PRAMC – Karnataka Road Asset Management System

- The Karnataka Road Asset Management System (**KRAMS**) will function as the **cornerstone of the approach to managing public road assets** in Karnataka.
- It is used as a **scientific tool for the planning, programming, budgeting and management** of the state road network that is owned and managed by PWD, Government of Karnataka.
- It comprises various **computerised decision support systems** that take into account **asset life cycles** as well as other **social and environmental factors**.
- KRAMS will **assist policy makers to make technical and budgetary decisions** on the basis of sound and transparent engineering, economic and financial information and analyses.
- KRAMS is a **comprehensive and integrated software application** (COTS, RIS-PWD, HDM-4, and TMT) designed to assist PRAMC in providing enhanced and streamlined management of roads under its jurisdiction
- This tool will assist PWP & IWTD to **utilise public funds more effectively and efficiently**, while maintaining the road network at acceptable levels of service.

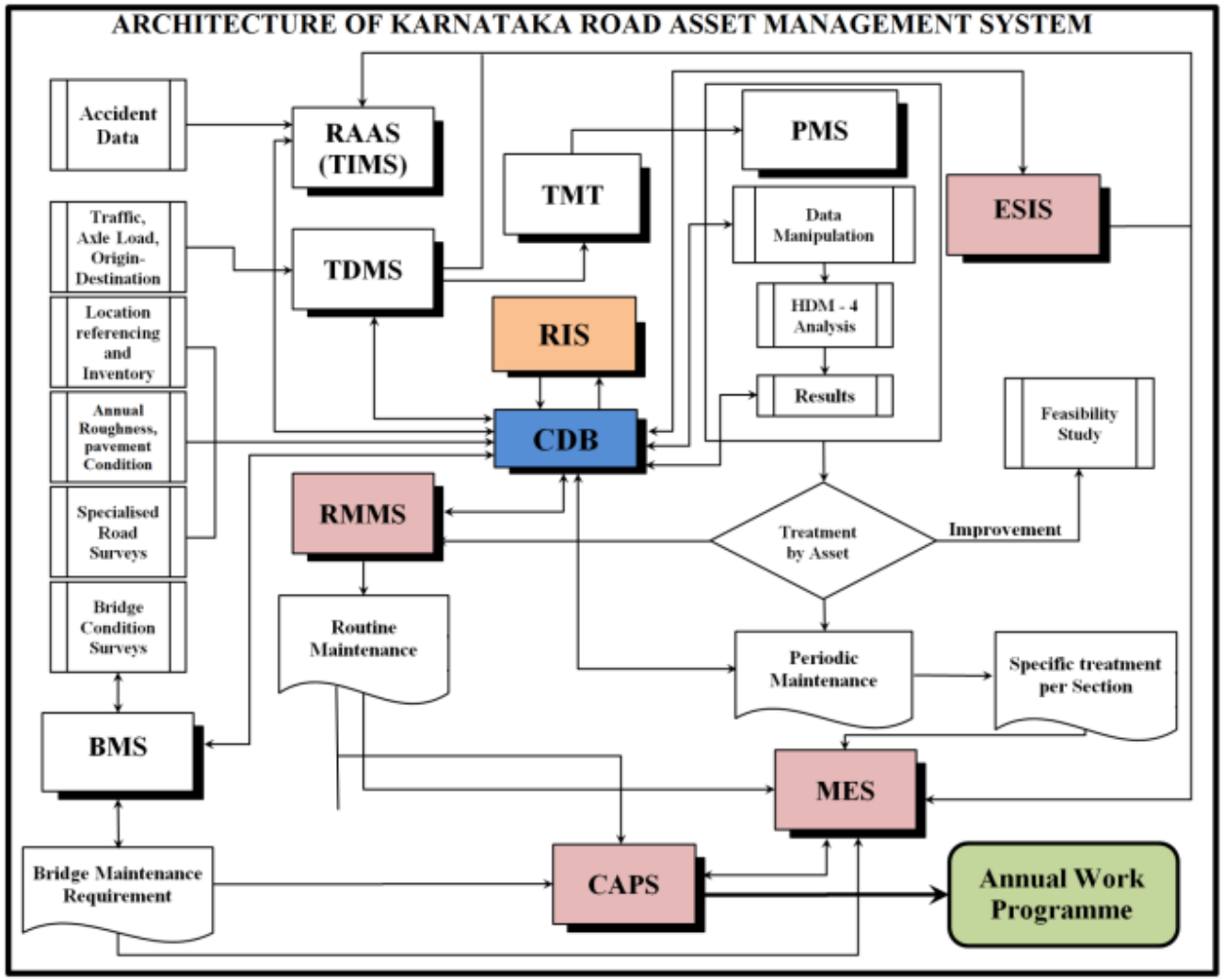
PRAMC – Karnataka Road Asset Management System

Features of KRAMS

- KRAMS is a commercial-of-the-shelf (COTS) software being **customized to suit the needs of the PRAMC**.
- A **Data Driven Scientific Process** of Maintaining, Operating and upgrading the assets at the accepted levels of service under budgetary constraints
- Data collected and made available through this system is **useful for the stakeholders responsible for road development and maintenance**, stakeholders, as well road users
- Assists in **identifying the investment options** with greatest returns
- **Centralized information repository** and relevant information readily accessible.
- **Robust Source** of readily accessible, relevant and valid data
- Comprises of **various computerised decision support systems**.
- Supports **decision making processes taking account of the assets life cycles, economic, social and environmental factors** within a rational framework, and with greater involvement and acceptance of all stakeholders.

PRAMC – Karnataka Road Asset Management System

KRAMS System Architecture



PRAMC – Karnataka Road Asset Management System

Modules in KRAMS

- In accordance with international best practice, the system architecture is based on a proven, **Commercial Off – the – Shelf (COTS) asset management system that is integrated with the RIS**
- **9 Modules** are developed under KRAMS with **CDB (Central Data Base)** as the Central Repository for non-spatial attribute data & RIS for GIS based spatial data
  - **P**avement **M**anagement **S**ystem (PMS)
  - **B**ridge **M**anagement **S**ystem (BMS)
  - **T**raffic **D**ata **M**anagement **S**ystem (TDMS)
  - **T**raffic **I**ncident **M**anagement **S**ystem (TIMS)
  - **R**outine **M**aintenance **M**anagement **S**ystem (RMMS)
  - **M**onitoring and **E**valuation **S**ystem (MES)
  - **E**nvironmental and **S**ocial **I**nformation **S**ystem (ESIS)
  - **C**ross **A**sset **P**rioritization **S**ystem (CAPS)
  - Administrative Module
- KRAMS is **configured to interact** with the **Arc GIS, HDM-4** and **TRANSCAD** software externally

PRAMC – Karnataka Road Asset Management System

Overall process of Modules in KRAMS

- In accordance with international best practice, the sub-modules in the KRAMS have been **developed to suit the KPWD needs**.
- All the Modules have a same set of top menu for **easy accesses use by the user**.
- Each sub-system has the **top menu** with following options
  - **List** – These will have the predefined parameters of different elements for each module.
  - **Setup** – The various condition parameters, Unit rates are defined.
  - **Import** – The processed / validated data of different parameters related Traffic / Road / Bridge etc. in the predefined standard input templates are loaded.
  - **Tools** - to Commit, Flag, publish and freeze / finalise the latest data to be taken for the analysis, we can select the latest available data for analysis.
  - **Proc** - Process the loaded data to get the condition / cost / BCI etc.
  - **Edit** – Edit minor details, load additional details such as Photos, videos, documents etc..
  - **View** – View the processed data of the respective modules
  - **Report** – Generating various reports as required.

PRAMC – Karnataka Road Asset Management System

Home Screen of KRAMS

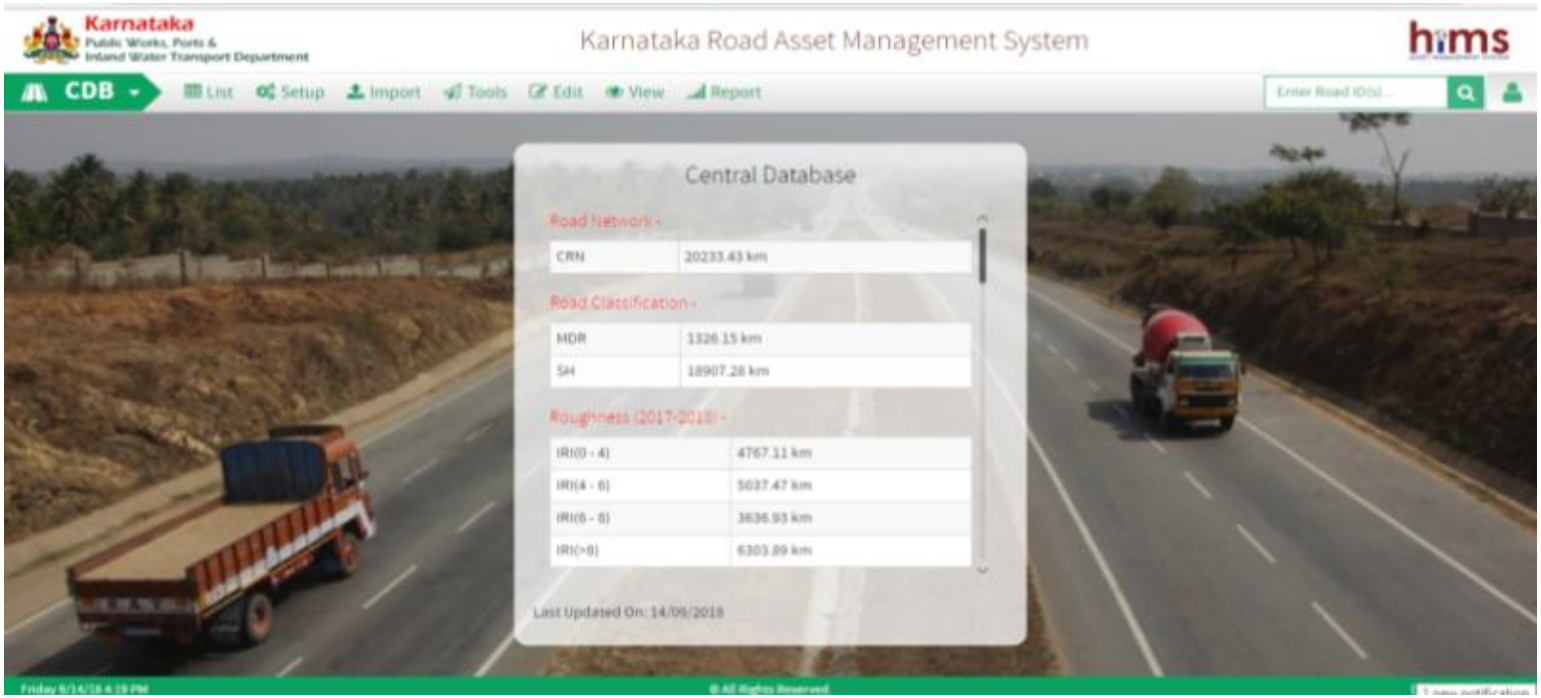
PRAMC – Karnataka Road Asset Management System

Central Data Base - CDB

- It acts as **central repository for all road related data** for KRAMS
- Contains
  - Data collected using equipment such as
    - ROMDAS – Road Measurement and Data Acquisition System
    - FWD – Falling Weight Deflectometer
    - GPR – Ground Penetrating Radar
  - Road History from RIS (Road Information System)
  - Committed projects data

PRAMC – Karnataka Road Asset Management System

Central Data Base - CDB



- Ability to load / import RIS data (Road Inventory, Condition, Pavement Strength, Pavement Composition, Geometry etc.)
- Manage (View, Edit) RIS data (Road Inventory, Condition, Pavement Strength, Pavement Composition, Geometry etc.)
- Ability to commit, flag most recent and publish data.
- To facilitate **required data for PMS analysis**.

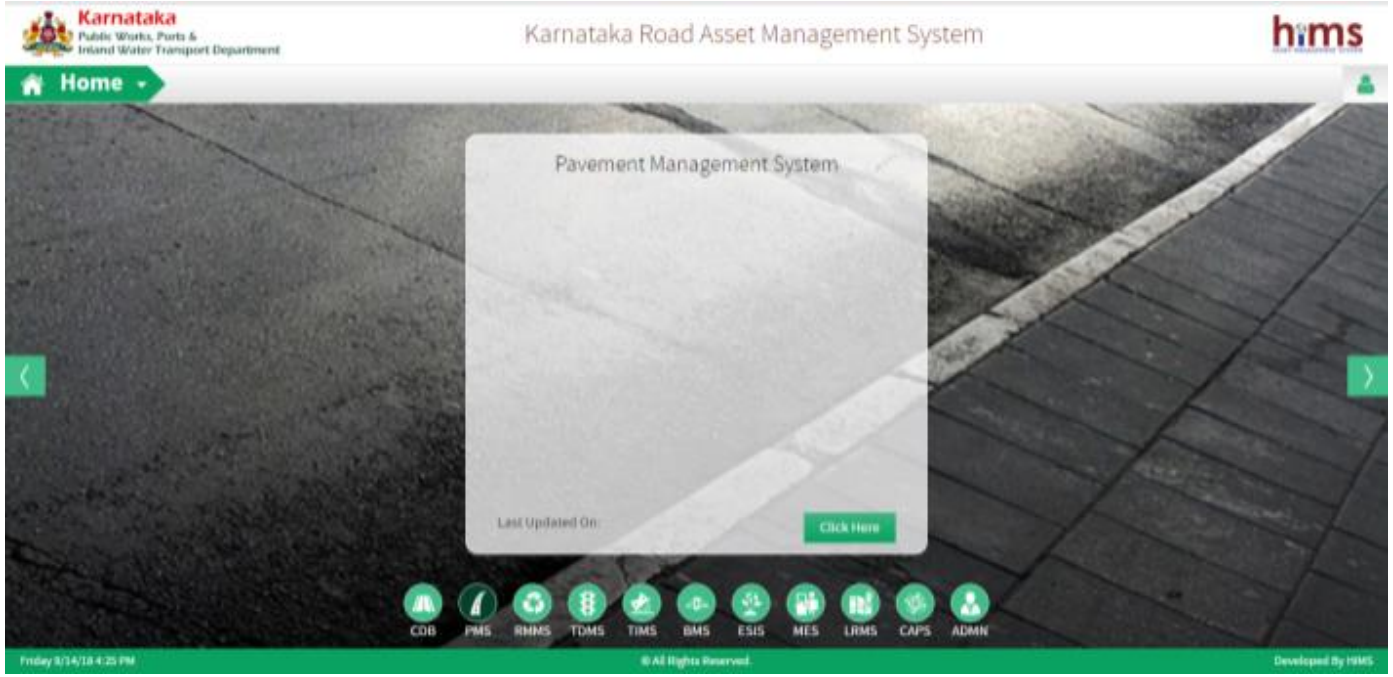
PRAMC – Karnataka Road Asset Management System

Pavement Management System - PMS

- PMS is a tool used for **planning, programming, budgeting and management of the state road network.**
- **The function of PMS** is to **predict the pavement condition and the cost associated with its maintenance and rehabilitation** over a given time frame, and aid in the planning and programming of works.
- **Management of road network needs** in terms of road improvement / Maintenance.
- **Management of periodic and capital road work activities**, such as widening, reconstruction and strengthening.
- Uses **HDM-4 and decision tree based approach.**
- Facilitates in generating **multi-year rolling works programme under budget constraints.**
- Generate various **reports for annual works programme**

PRAMC – Karnataka Road Asset Management System

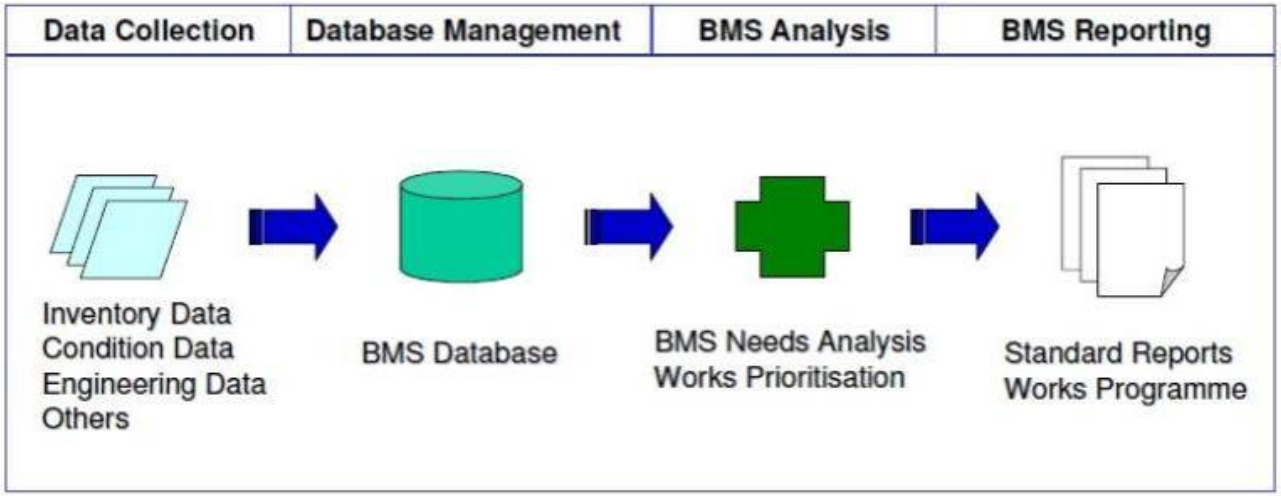
Pavement Management System - PMS



- PMS generates **automatic homogeneous sections** using factors such as condition, inventory and traffic.
- PMS **generates road network file** for analysis in HDM4 to generate work program.
- PMS is used to perform various type of **analysis such as Strategy / Programme / Project analysis**
- Integrated process, to **export input files to HDM-4** and to **bring back HDM-4 output files into PMS**

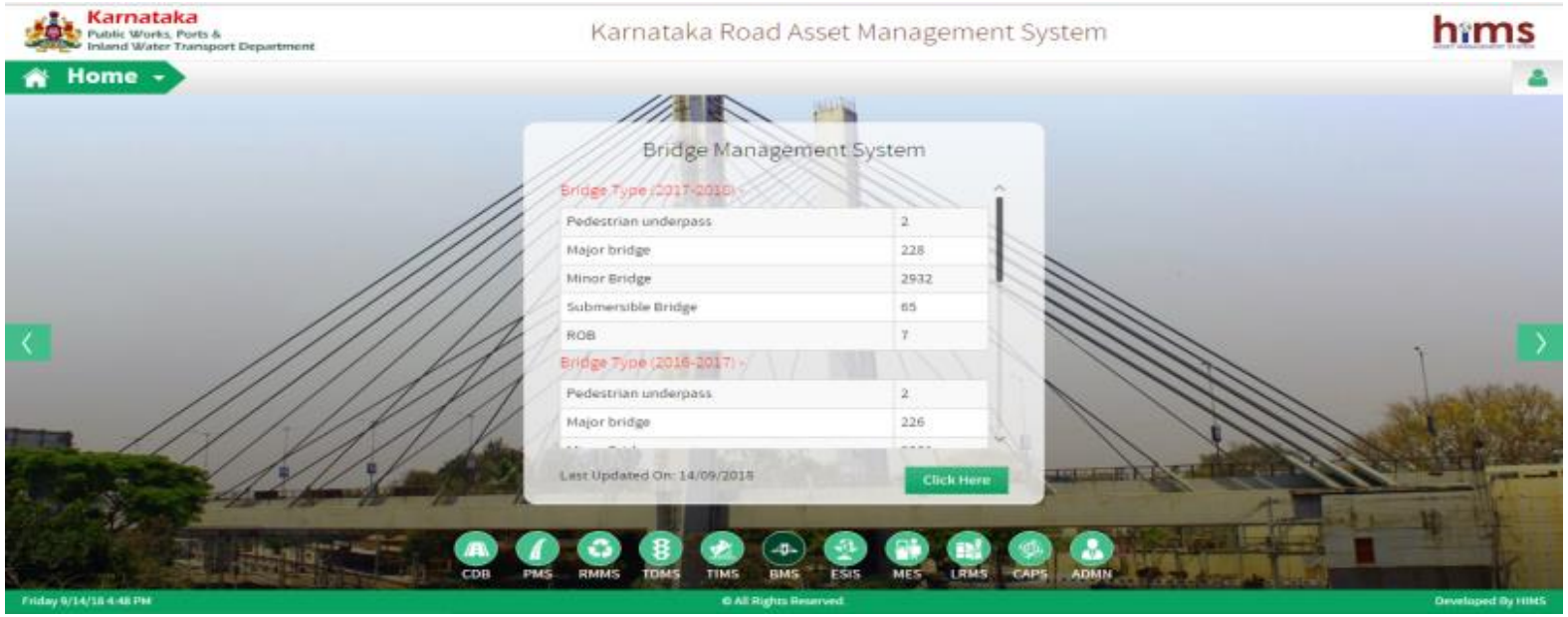
Bridge Management System - BMS

- The BMS will be used to store inventory data, analyse and **prioritise for Minor and Major Bridges and other structures** from information collected through routine and special inspections.
- These will be used in arriving the in order to arrive at an **overall Bridge Condition Index (BCI).** The BCI will be the basis for **prioritising bridge maintenance interventions and repair works** taking into account safety and urgency.
- **The overall BMS planning process** generally includes
  - Data Collection
  - Database Management
  - BMS Analysis
  - BMS Reporting



PRAMC – Karnataka Road Asset Management System

Bridge Management System - BMS



- **Prioritisation of bridge works** based **on overall condition rating / condition index** and planning, preparation of work programs.
- Features for **scheduling the inspection programs** and tracking bridge inspections
- Estimate the **Asset value** of structures
- **Generate various reports** on Detailed / summarised bridge inventory, inspection data of selected bridges in a sub-division / division / circle / headquarters or by road.
- **Generate reports on annual maintenance / improvement requirements** of the bridges by road / sub-division / division / Circle / Head Quarters

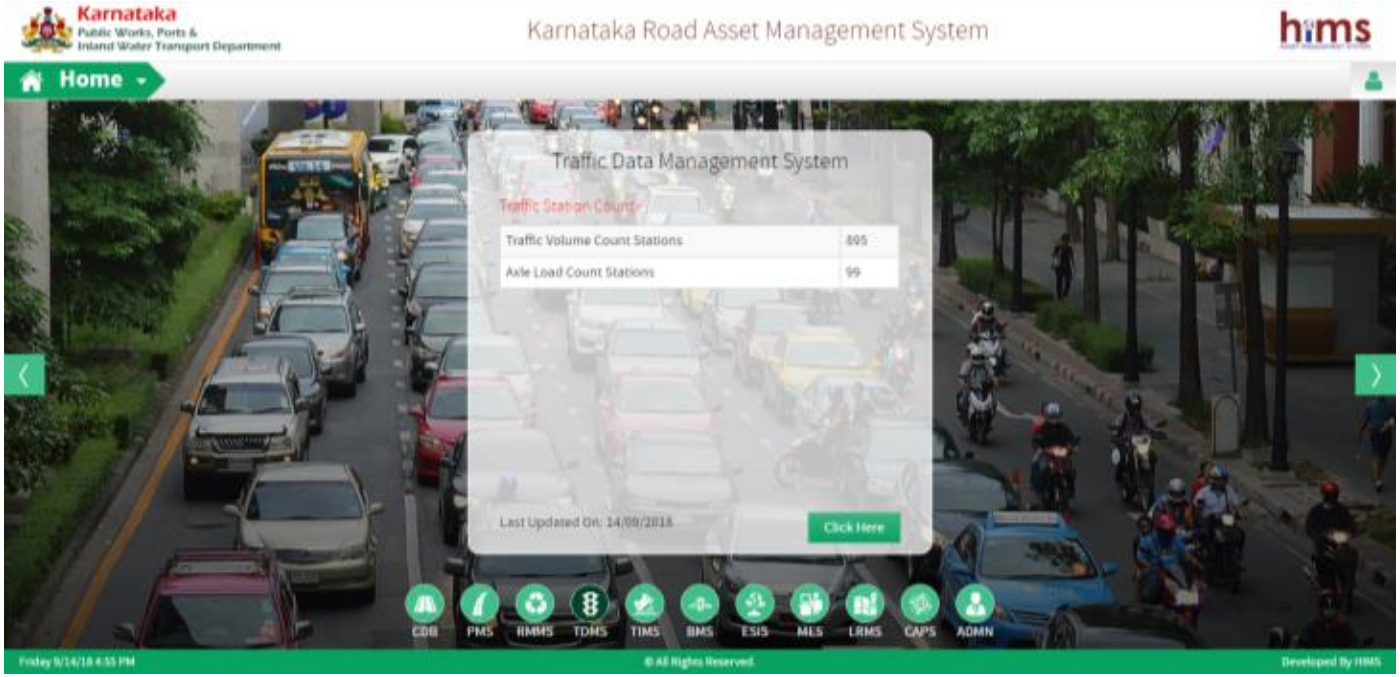
PRAMC – Karnataka Road Asset Management System

Traffic Data Management System - TDMS

- Store, process, analyse and report various **types of traffic data** or information.
- Generate **ADT, AADT, PCU data** for the road network
- Generate traffic **related outputs required by HDM-4** (PCU and PCSE)
- Able to estimate the traffic levels for the road links which don't have traffic count stations
- Able to generate **growth rates** based on different traffic projection methods
- Provide **input data for TMT**
- Data of **7-day** (PWD) & **2-day** (PWD) **classified traffic counts** and classified traffic counts from other surveys – various time intervals and directional (15 minute, 30 minute, 60 minute etc.)
- Data related to **Vehicle fleet characteristics** - collected from secondary sources which will be used in economic analysis
- **Axle load** survey data, **O-D survey** data

PRAMC – Karnataka Road Asset Management System

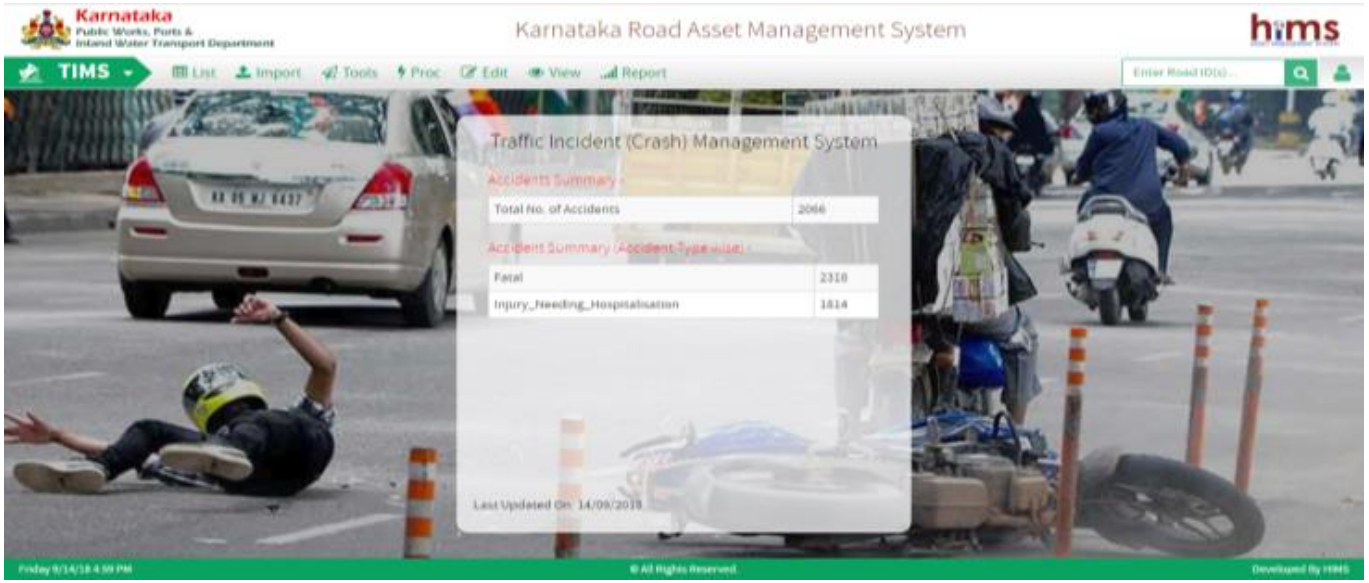
Traffic Data Management System - TDMS



- Able to store other supporting data like **seasonal correction factor, monthly fuel consumption, vehicle fleet registration** and **willingness to pay survey data**
- Has features for internal checking, flagging latest data, inconsistencies, and identifying abnormalities in the data
- To produce **various reports like Traffic volume** and **flow characteristics; average daily traffic** etc.

PRAMC – Karnataka Road Asset Management System

Traffic Incident Management System - TIMS



- Traffic Incident Management System (TIMS) is a module where the **accident analysis on the network are analysed** and ensure that that the **improvement in terms of engineering is carried out to make travel safe.**
- To identify appropriate **optimised improvement** of the link / junction and ensure the **numbers of incidents are reduced** at the network level.
- Identify the **Black spots** for analysis.
- Configured as per **MORTH guidelines for Black spot (IRC-53 2012).**

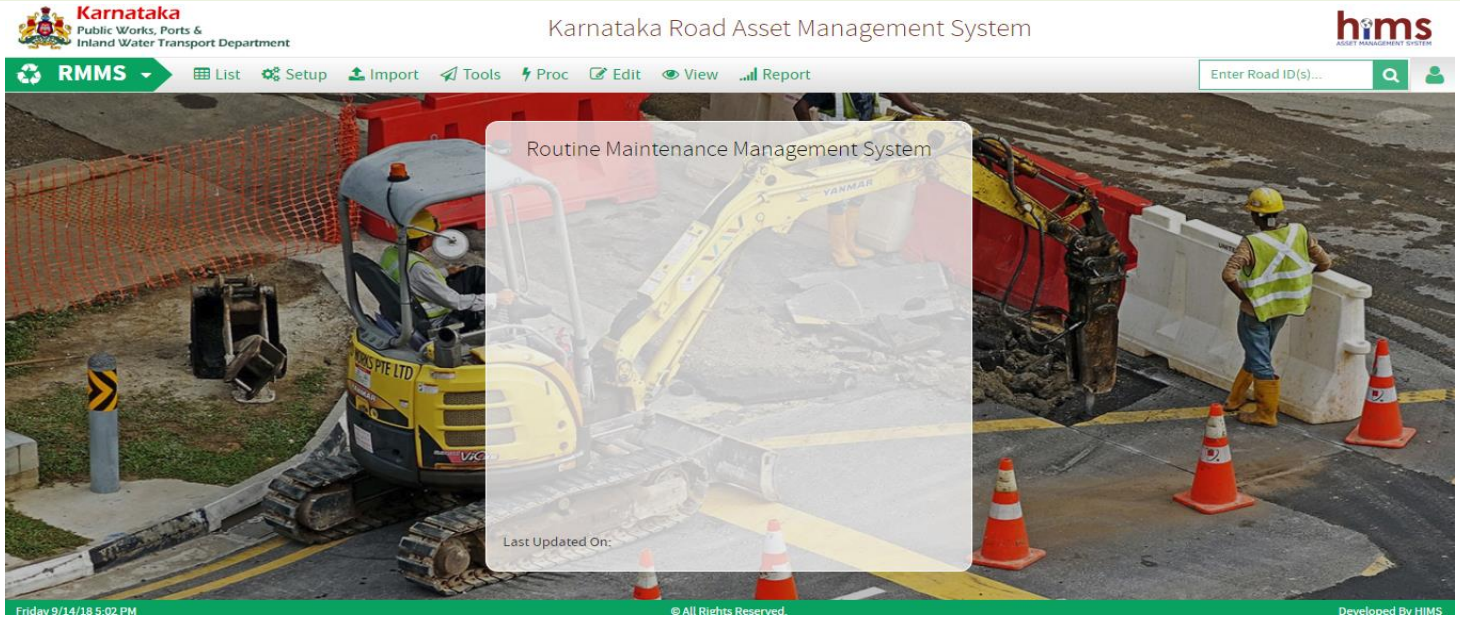
PRAMC – Karnataka Road Asset Management System

Routine Maintenance Management System (RMMS)

- RMMS is used to determine **routine maintenance requirements** of the road network
- RMMS deals with assets such as shoulders, cross drains, road furniture, road marking, side drains, vegetation clearance.
- Assess **actual need for the main activities of routine maintenance** along network pre and post monsoon and prioritize road sections accordingly;
- Perform work according to **priority within available budget** and report main output and resource consumption per road section
- RMMS is used to **generate annual maintenance plan** using various maintenance reports by activity and cost
- RMMS will have **GIS interface** for performing any activity in the software, it will a base for selection of Road / Link / Section, Districts etc.
- Data from CDB is also referred for some of the Input for RMMS.

PRAMC – Karnataka Road Asset Management System

Routine Maintenance Management System (RMMS)



- RMMS un-constraint output will be **utilised in CAPS for cross assets / routine maintenance prioritization** based on budget constraint and various other parameters.
- Condition data will be imported / entered / edited using RMMS interface
- Other Module Data Integration – Location referencing, road inventory, traffic data, project information, accident data shall be gathered into RMMS from other respective modules of KRAMS.
- The work order, reporting and **work monitoring of RMMS activities** will be **handled by MES module.**

PRAMC – Karnataka Road Asset Management System

Monitoring and Evaluation System (MES)

- MES will integrate with **existing PWD Progress Monitoring System (Pr.MS)**
- All required data will be accessed from the existing Progress Monitoring System
- MES will provide **input data to the PMS** in terms of roads under construction / maintenance / maintenance likely to initiated.
- MES will **enable monitoring in terms of project progress, status**
- MES will enable evaluation of performance indicators in terms of improvement in network condition, reduction in accidents etc**.**

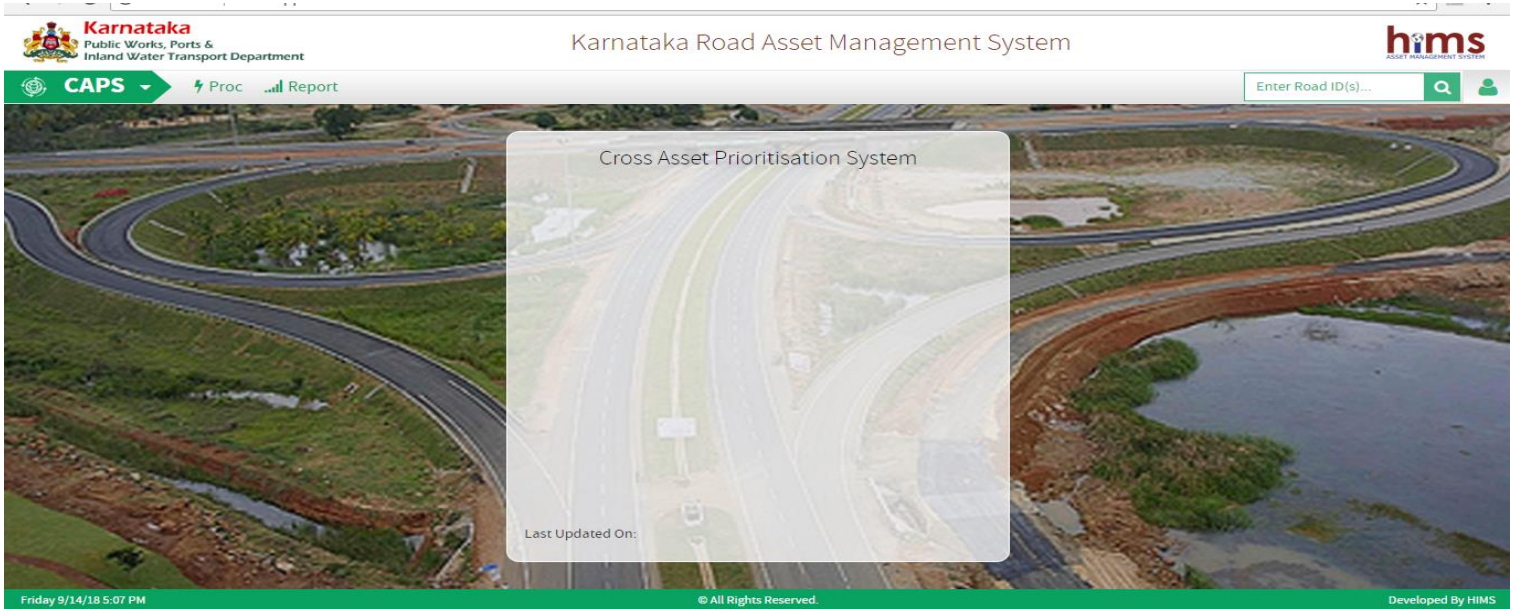
PRAMC – Karnataka Road Asset Management System

Environmental and Social Information System (ESIS)

- ESIS will provide an **assessment of the social and environmental impact** criteria which are critical to the development and management of the road asset.
- Levels of importance for each criteria or group of criteria are established and these will be **assessed in relation to road network** or project development.
- Stores the **environment and social information data** and processed for roads
- Used for **decision-making** to plan and implement the improvement, up-gradation & maintenance of roads
- Will **outline the environment & social impacts expected** from road asset management
- Store **Roadside social features**, habitation along the road alignment, Water bodies, religious structures etc.
- Facilitate **required reports for various environmental and social parameters** and reports related environmental clearances.
- Reports on **Road User Satisfaction Survey (RUSS)**

PRAMC – Karnataka Road Asset Management System

Cross Asset Prioritization System (CAPS)

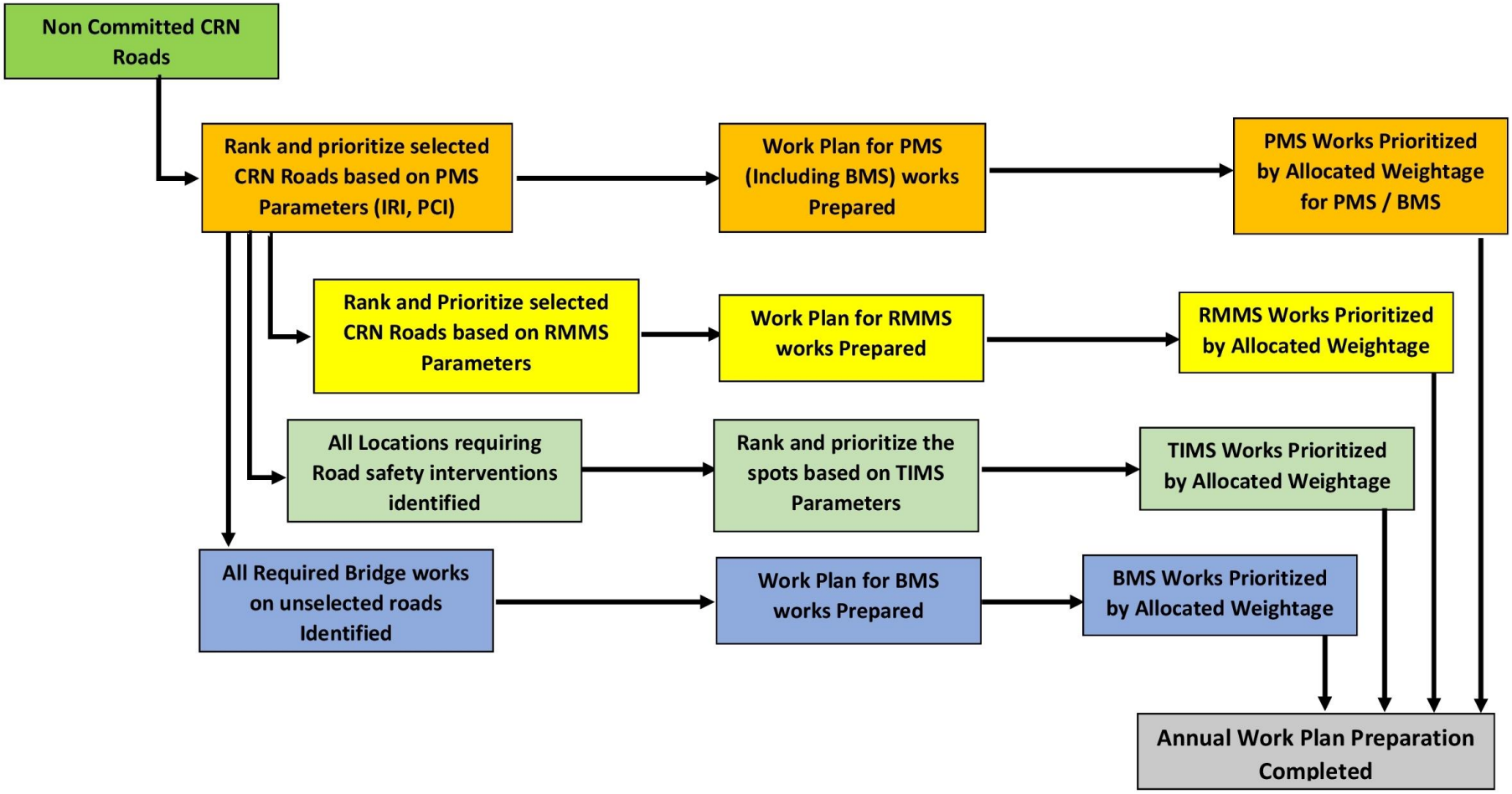


- CAPS will use **a multi-objective analysis technique** that allows trade-off between multiple criteria
- CAPS is used for **prioritisation of assets** (pavements, structures, road safety and routine maintenance) to **finalise overall annual programme**
- CAPS will have **provision to provide weightages to various assets**
- CAPS enables the user to change the parameters and adjust the work programme
- Generates various **reports based on prioritised work programme**

PRAMC – Karnataka Road Asset Management System

Cross Asset Prioritization System (CAPS)

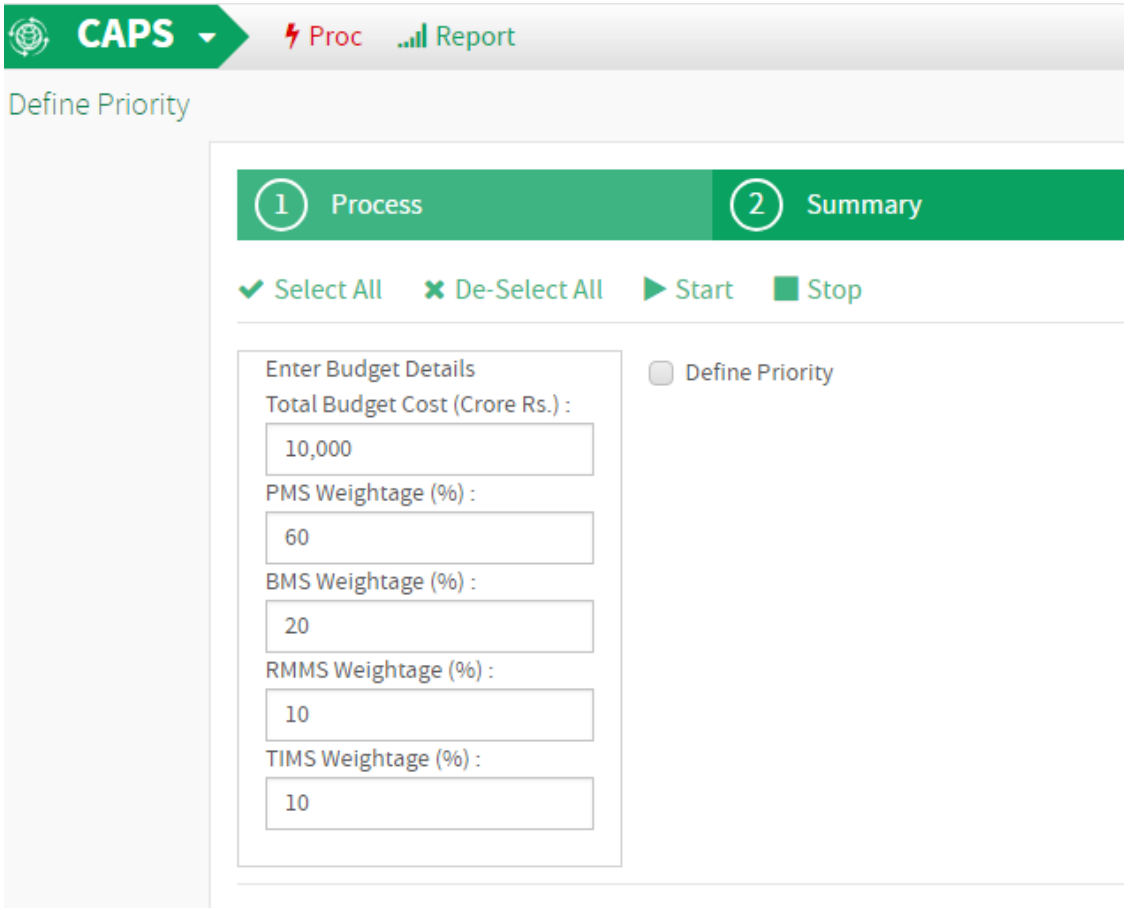
CAPS Work Flow



PRAMC – Karnataka Road Asset Management System

Cross Asset Prioritization System (CAPS)

- The **AWP is generated for the following Scenarios in the HDM4 process**
  - **Unconstrained** Budget
  - **10% Increase** on **Overall Budget of PWD**
  - **10%** Incremental Budget
  - **15%** Incremental Budget
  - **20%** Incremental Budget
  - **25%** Incremental Budget
- Ability to allow the user to **define weightages** for automatic generation of prioritised list
- Ability to **combine different works programmes** into one comprehensive programme



PRAMC – Information Technology Unit

PRAMC Data Centre

- Established with **world class servers and network equipment** to support PRAMC's IT needs.
- Has **huge storage space** to manage Road Asset data such as Videos, Images, Large size data files, Engineering drawings, GIS Maps.
- Road **Assets Data collected are processed** in PRAMC; hence the data such as Inventory & Condition data of Roads / Bridges, Traffic data, Social and Environmental Data, Project / Work Data will be **managed centrally in PRAMC and is one stop source for such information**.
- KRAMS is hosted and the data from various surveys are loaded into the server for further analysis.
- **KRAMS is an integrated Application** / solution with RAMS, HDM-4, Trans CAD, ArcGIS and other tools is implemented to envisage the centralization of Data Collection and Processing.
- It is empowered with **high bandwidth secured internet connections** and thereby providing access to all the stake holders.