for respective road sections based on given range of carriageway width.

### Adding Speed Flow Type

Perform the following steps to add a speed flow type:

- Click "**Add**" button.
- A new row is created at the bottom of the grid, and software will provide the name for speed flow as "New Speed Flow". Change name of the speed flow type.
- Initially, the software will select the Road Type as "Single Lane Road", and will provide default calibration parameters for that type of road.
- Select appropriate Road Type from the drop-down and modify calibration parameters.
- Click "**Load Defaults**" if you wish to reset with associated defaults of HDM-4 for the currently selected Road Type.
- When you have finished working, click "**Save**" button.

### Editing Speed Flow Type

- Select the Speed Flow Type from the list.
- Update necessary calibration parameters.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Deleting Speed Flow Type

- Select the Speed Flow Type from the list.
- Click "**Delete**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the Speed Flow Type, or **No** to cancel the delete action.
- If you click **Yes**, the Speed Flow Type is no longer displayed in the list.

## 5.5. Accident Classes

The primary function of HDM-4 Accident Class is to represent the accident rate characteristics of different roads. Accident rate characteristics are defined in terms of the accident rates per 100 million vehicle-km. They can either be specified by accident components (Fatal, Injury and Damage), or a single rate for all accident types.

### Viewing / editing Accident Classes

Click the "Accident Classes" button from the switchboard or select the same from the menu. The interface for managing accident classes is appeared in the screen (see below).



Name of Accident Class
Single Lane Road
Intermediate Road
Two Lane Road

Accident rates (in number per 100 million vehicle-km)

Name: Single Lane Road

By component

Fatal: 0

Injury: 0

Damage: 0

All

All Accidents: 0

Note: It is not allowed to add new or modify the name of Accident Class since there is a relationship between Accident Class and Speed Flow Type. Accident classes will automatically be inserted or updated whilst insertion and/or modification take place in the speed flow type.

Figure-12. Interface for managing accident classes



- Name of Accident Class will be the same of Speed Flow Types. It is not allowed to add new or modify the name of Accident Class since there is a relationship between Accident Class and Speed Flow Type.
- Accident classes will automatically be inserted or updated whilst insertion and/or modification take place in the speed flow type.
- During preparation of road network, accident class will automatically be determined for respective road sections based on range of carriageway width given for speed flow type.

### Editing Characteristics of Accident Class

- Select the Accident Class from the list.
- Update characteristics data.
- When you have finished working, click "Save" button. If you do not click Save before closing the window, your changes will be lost.

## 5.6. Climate Zones

Climate Zones are used to represent the climatic conditions found in different parts of a Road Network. The data items that represent these climatic conditions affect pavement deterioration. Climate Zone data are divided into two categories, Moisture and Temperature.

For each of the two categories, aggregate level parameters are provided. These are Temperature Classification and Moisture Classification. HDM-4 supports a fixed set of Temperature Classifications, each of which has an associated set of defaults for the temperature parameters. Changing the Temperature Classification selected for a Climate Zone causes the corresponding set of temperature data to be adopted.

Similarly, HDM-4 supports a fixed set of Moisture Classifications, each of which has an associated set of defaults for the moisture parameters. Changing the Moisture Classification currently selected for a Climate Zone causes the corresponding set of moisture defaults to be adopted.

### Viewing / editing / creating Climate Zones

Click the “Climate Zones” button from the switchboard or select the same from the menu. The interface for managing climate zones is appeared in the screen (see below).

Name of Climate Zone
BD-Humid

**Climate**

Name:

Moisture Classification:

Moisture Index:

Duration of dry season:  months

Mean monthly precipitation:  mm

Temperature Classification:

Mean temperature:  °C

Avg. Temperature Range:  °C

Days T>32°C:  days

Freeze Index:  C-days

**Districts under the Climate Zone**

District Name
PANCHAGARH
THAKURGAON
DENAIPUR
NILPHAMARI
LALMONIRHAT
RANGPUR
KURIGRAM
GAIBANDHA
JOYPURHAT
BOGURA
NAOGAON
C. NAWABGANJ
RAJSHAHI
NATORE
SERAJGANJ
PABNA

Figure-13. Interface for managing climate zones



Each of the climate zone should be associated with respective districts. During preparation of road network, climate zone will automatically be selected for respective road sections based on their geographic location.

## Adding Climate Zone

Perform the following steps to add a climate zone:

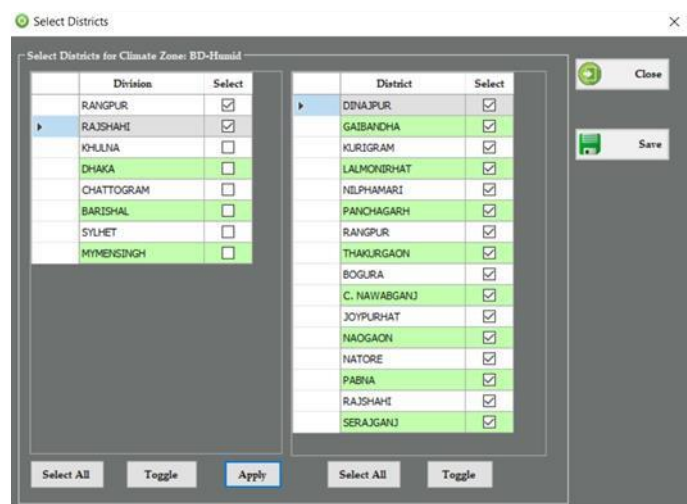
- Click **"Add"** button.
- A new row is created at the bottom of the grid, and software will provide the name for climate zone as "New Climate Zone". Change name of the climate zone.
- Initially, the software will select the Moisture Classification as "Humid" and Temperature Classification as "Tropical", and will provide associated set of default parameters for those classifications.
- Select appropriate Moisture and Temperature Classification from the drop-down and modify parameters.
- Click **"Load Defaults"** if you wish to reset with associated defaults of HDM-4 for the currently selected Moisture and Temperature Classification.
- When you have finished working, click **"Save"** button.

## Associating Districts with Climate Zone

- Select the Climate Zone from the list.
- Click **"Update Districts"** button.

A separate interface is appeared (see right hand side), from which you can select districts associated with the climate zone.

- In this regard, first select respective Division(s) from the Division List, and click **"Apply"** button so that all the Districts under selected Division(s) is appeared and get selected by default in the District List.



- Select respective districts for the climate zone.
- When you have finished working, click **"Save"** button. If you do not click Save before closing the window, your changes will be lost.



- Function of **"Select All"** button is to select all the items (divisions/ districts) of the corresponding list.
- Function of **"Toggle"** button is to reverse-select items (divisions/ districts) of the corresponding list.

### Editing Climate Zone

- Select the Climate Zone from the list.
- Update necessary parameters.
- If you wish to update districts for the climate zone, click "**Update Districts**" button and follow the steps as described above.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Deleting Climate Zone

- Select the Climate Zone from the list.
- Click "**Delete**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the Climate Zone, or **No** to cancel the delete action.
- If you click **Yes**, the Climate Zone is no longer displayed in the list.

## 5.7. Currencies

HDM-4 maintains a list of Currencies. These are used to specify the following:

- Vehicle Fleet unit costs
- Default works unit costs
- Road Network Asset Values
- Project analysis output
- Programme analysis output
- Strategy analysis output

Some common currencies (e.g. US Dollar, Pound Sterling, Euro, Peso) are available in the HDM-4, by default. Here, it is required to add only one currency "Bangladesh Taka" so that the same can be associated with related datasets, which has been included within the software backend database.



Do not add common currencies (e.g. US Dollar, Pound Sterling, Euro, Peso) in the software since those are already available in the HDM-4, by default. If you include those currencies again in the software backend database then it will cause to generate error during importing currency in HDM-4.



## Viewing / editing / creating Currencies

Click the "Currencies" button from the switchboard or select the same from the menu. The interface for managing currencies is appeared in the screen (see below).

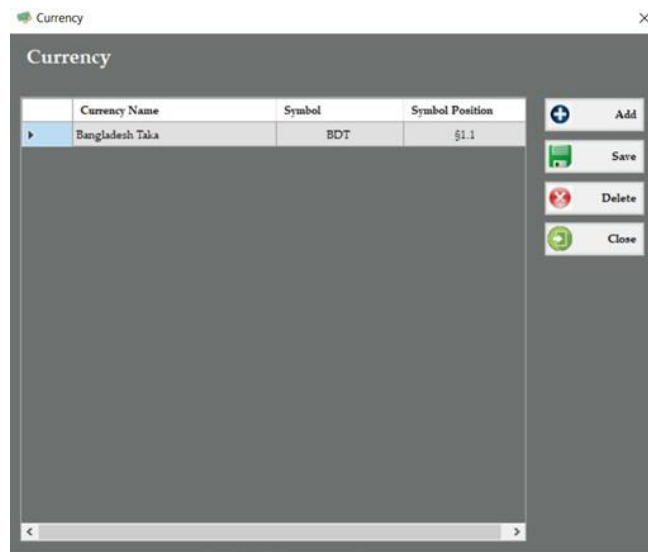


Figure-14. Interface for managing currencies

### Adding Currency

Perform the following steps to add a currency:

- Click "**Add**" button.
- A new row is created at the bottom of the grid, and software will provide the name for currency as "New Currency". Change name of the currency.
- Input Symbol (e.g. BDT) and select Symbol Position from the drop-down.
- When you have finished working, click "**Save**" button.

### Editing Currency

- Select the Currency from the list.
- Do necessary modifications.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Deleting Currency

- Select the Currency from the list.
- Click "**Delete**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the Currency, or **No** to cancel the delete action.
- If you click **Yes**, the Currency is no longer displayed in the list.

## 5.8. RD Calibration

Road Deterioration Calibration Sets allow sets of section calibration coefficients to be defined for the range of pavement types commonly found on the road network being analyzed. Sections that have the same characteristics are able to use the same calibration item.

When a Road Network is created a Calibration Set is selected for each of its road section. HDM-4 calibration set contains a number of Calibration Items for Bituminous, Concrete, and Unsealed pavement types. Each Calibration Item has a unique name and defines a user-defined set of calibration coefficients. When defining a section a calibration item is selected to define all the calibration coefficients. Calibration items for Bituminous and Concrete pavement types are considered for the rural road network under LGED.

Among others, calibration coefficients under road deterioration calibration set play important role for analyzing and determining progression of road surface condition. Some of these coefficients need to be adjusted over time to increase accuracy level of the result derived from deterioration model of HDM-4.

### Description of Calibration Factors (CF) used in the deterioration models for Bitumen Pavement Road Sections

CF	Description
CDS	Construction defects indicator for bituminous surfacing
CDB	Construction defects indicator for the base
CRT	Crack retardation time due to maintenance (years)
RRF	Ravelling retardation factor due to maintenance
Kcia	Calibration factor for initiation of All structural cracking
Kcpa	Calibration factor for progression of All structural cracking
Kciw	Calibration factor for initiation of Wide structural cracking
Kcpw	Calibration factor for progression of Wide structural cracking
Kcit	Calibration factor for initiation of transverse thermal cracking
Kcpt	Calibration factor for progression of transverse thermal cracking
Kvi	Calibration factor for ravelling initiation
Kvp	Calibration factor for ravelling progression
Kpic	Calibration factor for pothole initiation due to wide structural cracking
Kpir	Calibration factor for pothole initiation due to ravelling
Kpp	Calibration factor for pothole progression
Keb	Calibration factor for edge-break progression
Ktd	Calibration factor for texture depth
Ksfc	Calibration factor for skid resistance
Ksfcs	Calibration factor for skid resistance speed effects
Krid	Calibration factor for initial densification
Krst	Calibration factor for structural deformation
Krpd	Calibration factor for plastic deformation
Kdrain	Calibration factor for progression of Wide structural cracking
Ksnpk	Calibration factor for SNPK

CF	Description
Krsw	Calibration factor for surface wear
Krds	Calibration factor for rut depth standard deviation
Kf	Calibration factor for wet/dry season SNP ratio (range 0.1 to 10)
Kgm	Calibration factor for the environmental component
Kgp	Calibration factor for potholing component of roughness
Kgs	Calibration factor for structural component of roughness
Kgc	Calibration factor for the cracking component of roughness
Kgr	Calibration factor for the rutting component
Kddf	Calibration factor for progression of Wide structural cracking
ESTEP	Effective number of lanes for the road section

### Viewing / editing / creating RD Calibration

Click the "RD Calibration" button from the switchboard or select the same from the menu. The interface for managing RD calibration set is appeared in the screen (see below).

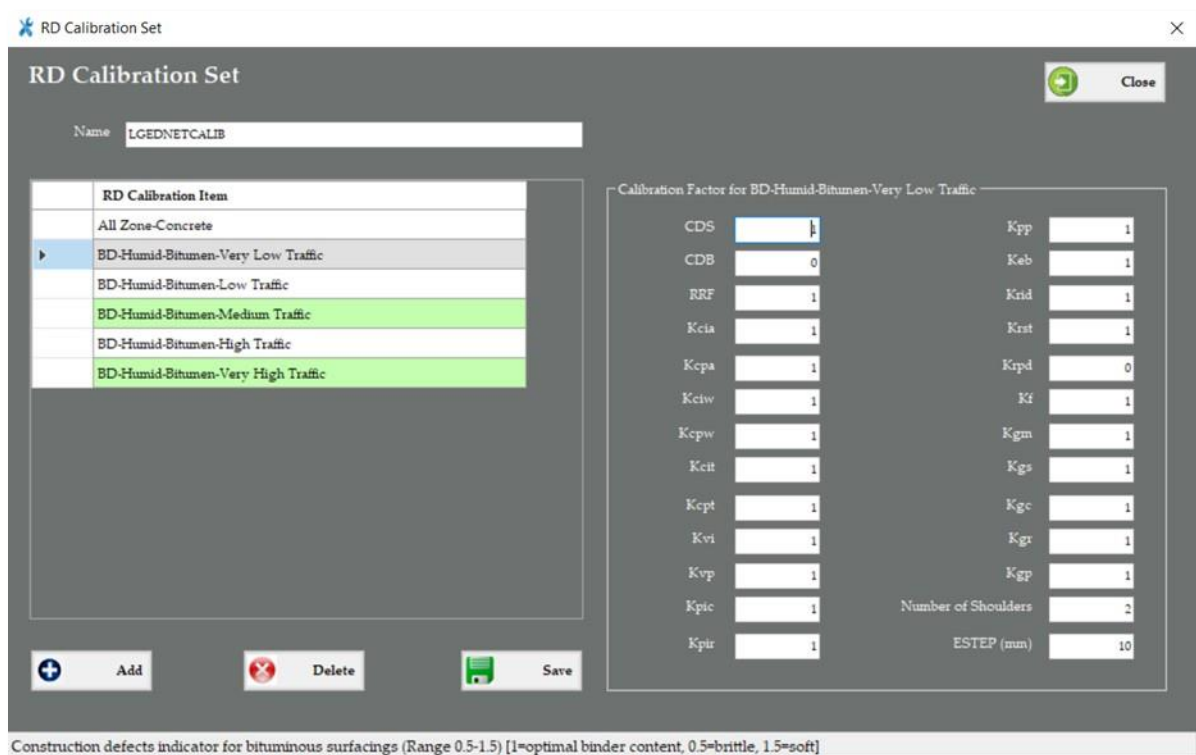


Figure-15. Interface for managing RD calibration set for bitumen pavement

When you move the cursor to any textbox, description of respective coefficient is displayed in the status bar of the interface.

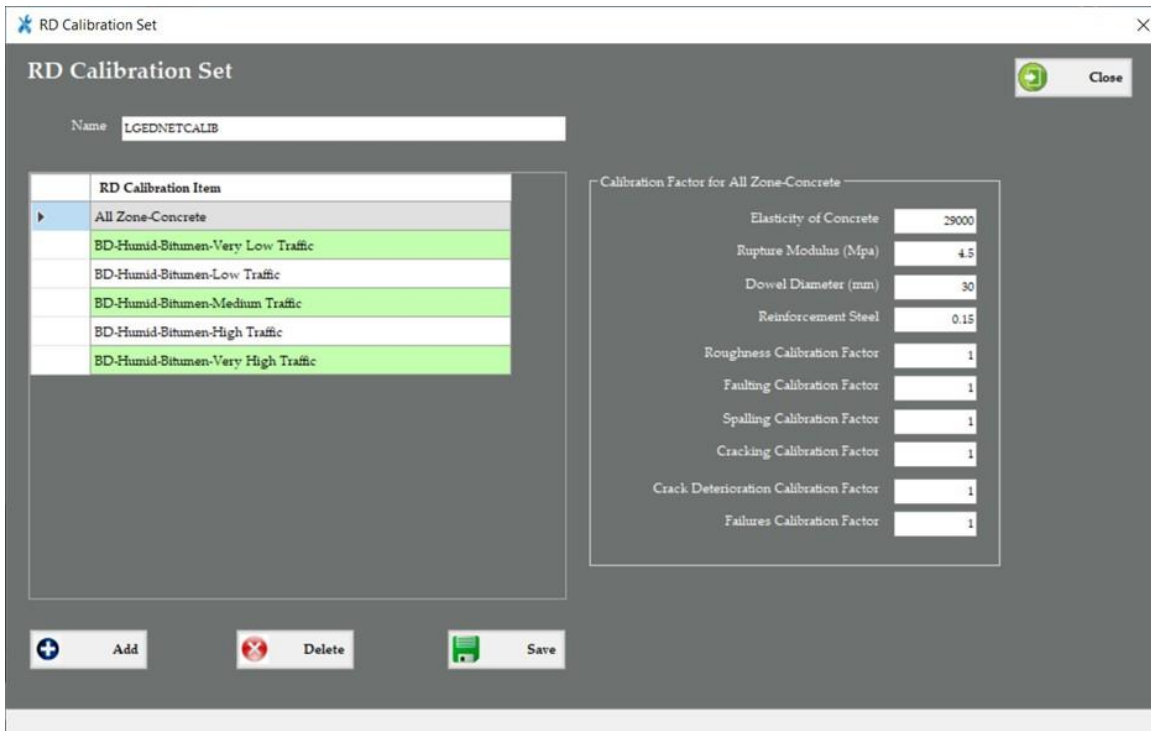


Figure-16. Interface for managing RD calibration set for concrete pavement



Coefficients of calibration items for bitumen surface have strong relationship with climates and traffic volume. Accordingly, respective climate zone and traffic band (as defined in the section configuration) to be associated with each of the RD Calibration Item. However, only one RD Calibration Item has been considered for concrete surface. During preparation of road network, RD calibration item will automatically be selected for respective road sections based on their geographic location, which would be identified from the associated climate zone and traffic band.

### Adding RD Calibration Item

Perform the following steps to add a RD Calibration Item:

- Click **"Add"** button.
- A new window is appeared (see right hand side).
- Select the associated climate zone from the drop-down.
- Click **"OK"** button to add new calibration items, or click **"Cancel"** button to cancel the action.
- Once you click OK, if there is no calibration item for concrete pavement, then the software will create calibration item for concrete pavement for all climate zones and will create necessary calibration items for bitumen pavement for that climate zone and traffic band as defined in the section configuration along with HDM-4 default value for different coefficients. Otherwise, the software will create necessary calibration items for bitumen pavement for that climate zone and traffic band as defined in the section configuration along with HDM-4 default value for different coefficients.



- Modify coefficients where necessary and as appropriate with respect to selected climate zone.
- When you have finished working, click "**Save**" button.

### Editing RD Calibration Item

- Select the RD Calibration Item from the list.
- Modify coefficients where necessary and as appropriate with respect to selected climate zone.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Deleting RD Calibration Item

- Select the RD Calibration Item from the list.
- Click "**Delete**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the RD Calibration Item, or **No** to cancel the delete action.
- If you click **Yes**, all the RD Calibration Items associated with the same climate zone will be deleted and will no longer be displayed in the list.

## 5.9. Section Configuration

Section Configuration constitutes section aggregate data and calibration parameters. HDM-4 system, variables for traffic volume, road class, geometry class, construction quality, structural adequacy, ride quality, surface condition and surface texture parameters are being maintained. The variables that you define (for example good, fair, poor, bad) correspond to detailed values in the Section Aggregate Tables that allows to define what constitutes good, bad or fair to suit the local conditions.

These calibration parameters are related to the Road Deterioration and Work Effects models, and the corresponding detailed values from the Section Aggregate Tables are used when you run an analysis.

The interface for Section Configuration of the software provides facility to modify section aggregate parameters for:

- Traffic Volume
- Ride Quality (Roughness)
- Surface Condition

LGED's road types (UZR, UNR, VR-A and VR-B) are being used as default value for road class parameter, and HDM-4 defaults are being used for remaining parameters and for their associated variables.

## Viewing / editing Section Configuration

Click the "Section Configuration" button from the switchboard or select the same from the menu. The interface for managing section aggregate data is appeared in the screen (see below).



Figure-17. Interface for managing section aggregate data

Section aggregate parameter options is listed at the left hand side of the interface. When you will select any of the parameter, respective table (grid) containing variables for that parameter will be displayed at the right hand side as shown above.

## Editing Variables for Traffic Volume

- Select Traffic Volume from the Aggregate Parameter list.
- Table for traffic band AADT for different surface is appeared in the interface as below:

Traffic Band	AADT on Bituminous Surface	AADT on Concrete Surface	AADT on Unsealed Surface
Very Low	100	80	20
Low	500	400	100
Medium	1,500	1,200	300
High	3,000	2,500	600
Very High	15,000	12,000	1,000

- Five traffic bands (very low, low, medium, high and very high) have been considered for this parameter.
- Edit upper value of the AADT range for bituminous, concrete and unsealed surface, and for each traffic band. For example - if you enter AADT on Bituminous Surface for Very Low traffic band as 100, then its range would be denoted as 0-100. If you enter AADT on Bituminous Surface for Low traffic band as 500, then its range would be denoted as 101-500 [*upper value of preceding traffic band plus 1 to upper value of current traffic band*].
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Editing Variables for Ride Quality (Roughness)

- Select Ride Quality (Roughness) from the Aggregate Parameter list.
- Table for ride quality (roughness) in IRI in m/km for different road types and for different surface is appeared in the interface as below:

	Road Type	Good (BC)	Fair (BC)	Poor (BC)	Bad (BC)	Good (Concrete)	Fair (Concrete)	Poor (Concrete)	Bad (Concrete)
▶	UZR	6.00	8.00	10.00	16.00	6.00	8.00	10.00	16.00
	UNR	6.00	8.00	10.00	16.00	6.00	8.00	10.00	16.00
	VR-A	6.00	8.00	10.00	16.00	6.00	8.00	10.00	16.00
	VR-B	6.00	8.00	10.00	16.00	6.00	8.00	10.00	16.00

- Four road surface condition parameters (good, fair, poor and bad) have been considered for each road types, and for bituminous and concrete pavement.
- Edit upper value of the IRI range for different road surface conditions against bituminous and concrete surface, and for each road type.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Editing Variables for Surface Condition (Surface Distress)

- Select Surface Condition from the Aggregate Parameter list.
- Table for surface distress for different distress mode and for different distress types is appeared in the interface as below:

	Distress Mode	Cracking (%)	Ravelling (%)	No. Potholes per km	Edge Break m <sup>2</sup> per km	Mean Rut Depth (mm)
▶	Good	0.00	1.00	0.00	0.00	2.00
	Fair	5.00	10.00	0.00	10.00	5.00
	Poor	15.00	20.00	5.00	100.00	15.00
	Bad	25.00	30.00	50.00	300.00	25.00

- Four distress mode parameters (good, fair, poor and bad), and five distress types (% of cracking, % of ravelling, pothole number per km, edge break per km and mean rut depth) have been considered.
- Edit upper value for different distress types and for different distress modes.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

## 6. Road Network Preparation and Data Migration

Main purpose of the software is to provide interoperability between LGED's Road and Structure Database Management System (RSDMS) and Road Deterioration and Works Effects (RDWE) of HDM-4. The HDM-4 Road Network stores details of the roads that you wish to analyze. Each road network consists of a number of road sections that typically corresponds to an identifiable length.

A Road Network is associated with a Calibration Set which define sets of section calibration coefficients (a calibration item) for the range of pavement types found in the road network. Sections which have the same characteristics can all use the same calibration item. A Road Network is associated with a Vehicle Fleet. The Vehicle Fleets Vehicle Types are used to define the traffic volume for each section. Apart from these, a Road Network is also associated with Traffic Growth, Traffic Flow Pattern, Speed Flow Type, Accident Class, and Climate Zone.

The module of this software facilitates in preparation of the Road Network datasets from LGED's RSDMS and making association of various necessary calibration coefficients with each road sections by a Single Click. Apart from the Road Network dataset, this module also facilitates exporting calibration and configuration dataset so far prepared using this software.

### 6.1. Network Preparation for HDM-4

Click the "Network Preparation for HDM-4" button from the switchboard or select the same from the menu. The interface for road network preparation & export for HDM-4 is appeared in the screen (see below).

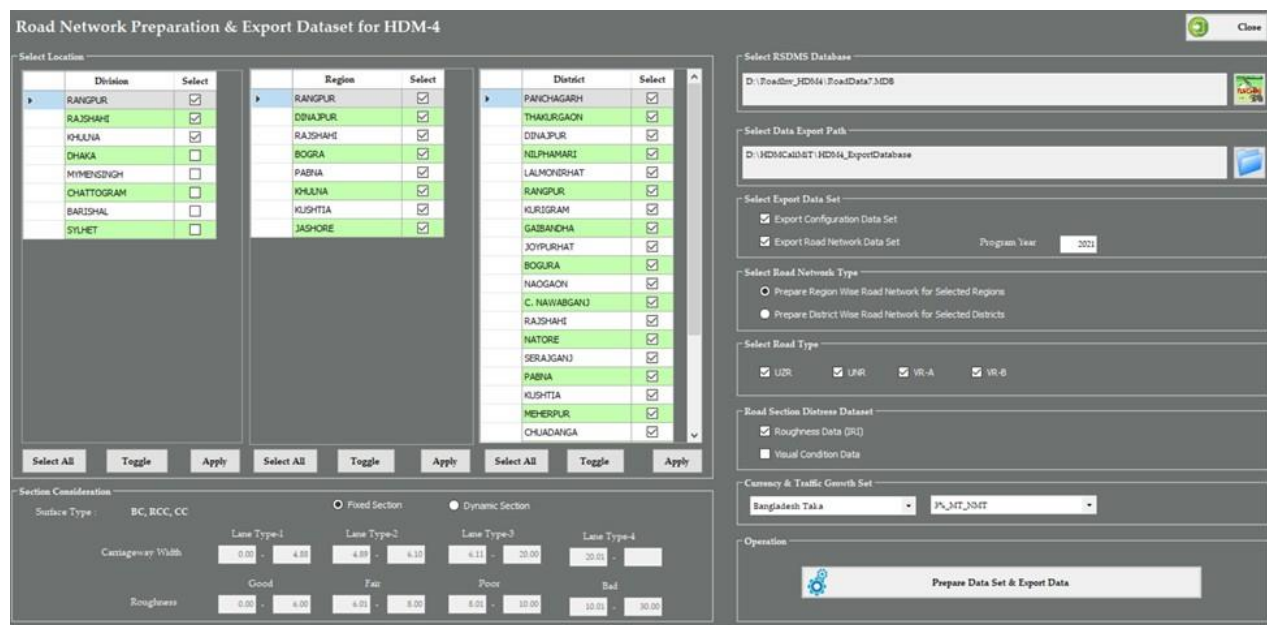


Figure-18. Interface for network preparation & export for HDM-4



Perform the following actions to prepare the road network(s) and to export the same according to the required database format of HDM-4.


- 1 **Select Location:** Firstly, it is required to select the locations of road network(s), for which you are planning to prepare and export dataset for HDM-4. You may wish to prepare and export road networks for the whole country at one-go, whilst you may wish to do the same for a few selected regions or districts. Select the location according to your plan.

In this regard, first select respective Division(s) from the Division List, and click "**Apply**" button so that all the Regions under selected Division(s) is appeared and get selected by default in the Region List. Afterwards, select respective Region(s) from the Region List, and click "**Apply**" button so that all the Districts under selected Region(s) is appeared and get selected by default in the District List.

- Function of "Select All" button is to select all the items (divisions/ regions/ districts) of the corresponding list.
- Function of "Toggle" button is to reverse-select items (divisions/ regions/ districts) of the corresponding list.


- 2 **Select RSDMS Database:** Secondly, select the RSDMS database (RoadData7.mdb). Generally, RSDMS database is located at C:\RoadInv, and the same path is automatically being selected by the software application. It is not required to re-select the RSDMS database if it is available at its default location. However, the software provides facility to relocate if it resides at different location of your computer, or if you wish to connect the same from shared network location.

If you want to change the database location, then -

- Click the associated  button;
- **Browse the folder** location of RSDMS database;
- Double-click the folder that contains the database;
- **Select the database** (RoadData7.mdb) and click **Open**.

The software will perform validation to ensure correctness of RSDMS database, and will store the given location within its backend database. So, it is not required to select the database path every time if the same remain available in the given path.

- 3 **Select Data Export Path:** Thirdly, select the folder where you want to store the databases to be exported for HDM-4. Previously selected folder, if any, is stored within the backend database, and the path will automatically be selected here. However, if you want to change the export path, then -

- Click the associated  button;
- **Browse the folder** where you want to store exported data;
- Double-click the folder and click **OK**.
- If you want to create new folder, click **Make New Folder**.

- 4 Select Export Data Set:** Fourthly, select the data set to be exported. Two options are available here, (1) **Export Configuration Data Set**, and (2) **Export Road Network Data Set**. You can opt both the datasets to be exported simultaneously, or you can opt for either of the dataset.

If you choose Export Configuration Data Set, then all the Calibration Coefficients and Configuration datasets, so far prepared using the software, to be exported. Altogether nine data files will be created at the "ConfigDatabase" sub-folder under the given data export folder for different datasets as discussed earlier.

If you choose Export Road Network Data Set, then required number data files will be created at the "NetworkDatabase" sub-folder under the given data export folder for different road network. Apart from network dataset, Program dataset will also be created at the "ProgramDatabase" sub-folder under the given data export folder for the same road network(s).

It is required to input the Program Year if you want to create network dataset. **Program Year** refers to the year for which you are planning to carryout need assessment of your road network to prepare annual road maintenance program thereby. By default, current year (from system date) is displayed, which can be modified according to need.

RDWE model of HDM-4 will use the program year for preparing multi-year forward programming and for calculation of road section deterioration. For instance, if you want prepare program for the year 2021 and roughness was surveyed for a road section in 2018, HDM-4 will calculate estimated progression of roughness for the section for the year 2021 to 2025 (5-year estimated progression in future date).

- 5 Select Road Network Type:** Fifthly, select the type of road network you wish to prepare. HDM-4 has limitations of processing number of records during analysis. It would not feasible to prepare a single network for the entire paved road section of LGED, because HDM could not able to analysis as such huge number of records at a time. Accordingly, two options are considered here, (1) **Prepare Region Wise Road Network for Selected Regions**, and (2) **Prepare District Wise Road Network for Selected Districts**. You can opt either of them.

- 6 Select Road Type:** Sixthly, select the type of roads (UZR, UNR, VR-A and VR-B) to be considered during preparation of road network.

- 7 Road Section Distress Dataset:** Seventhly, select the road section distress dataset to be considered during preparation of road network. Two options are available here, (1) **Roughness Data**, and (2) **Visual Condition Data**. You can opt both the datasets to be exported with road section data, or you can opt for either of the dataset.

- 8 Currency & Traffic Growth Set:** Eighthly, select currency and traffic growth set to be associated with the road network.

- 9 Section Consideration:** Ninthly, select section consideration. Two options are available here, (1) **Fixed Section**, and (2) **Dynamic Section**. You can opt either of them.

Fixed section refers to the current road sectioning practice of LGED, where typical sections are 500m in length.

Dynamic section refers to the concept of homogenous sections, where each section has uniform surface type, geometry and condition characteristics over its entire length. Traffic volume could be another determination factor for homogenous sections, but, currently LGED does not collect traffic data by section and hence this factor is not considered. Selecting this option will enable defining lane type by the range of carriageway width, and defining road condition by range of roughness (IRI) value. Opting this option would be ideal if you wish to carryout program analysis and thereby generating work program from HDM-4.

- 10 **Prepare Data Set & Export Data:** Finally, click "Prepare Data Set & Export Data" button. The software will do the rest, and after preparation it will export data sets to the respective sub-folders as discuss below.

### Location, list and naming convention for exported files

If you choose **Export Configuration Data Set**, then following nine data files will be created at the "**ConfigDatabase**" sub-folder under the selected data export folder:

- 01-Currencies.mdb
- 02-Vehicle Fleet-LGED.mdb (*Name of the file will be according to name vehicle fleet*)
- 03-Accident Classes.mdb
- 04-Traffic Flow Patterns.mdb
- 05-Speed Flow Types.mdb
- 06-Climate Zones.mdb
- 07-LGEDNETCALIB.mdb (*Name of the file will be according to name RD calibration set*)
- 08-SecConfig.mdb
- 09-WorkStds.mdb

As seen above, a serial number is maintaining as prefix for each data file. While importing these data files into HDM-4, the given sequence needs to be maintained. Which means it is required to import currencies first, then vehicle fleet and so on.

If you choose **Export Road Network Data Set**, then required number data files will be created at the "**NetworkDatabase**" and "**ProgramDatabase**" sub-folder under the given data export folder for different road network. For example, if the program year is 2021 and if you would select road network type as "Prepare Region Wise Road Network for Selected Regions" then the name of road network and program database for Rangpur Region would be "*Network-Rangpur Region.mdb*" and "*AWP-Rangpur Region-2021.mdb*" respectively. But, if you would select road network type as "Prepare District Wise Road Network for Selected Districts" then the name of road network and program database for Rangpur District would be "*Network-Rangpur District.mdb*" and "*AWP-Rangpur District-2021.mdb*" respectively.

## 6.2. Start working with the HDM-4

### 6.2.1. Running HDM-4

To run HDM-4:

- Click the Windows Start menu.
- Select the HDM-4 Version 2 application item from the HDM-4 Version 2 program group.
- The HDM-4 splash screen is displayed. Once HDM-4 is loaded the HDM-4 Welcome screen is displayed.

#### The HDM-4 Welcome screen

The Welcome screen is designed to introduce you to the concepts and facilities of HDM-4. As you become familiar with the system, you will find it easier to use the Workspace window where you can access all the HDM-4 facilities.

The welcome screen provides access to the following core HDM-4 facilities:

- **Create** a new study  
Select this option to create a new Project, Programme or Strategy analysis.
- **Open** an existing study  
Select this option to open an existing Project, Programme or Strategy analysis.
- Go to the **HDM-4 Workspace**  
Select this option to open the HDM-4 Workspace window.



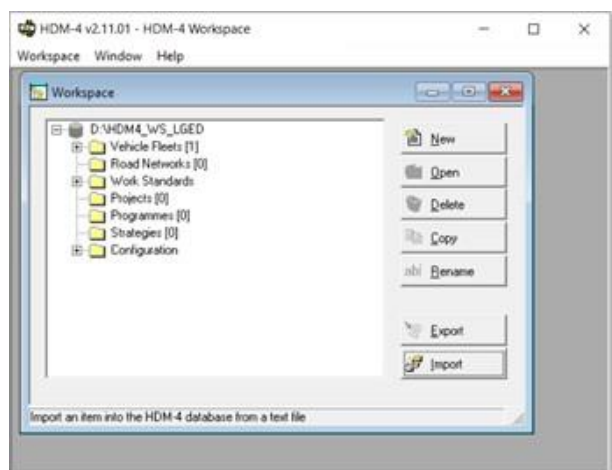
### 6.2.2. Working with the HDM-4 Workspace

The Workspace window is the central hub of HDM-4. Folders are listed on the left, and buttons on the right.

To help you navigate through the system, the folders are listed in the sequence that you would use to create and analyze a new study if you were beginning with a clean system.

The general procedure for performing an operation is:

- Expand a folder by clicking the + to the left of the folder name.
- Select an item in the folder.
- Click the appropriate button for the operation you wish to perform.



### 6.3. Import Configuration and Calibration data into HDM-4

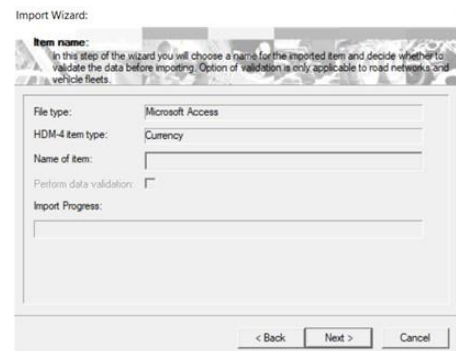
It is required to import configuration and calibration data into HDM-4 in a sequential manner. For example, currency is used for vehicle fleet as well as the other dataset. Hence, currencies data sets to be imported before importing vehicle fleet. The software (HDM CaliMiT) maintains a serial number as prefix for each data file. While importing data into HDM-4, follow the sequential order of file name.

#### 6.3.1. Importing Currencies

To import currencies, do the followings:

- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 01-Currencies.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- Click **Next** to complete the import operation.

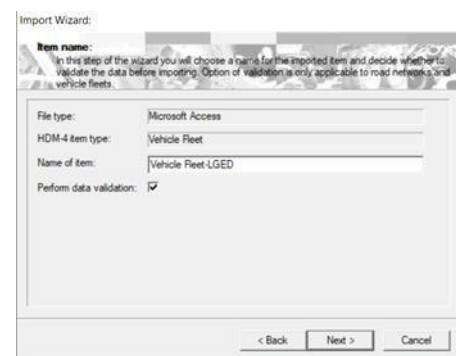
*You are informed if a Currency of the same name already exists. You must then decide whether to overwrite the existing Currency, or to rename the Currency that is being imported, or to cancel the import operation.*



#### 6.3.2. Importing Vehicle Fleet

To import vehicle fleet, do the followings:

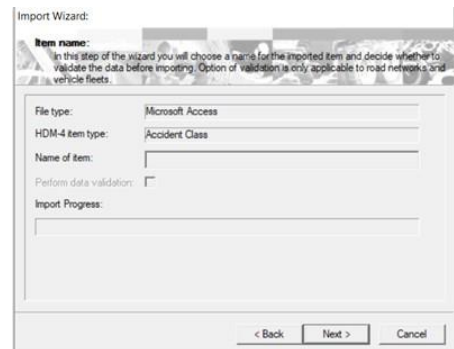
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 02-Vehicle Fleet-LGED.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- **Remove the prefix “02-“** from Name of Item in the associated textbox.
- Click **Next** to complete the import operation.



### 6.3.3. Importing Accident Classes

To import accident classes, do the followings:

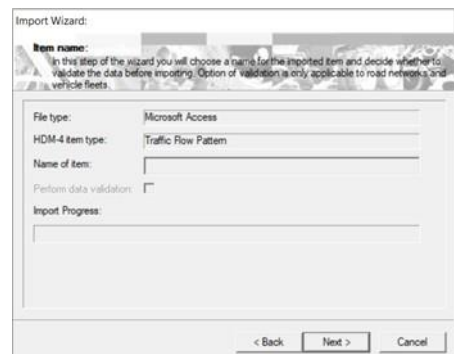
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 03-Accident Classes.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- Click **Next** to complete the import operation.



### 6.3.4. Importing Traffic Flow Patterns

To import traffic flow patterns, do the followings:

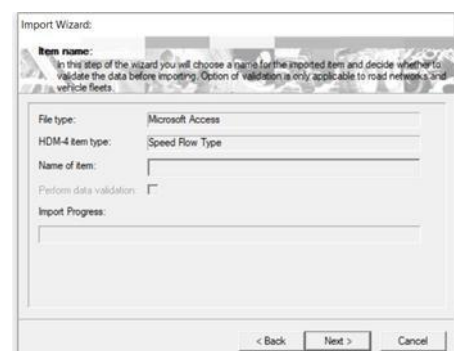
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 04-Traffic Flow Patterns.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- Click **Next** to complete the import operation.



### 6.3.5. Importing Speed Flow Types

To import speed flow types, do the followings:

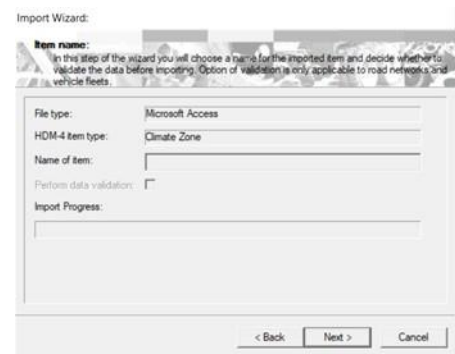
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 05-Speed Flow Types.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- Click **Next** to complete the import operation.



### 6.3.6. Importing Climate Zones

To import climate zones, do the followings:

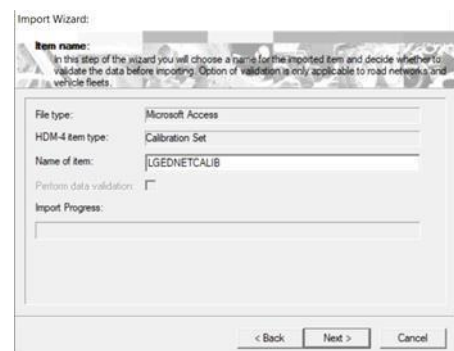
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 06-Climate Zones.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- Click **Next** to complete the import operation.



### 6.3.7. Importing RD Calibration Sets

To import RD calibration sets, do the followings:

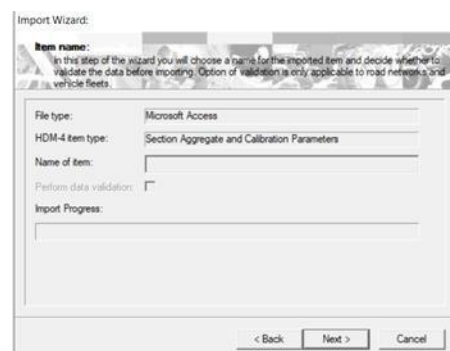
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 07-LGEDNETCALIB.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- **Remove the prefix “07-“** from Name of Item in the associated textbox.
- Click **Next** to complete the import operation.



### 6.3.8. Importing Section Aggregate and Calibration Parameters

To import section configuration (section aggregate and calibration parameters), do the followings:

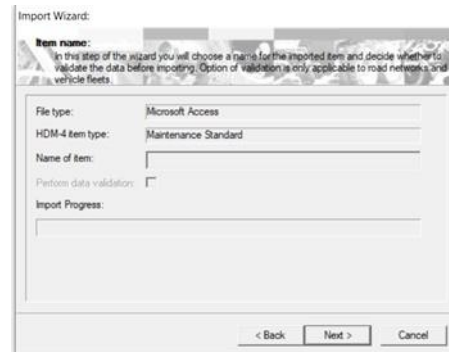
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 08-SecConfig.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- Click **Next** to complete the import operation



### 6.3.9. Importing Work Standards

To import work standards, do the followings:

- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. 09-WorkStds.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard. The import routine detects the file type.
- Click **Next** to complete the import operation



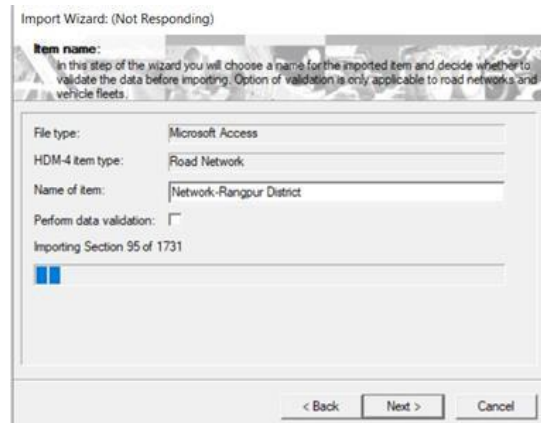
While importing **Vehicle Fleet** and **RD Calibration Set**, it is necessary to **remove the prefix** from Name of Item. Because, actual name of the Vehicle Fleet and RD Calibration Sets do not contain any prefix, and their names are being referred to the network and program dataset. Hence, name of these datasets shall remain same as you have defined during preparation of network and program dataset. However, if you forgot to change their name during import operation, rename them in the HDM-4 workspace immediately.



## 6.4. Import Road Network data into HDM-4

To import road network (road sections), do the followings:

- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. Network-Rangpur District.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard.
- **Deselect** the option Perform data validation.



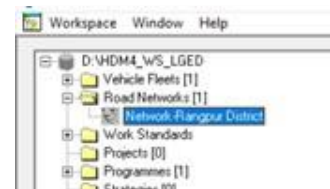
It is recommended to deselect this option as all the required data may not be available for some of the road sections in RSDMS. You can opt to perform data validation in future when data quality in RSDMS is improved.

- Click **Next** to proceed the import operation. A progress bar is appeared in the screen where you can see the status. Wait until the task is finished.

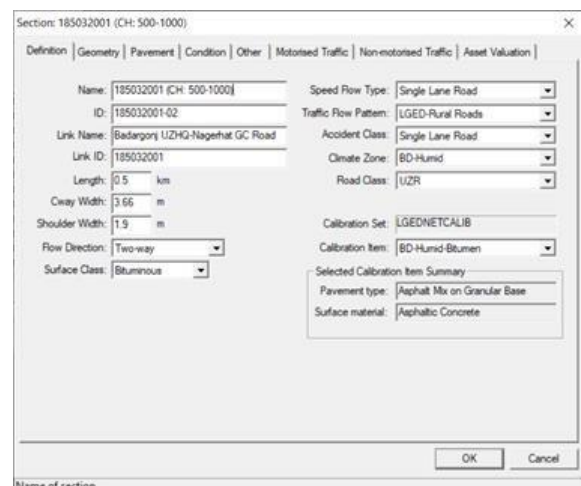
### Viewing Road Network

After completion of import operation, Road Network will be saved in the current Workspace. You may wish to view the road network data that is imported, and to do so -

- Expand the Road Networks folder by clicking the + to the left of the folder name.
- Double-click the road network.
- The road network interface is displayed where you can view all the road sections under the network.
- Double-click the respective road section to view more detailed information.



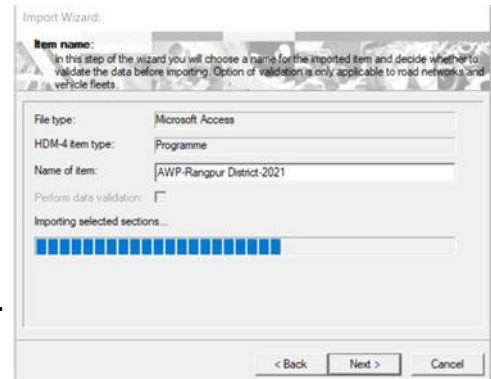
ID	Description	Data Last Modified	Surface Class	Pavement Type
185032001-01	185032001 (CH: 0-500)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032001-02	185032001 (CH: 500-1000)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032001-03	185032001 (CH: 1000-1500)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-01	185032002 (CH: 0-500)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-02	185032002 (CH: 500-1000)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-03	185032002 (CH: 1000-1500)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-04	185032002 (CH: 1500-2000)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-05	185032002 (CH: 2000-2500)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-06	185032002 (CH: 2500-3000)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-07	185032002 (CH: 3000-3500)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-08	185032002 (CH: 3500-4000)	18/06/21	Bituminous	Asphalt Mix on Granular Base
185032002-09	185032002 (CH: 4000-4500)	18/06/21	Bituminous	Asphalt Mix on Granular Base



## 6.5. Import Program data into HDM-4

To import program data, do the followings:

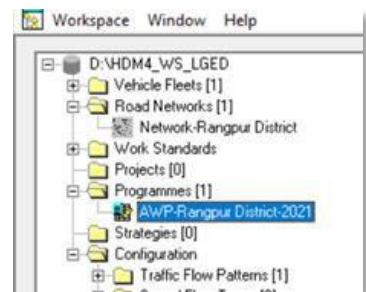
- With the HDM-4 active Workspace window, click the **Import** button.
- The HDM-4 Import Wizard dialog box is displayed.
- Click on **Browse**.
- Double-click the folder that contains the file to be imported.
- **Select the file** to be imported (e.g. AWP-Rangpur District-2021.mdb) and click **Open**.
- Click **Next** to move to the next step in the wizard.
- Click **Next** to proceed the import operation. A progress bar is appeared in the screen where you can see the status. Wait until the task is finished.



## Viewing Program

After completion of import operation, Program will be saved in the current Workspace. You may wish to view the program data that is imported, and to do so -

- Expand the Programmes folder by clicking the + to the left of the folder name.
- Double-click the program.
- The program interface is displayed. Features and functionalities of HDM-4 program analysis is discussed in the sub sequent section.



Program is prepared and exported automatically during preparation of respective road network from HDM CaliMIT. However, some of the sections under the road network may not be considered under the study sections of the program in case of unavailability of mandatory data. Particularly, year of last surfacing is the mandatory parameter for running program analysis. Accordingly, sections for which last surface year is not available in the maintenance history table of RSDMS would be excluded from the program.

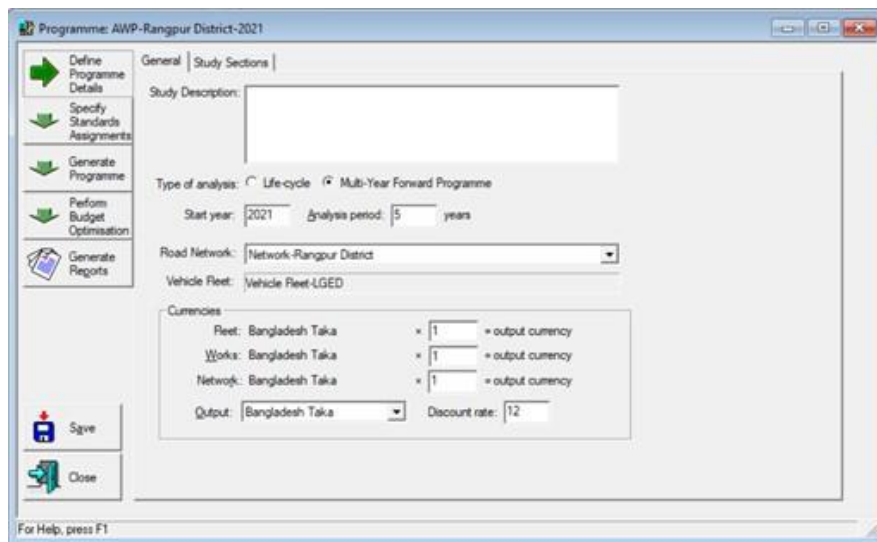
## 6.6. Running Program Analysis (RDWE model) into HDM-4

HDM-4 Program Analysis allows you to generate a short to a medium term program of works for a selected set of road/sections sorted by descending the economic return subject to budgetary constraints. The investment alternatives defined depend on the mode of analysis selected; Multi-year Forward Programming or Life Cycle Analysis. Each method allows the user to define a combination of maintenance and/or improvement standards for a Section. In the case of Life Cycle Analysis, several investment alternatives can be defined. Multi-year Forward Programming allows you to enter one set of standards and analyze the benefit of performing the work when required or delaying the work until the end of the analysis period.

Key feature of the Program interface (shown below) is the five workflow buttons on the left hand side, workflow of which is discussed below to provide an overview on their functionalities.

As we understand, the intention of this initiative is to use the deterioration model of HDM-4 for predicting pavement condition in future dates, and the results to be transferred to LGED’s RSDMS so that selection and prioritization of roads can be done according to the current practice of the organization.

Accordingly, to get the job done, it is required to follow the “**Run Program Analysis**” part of the document. Remaining part of the section provides a brief overview on this module.



The following table shows how the workflow buttons guide you through the process of defining and running a Program analysis.

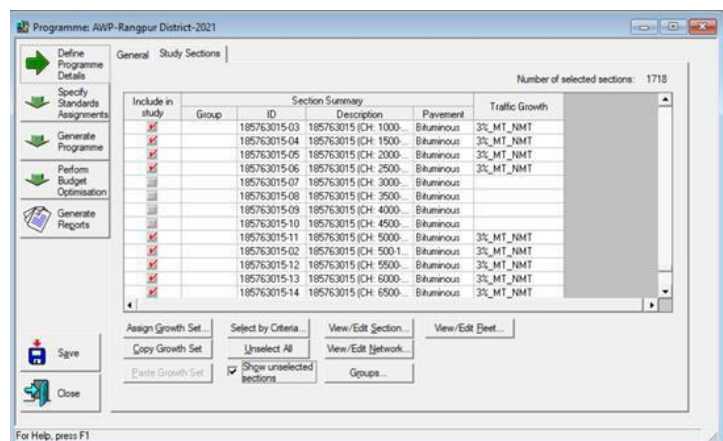
Workflow button	Tab-page	Procedure	
Define Program Details	General	1	Specify the Road Network that contains the Sections to be analyzed.
		2	Specify general Program information such as the start year, duration, output Currency, and discount rate.
		3	Specify the analysis mode. There are two modes of analysis: <ul style="list-style-type: none"> <li>- Life Cycle Analysis Determines the best investment from a set of alternatives.</li> <li>- Multi-year Forward Programming Determines whether the work should be performed during this budget period, or delayed.</li> </ul>
	Study Sections	4	Select specific Sections for analysis and assign a traffic growth to them.

Workflow button	Tab-page		Procedure
Specify Standards Assignments	Alternatives (for aLife Cycle Analysis)	5	The steps depend on the analysis mode you are using: For a Life Cycle Analysis, define the set of alternatives to be analyzed.
	Work Programming (for a Multi-year Forward Program)	6	For a Multi-year Forward Program, define the Maintenance Standards and Improvements for each Section.
Generate Program	Perform Run	7	Customize the run setup. For a Life Cycle Analysis, specify the base alternative. For a Multi-year Forward Program, specify whether an economic analysis should be performed. An unconstrained Program is generated if economic analysis is not selected.
		8	Run the analysis. If vital information is missing, you are informed. You must supply the necessary information so that HDM-4 can complete the run. The time required to perform the analysis depends on the complexity of the specified Program.
Perform Budget Optimization	Work Programming(for a Multi-year Forward Program)	9	The generated work program is displayed. If you want to perform a budget optimization, you can manually select works that you do not want to be considered for optimization.
		10	Define budget periods and values (Life Cycle Analysis only).
	11	Define the optimization parameters.	
	12	Run the budget optimization.	
	Work Program	13	The optimized work program is displayed.
Generate Reports	Select Reports	14	Generate reports and examine the results of the run

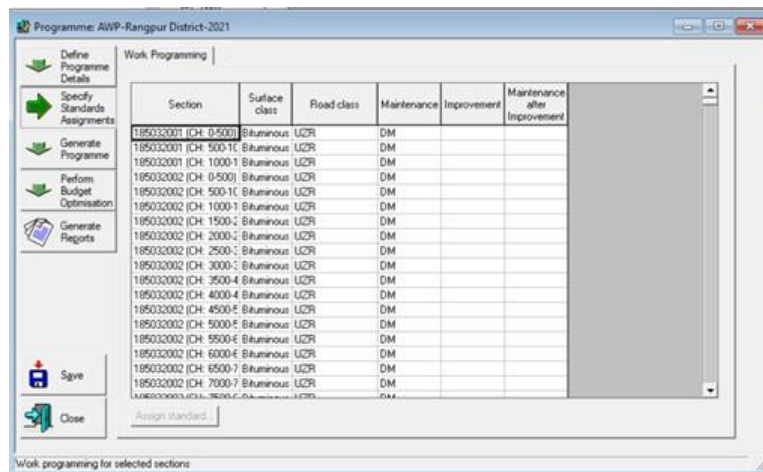
**Define Program Details:** This workflow interface consists of two tab pages, e.g. General and Study Sections. General tab page comprises basic characteristics, such as - type of analysis, start year, analysis period, road network, vehicle fleet, currencies, etc. (shown above)

The study section comprises list of sections so far considered for analysis. You may wish to double-click any section to see its detail information.

To see excluded sections, put check mark on "Show unselected sections" (see right hand side).



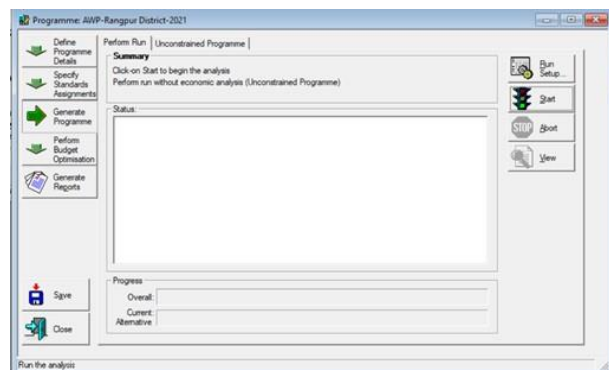
**Specify Standards Assignments:** This workflow interface consists of work programming tab page (shown below). The sections under the Program are listed in the spreadsheet. By default a maintenance standard (do minimum) is assigned against each of the section.



## Run Program Analysis

To run the program analysis, do the followings:

- 1 Click **Generate Programme** workflow button. The interface to perform run is appeared (see right hand side).

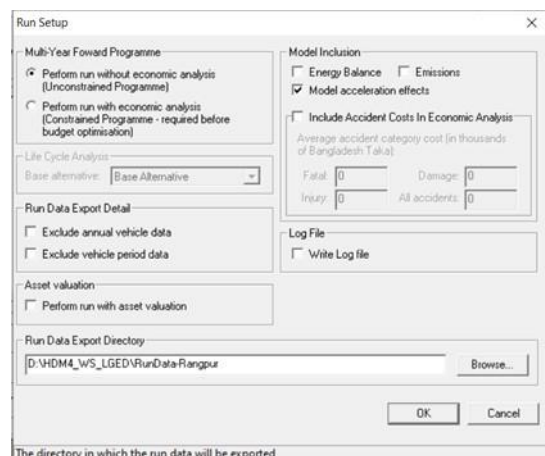


- 2 Click **Run Setup** button. The setup page is appeared (see right hand side).

- Select "Perform run without economic analysis (unconstrained program)" under Multi-Year Forward Program.

- Uncheck the option "Exclude annual vehicle data" and "Exclude vehicle period data" to run the analysis faster.

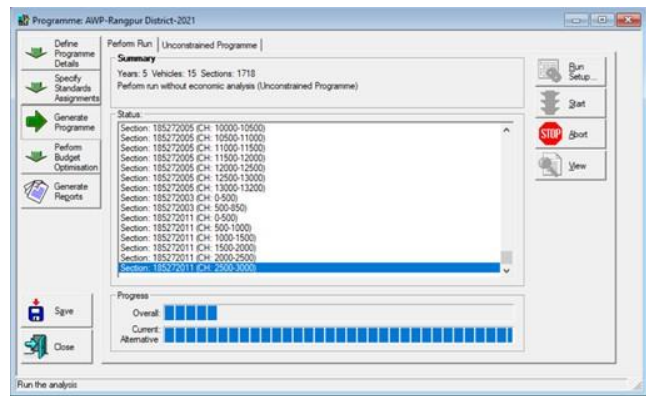
- Select the **Run Data Export Directory**. By default, name of the directory is Run, which is located under the HDM-4 workspace directory. Click **Browse** and select the desired directory, if you wish to change the location. After completion of the run, analysis result is exported to that folder.



3 Click **Start** button.

HDM-4 is analyzed and calculated road section deterioration. Wait until the task is finished.

When you have finished working with the Program, click **Save** before closing the window. If you do not click Save, your changes will be lost.



### 6.7. Transfer Analyzed Deterioration Data to RSDMS

Click the "Deterioration Data Transfer to RSDMS" button from the switchboard or select the same from the menu. The interface for transferring deterioration data to RSDMS is appeared in the screen (see below).

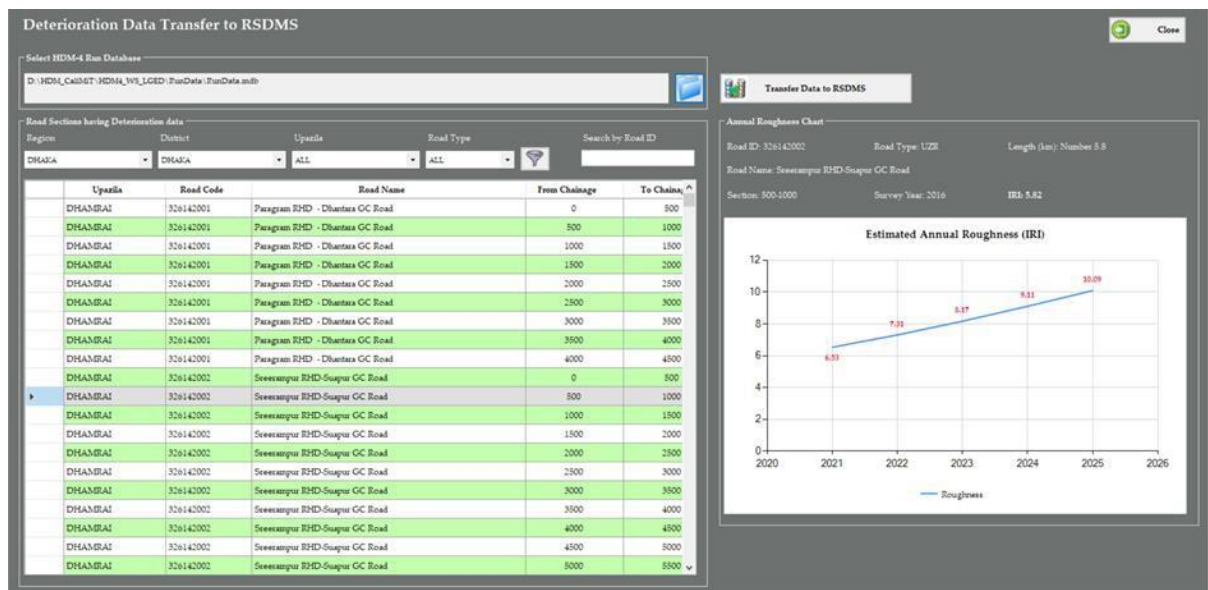


Figure-19. Interface for transferring deterioration data to RSDMS

To transfer deterioration data to RSDMS, do the followings:

- 1 Select the HDM-4 Run Database
  - Click the associated button;
  - **Browse the folder** where the run database is stored;
  - Double-click the folder that contains the database;
  - Select the database and click **Open**.
- 2 Click **Transfer Data to RSDMS**.

The software will transfer deterioration data to RSDMS, and at the same time it will show annual roughness chart by road section.

## 7. Access Control

Access control feature of HDM CaliMiT prevents unauthorized access or operations. Access control mechanism of the systems perform identification, authentication and authorization of users by evaluating required login credentials include user name, password and permissions to different interfaces of the software.

### 7.1. Role Management

HDM CaliMiT maintains role based access control security model, in which the system administrator defines the roles that govern access and operation permission to different interfaces of the software.

#### Viewing / editing / creating Role

Click the "Role Management" button from the switchboard or select the same from the menu. The interface for managing users' roles is appeared in the screen (see below).

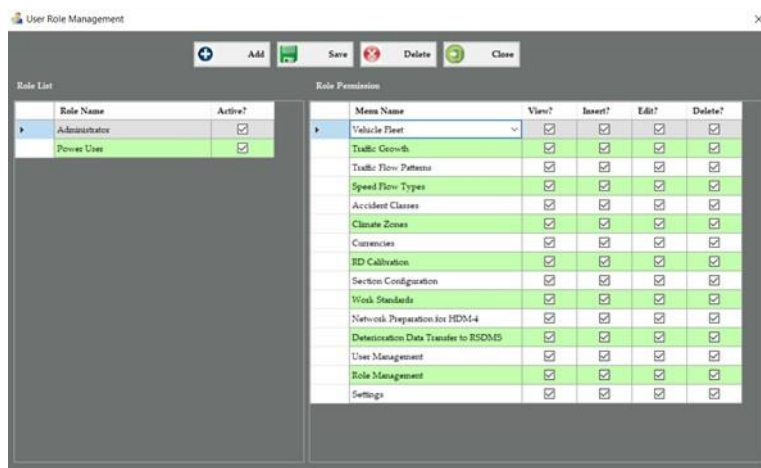
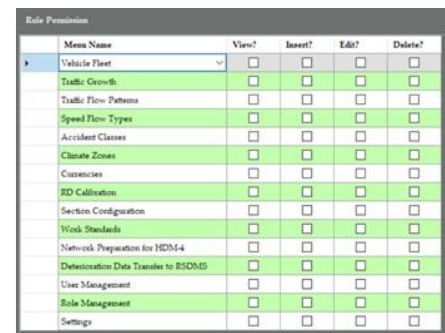


Figure-20. Interface for managing users' roles

#### Adding Role

Perform the following steps to add a role:

- Click "Add" button.
- A new row is created at the bottom of the Role List grid, and software will provide the name for role as "New Role". Change name of the role as appropriate.
- A new set of role permission comprises all the associated menus of the software will also be created where permission parameters will remain blank.
- Four types of permissions, e.g. view, insert, edit and delete, against each menu can be assigned.
- Click respective columns (view?, insert?, edit? and delete?) against each menu to manage permission.



To understand how it will work, considering Vehicle Fleet menu –

- if you uncheck all the permission columns, then the interface will not be accessible by the user to whom the role is assigned.
  - if you check only the view permission, then the interface will be accessible by the user to whom the role is assigned, while s/he can view the information, but cannot insert, update or delete any record.
  - if you check the view and edit permissions, then the interface will be accessible by the user to whom the role is assigned, while s/he can view and modify data, but cannot insert or delete any record.
  - if you check all the permission columns, then the interface will be accessible by the user to whom the role is assigned, while s/he can view, insert, modify and delete any record.
- When you have finished working, click "**Save**" button.

### Editing Role

- Select the Role from the role list (left hand side grid).
- Permission for the role to different menus is appeared in the right hand side grid.
- Update permissions according to your desire. You can mark the role inactive by unchecking the checkbox associated to the "IsActive" column. Users having inactive role could not able to log-in to the software.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

### Deleting Role

- Select the Role from the list.
- Click "**Delete**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the Role, or **No** to cancel the delete action.
- If you click **Yes**, the Role is no longer displayed in the list.

## 7.2. User Management

This feature provides facility for management of the system user. The interface allows you to create, modify or delete user for the system. A specific role to be assigned to the user, based on which access of the user to different interfaces of the software would be controlled. You may wish that one or more users will be responsible to preparation and modification of calibration and configuration related parameters while other users will perform data migration related activities. As such user management options are being facilitated by the interface.



## Viewing / editing / creating User

Click the "User Management" button from the switchboard or select the same from the menu. The interface for managing users of the software is appeared in the screen (see below).

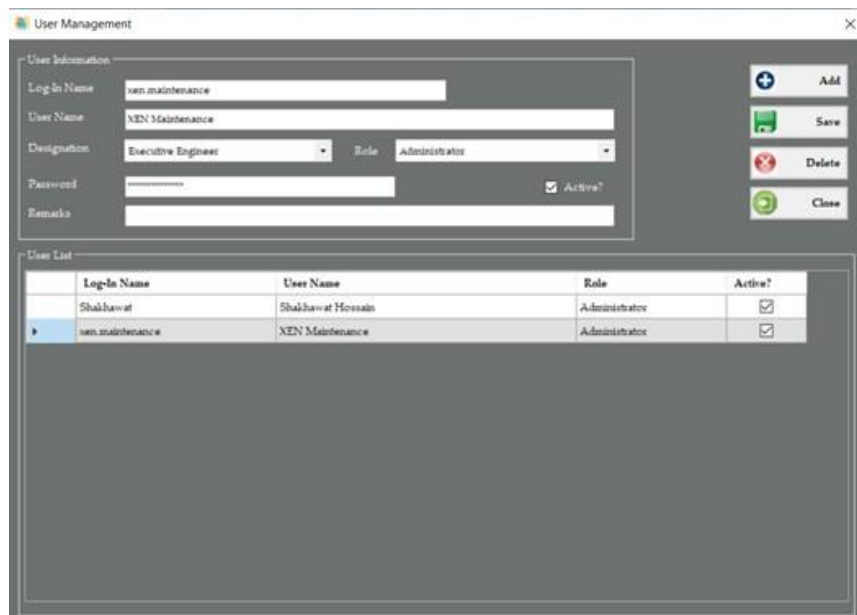


Figure-21. Interface for managing users of the system

## Adding User

Perform the following steps to add a role:

- Click "Add" button.
- A new row is created at the bottom of the User List grid, and software will provide the log-in name for user as "NewUser". Change log-in name of the user as appropriate.
- Input user name, select designation and role for the user from the associated drop-down. Input password for the user.
- The user will get access to the software according to the permission assigned to the selected role for the user.
- When you have finished working, click "Save" button.

## Editing Role

- Select the User from the user list.
- Information of the selected user is populated at the editable textboxes or drop-downs displayed within User Information group-box.
- Update credentials of the user as necessary. You can mark the user inactive by unchecking the checkbox associated to the "IsActive" column. Inactive users could not able to log-in to the software.
- When you have finished working, click "Save" button. If you do not click Save before closing the window, your changes will be lost.

## Deleting Role

- Select the User from the list.
- Click "**Delete**" button.
- The software will prompt with a confirmation message.
- Click **Yes** to delete the User, or **No** to cancel the delete action.
- If you click **Yes**, the User is no longer displayed in the list.

## 8. Settings

Settings option facilitates changing look and feel of the interfaces of the software, while it provides database management related basic functionalities.

### 8.1. General Settings

Select "Settings" from the menu. The interface is appeared in the screen (see below).

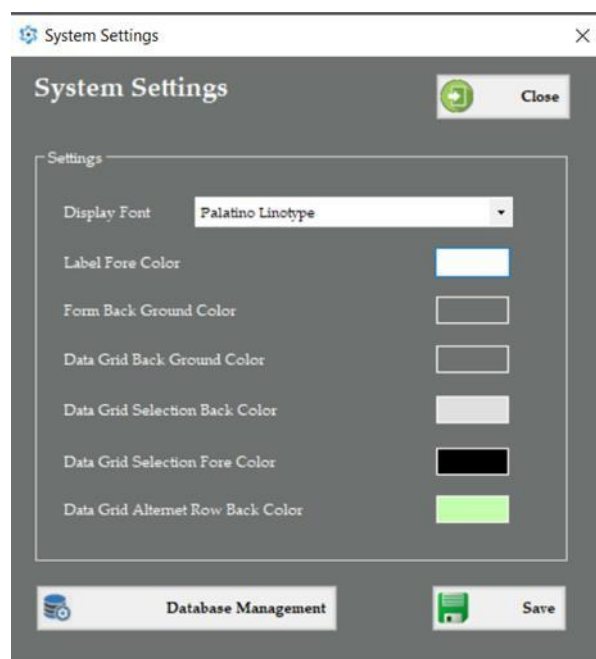


Figure-22. Interface for managing system settings

General settings feature facilitates changing name of the display font, background color of form/screen and different color related to grid. Do the followings make necessary changes:

- Select name of desired Font from the drop-down.
- To change color for different options, click the respective box. A color selection window is appeared. Choose your desired color, and click **OK**.
- When you have finished working, click "**Save**" button. If you do not click Save before closing the window, your changes will be lost.

## 8.2. Database Management

Select "Settings" from the menu, then click "Database Management" button. The interface is appeared in the screen (see below).

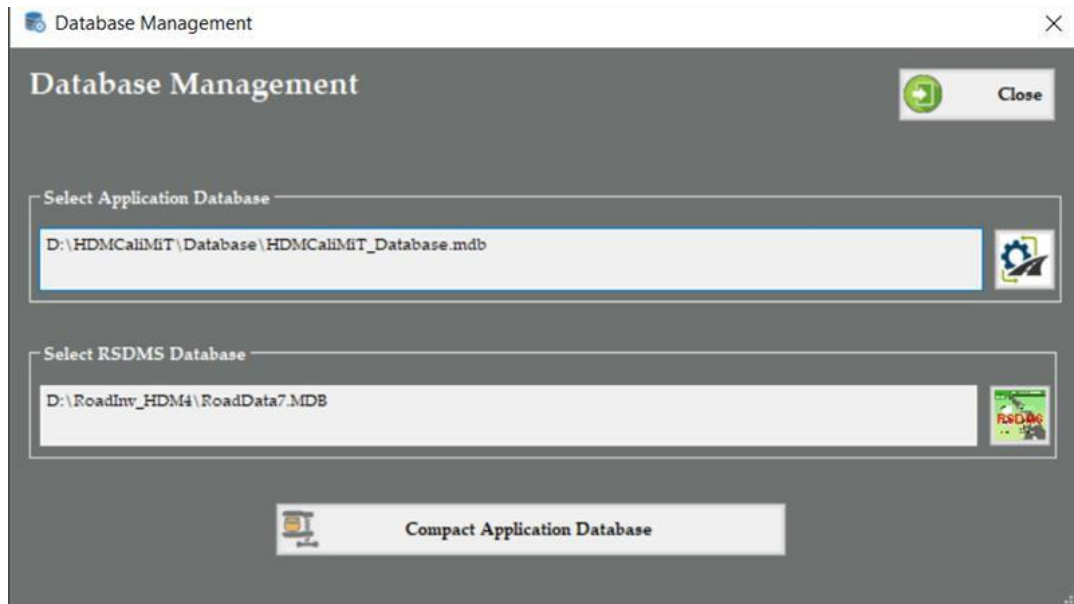



Figure-23. Interface for managing database

### Selecting Application Database

HDM CaliMiT has its own backend database where software related data is being stored. "HDMCalMiT\_Database.mdb" is the backend database of HDM CaliMiT, which will automatically be copied at "Database" sub-folder under the folder where the software is installed. Whilst running, it will prompt for providing location of the valid database if the software does not find the database in the given path, or if the database version varies from the software version. As such case it is required to select location of the database. You may also wish to maintain the database in different folder at your PC. This option facilitates relocating or changing the database location. Follow the below steps to change the database location:

- Click the  button;
- **Browse the folder** location of software backend database;
- Double-click the folder that contains the database;
- **Select the database** (HDMCalMiT\_Database.mdb) and click **Open**.

The software will perform validation to ensure correctness of the database, and will store the given location within its configuration file. At this stage, the software will notify you that a restart is required once the validation process is complete. Click **OK** to restart the software.

## Selecting RSDMS Database

Generally, RSDMS database (RoadData7.mdb) is located at C:\RoadInv, and the same path is automatically being selected by the software. It is not required to re-select the RSDMS database if it is available at its default location. However, the software provides facility to relocate if it resides at different location of your computer, or if you wish to connect the same from shared network location.

If you want to change the database location, then -

- Click the associated  button;
- **Browse the folder** location of RSDMS database;
- Double-click the folder that contains the database;
- **Select the database** (RoadData7.mdb) and click **Open**.

The software will perform validation to ensure correctness of RSDMS database, and will store the given location within its internal database. So, it is not required to select the database path every time if the same remain available in the given path.

## Compacting Application Database

Over the time, size of the backend database of HDM CaliMiT will be growing. Generally, it does not appears any major issue, however, it is recommended to compact the database at periodical interval so that performance of the software remain consistent. Just click "**Compact Application Database**" button to complete the task.

## 9. Viewing Software User Guide

The software user guide is available at "**User Guide**" sub-folder under the folder where the software is installed. The same can be viewed within the software interface as well.

Select "*Help*" from the menu, then select "*User Guide*". The software user guide is appeared in the screen, which can be read on screen or you may wish to take printout of the same.

