सत्यमेव जयते

आरम्भ

ग्रामीण सड़कों के नियमित रख-रखाव हेतु मोबाइल एवं वेब आधारित सड़क इन्वेंटरी, कंडीशन सर्वेक्षण, निगरानी एवं प्रबंधन प्रणाली

AARAMBH

A Mobile App & Web Based Road Inventory, Condition Data Capturing, Routine Maintenance Management & Monitoring System for Rural Roads

नियमित रख रखाव - बेहतर सड़कें

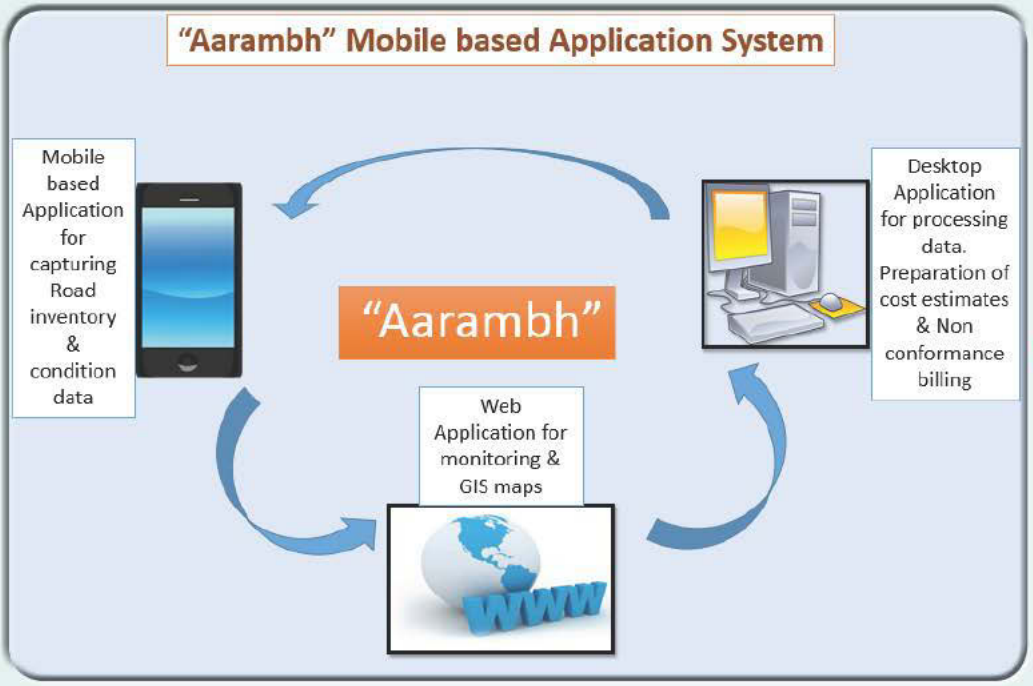
Better Roads by Preventive Maintenance

July 2017

MOBILE PHONE APP BASED SYSTEM FOR IMPLEMENTATION OF PERFORMANCE BASED MAINTENANCE CONTRACTS (PBMC) AND COMMUNITY CONTRACTING ON RURAL ROADS

Continuously increasing size of Rural Road networks and its maintenance is a growing challenge before the states. ILO in collaboration with the NRRDA is piloting simple routine maintenance systems using Performance Based Maintenance Contracting and Community Participation in 16 states to install sustainable and institutionalized preventive maintenance system on rural roads.

For establishing any kind of such system in place, an updated road inventory and road condition data are pre-requisite for any maintenance initiative. Many states in the country have road inventories in place but some states are still in the process of preparing road inventories and the relevant data base. Similarly, before awarding any road maintenance contracts, the road condition data has to be captured in an efficient manner so that a realistic estimate can be prepared for effective maintenance and monitoring of a rural road. Further this data needs to be processed for preparing Detailed Project Reports (DPR).



Presently, the road condition data is captured on paper formats by the field engineers and compiling and processing the data is a cumbersome process. When we talk about large road networks, the volume of the paper work increases multiple times which may lead to errors and anomalies in the data. To simplify the process for accurate & efficient data collection & processing, a Mobile & Web based application System ***"Aarambh"*** has been developed. The system consist of 4 sub-systems/applications;

1. Mobile based 'APP' for Road Inventory & Condition Data Capturing

2. Desktop Application for Processing Road Condition Data, Preparation of PBMC and Community Contracting Estimates, Monthly Payment Certificates

3. Web Application for Monitoring & GIS Mapping

4. Mobile 'App' for Road Inspection and Registering of Non Conformance

System Requirement for "Aarambh"

For Mobile Application: Touch Screen Mobile Phone /Tablet with ANDRIOD Operating System having facility of GPS, Internet Access

For Desktop Application: Windows Operating System & Internet Access

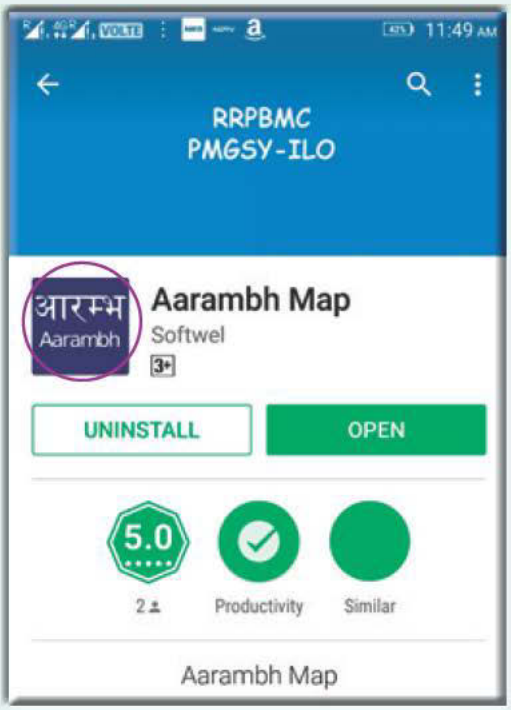
1. "AARAMBH MAP" THE MOBILE APP FOR ROAD INVENTORY & CONDITION DATA CAPTURING

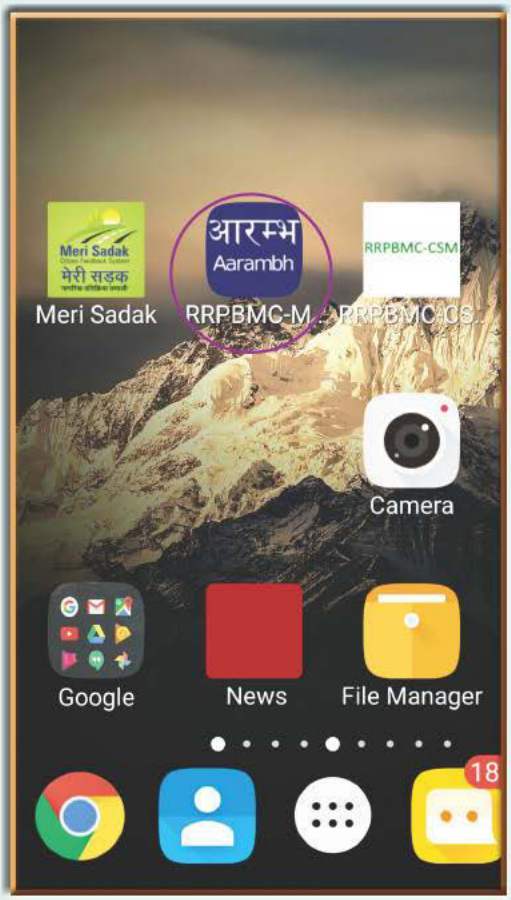
It is a smartphone based application using 'ANDRIOD' Platform which also make use of GPS technology. With the advantages of reduced chaining, data recording & data processing, this application can prove to be useful in simplifying preparation of Road Inventory & carrying out Road Condition Survey.

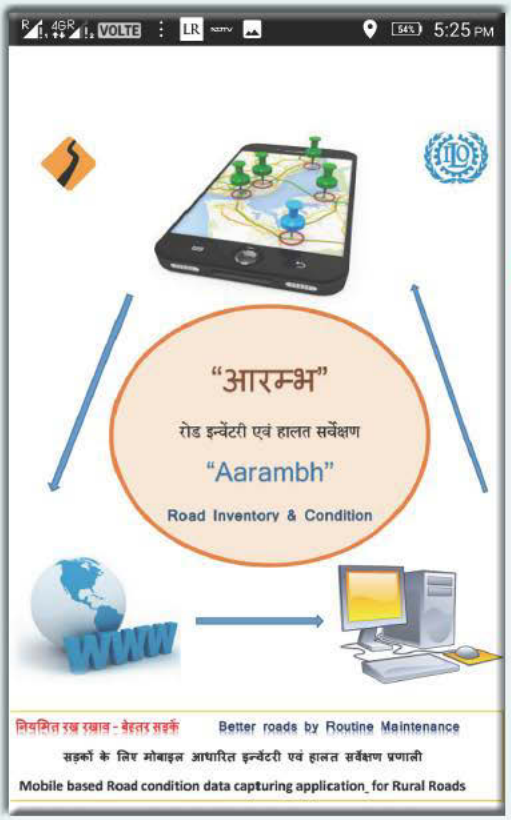
The 'App' can be used in following steps:

Downloading "AARAMBH"

1. Download the APP "Aarambh MAP" from "Google play store". It is a free App
2. Install the application

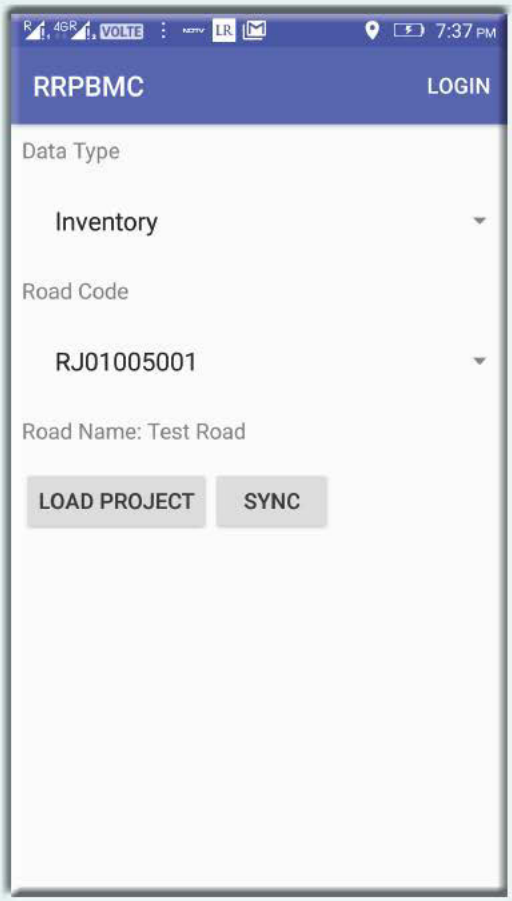


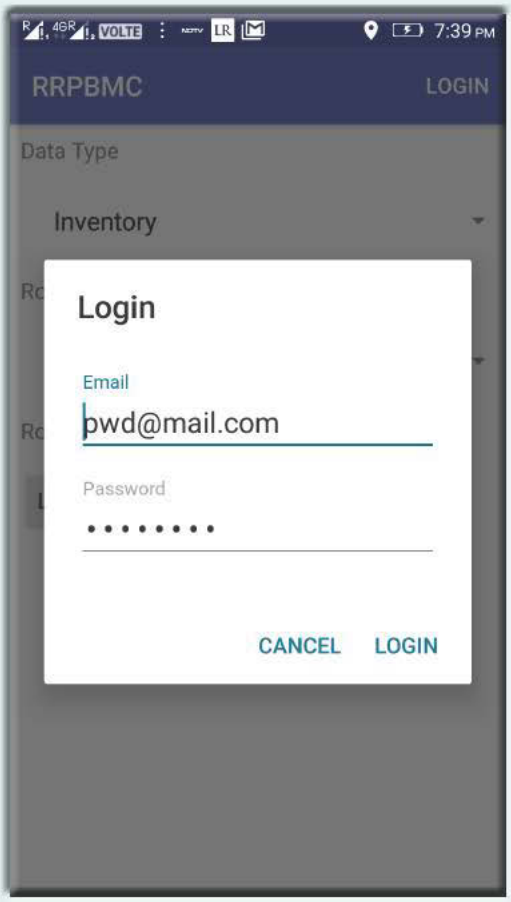




Run App

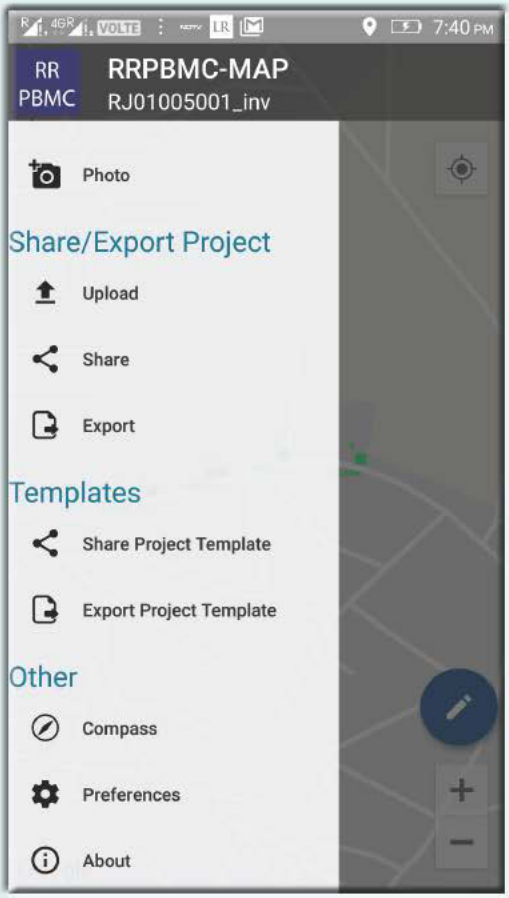
Login by putting Email id & password (To be provided by System Administrator)

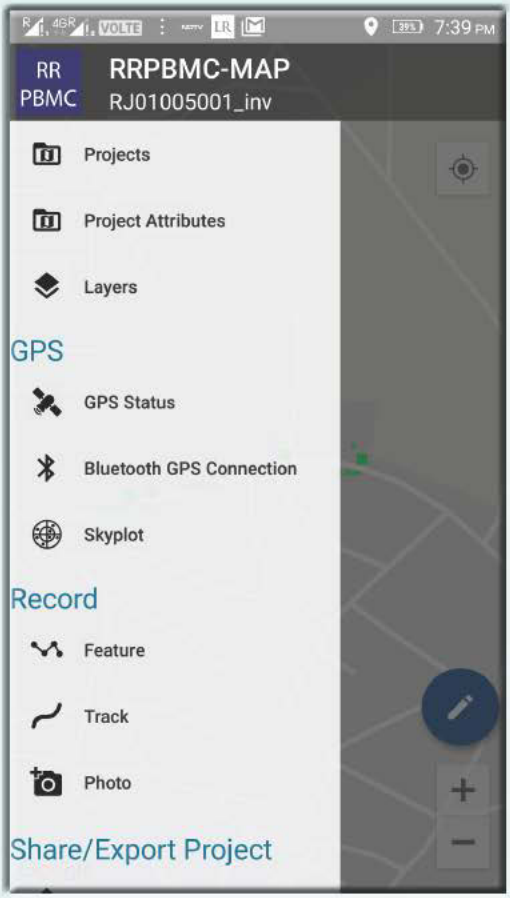




After login, the user will be able to access the Menu. Just slide Finger from Left to Road, the Menu Drawer will appear. It gives the facility to user to select features like New Project for data collection, switching on different layers, GPS settings, record attributes, exporting of files, templates and Compass etc. (Ref. Figures)

- **Project:** This menu opens project list
- **Project Attribute:** This menu opens project attribute.
- **Layers:** This menu opens Layer option (user can select background map and ON/OFF the layers)
- **GPS Status:** Show the Type of GPS and its status
- **Bluetooth GPS connection:** It allow user to connect External GPS for better accuracy.
- **Sky plot:** It diagrammatically shows the connected satellite with mobile.
- **Feature:** to start Condition survey
- **Track:** To start alignment recording
- **Photo:** click a photo graph with current location detail
- **Upload:** Upload the project file to the server
- **Share:** To share project file, kmz file or Shape file using sharing option existing in mobile.
- **Export:** To export project file, kmz file or Shape file to internal memory.
- **Compass:** View compass
- **Preferences:** Set option for the track ,inventory or condition survey data





1.1 For Capturing Road Inventory

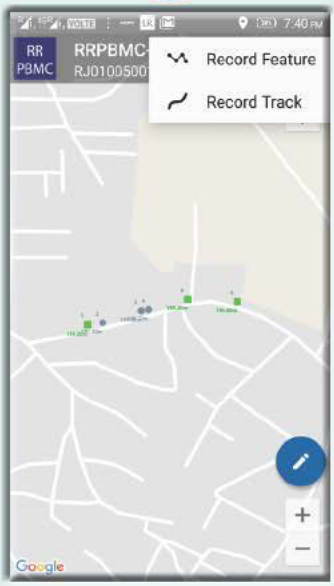
1. **Select data Type:** Select Inventory in drop menu

2. **Select Road Code:** (If the state already has a Road list with road code available) Just link it through separate Desktop application which can be uploaded in server and Tap "Sync". The road list will automatically be available in APP). For uniformity we can import list from OMMAS in Excel format and link with application

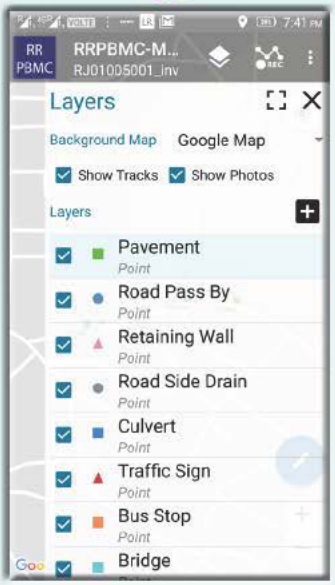
3. **Tap: Load Project**

The Road Inventory Screen will appear.

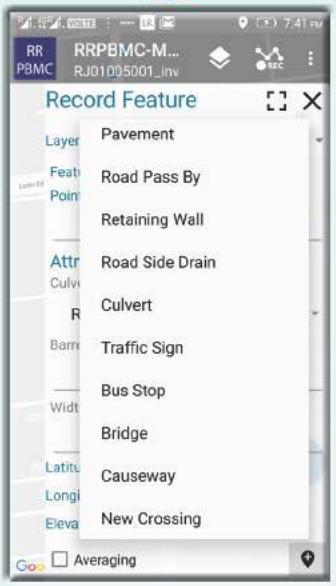
Tick -on the layers



Set Record features



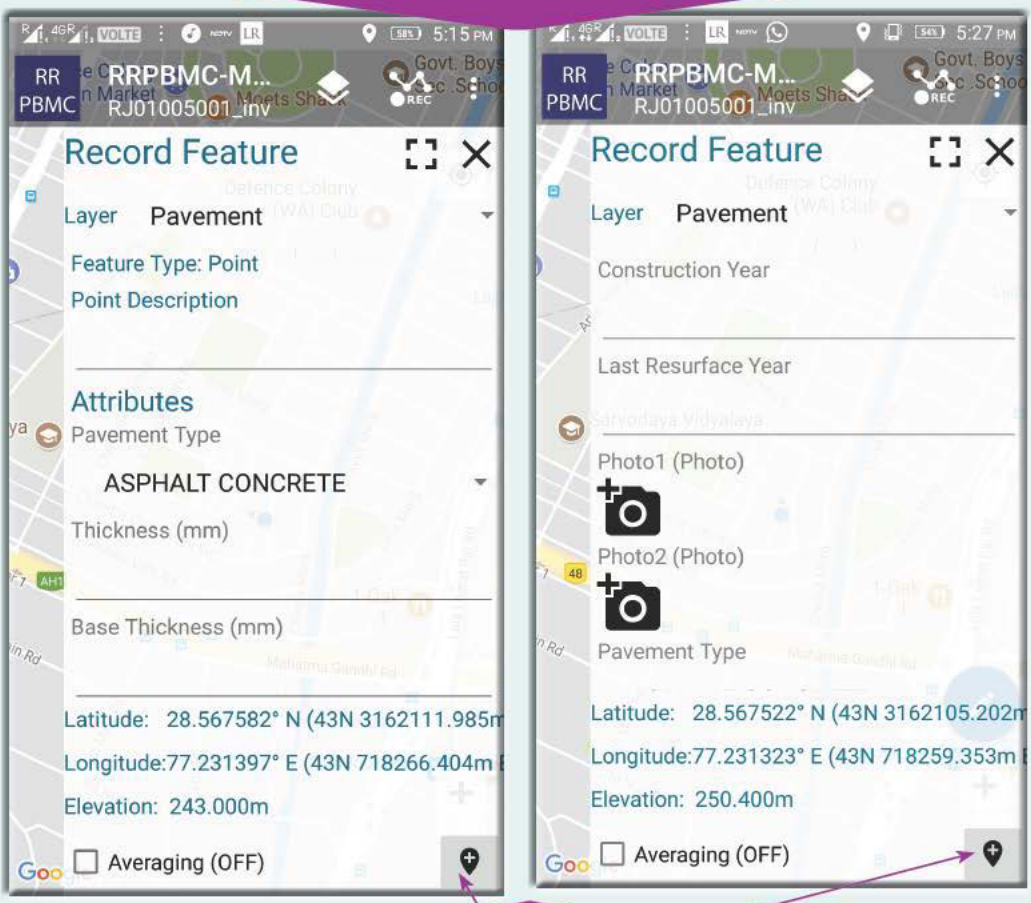
Select the attribute you want to record



Start walking on the road. Select item from above drop-list, the feature you want to record i.e. Pavement, Retaining wall, Culvert or Bridge.

Example: Pavement

- **Select pavement type, thickness, base & sub base, construction year, shoulders, construction year, last surface year etc.**
- **Can click two photographs of features also**



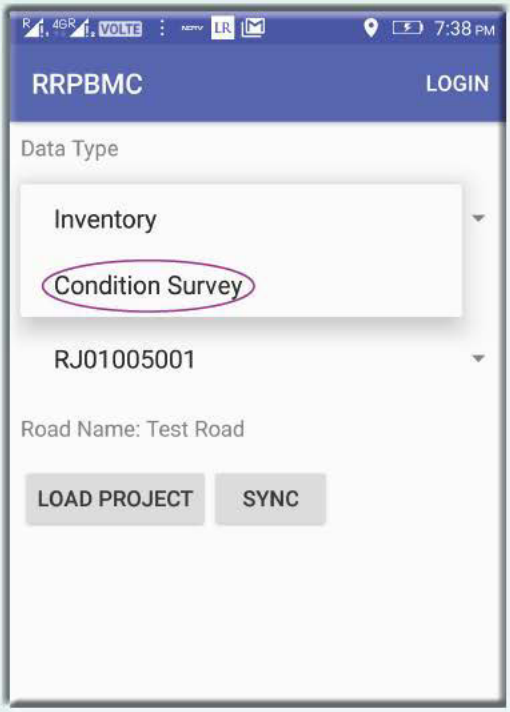
After capturing data, do not forget to click location icon. The GPS tag of attribute will be added to photographs

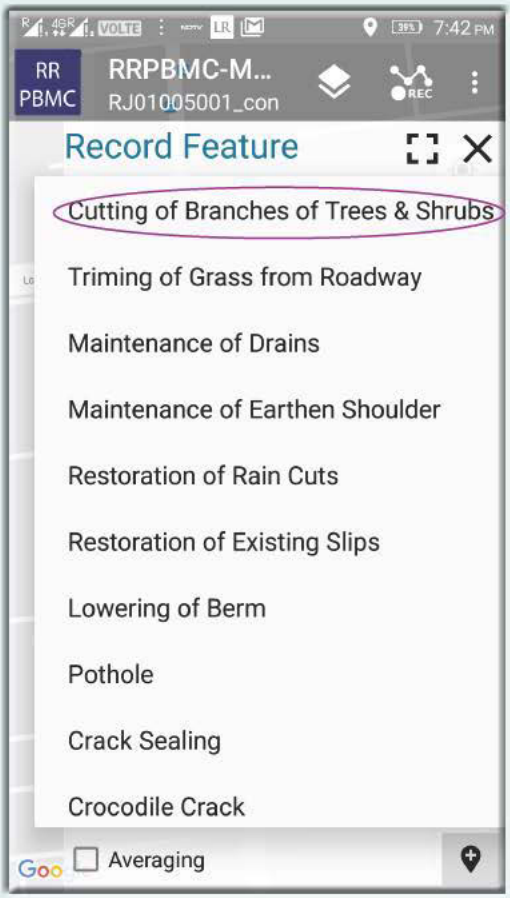
1. Similarly other attributes falling on the road which you want to record are selected and required data is captured
2. If , want to record more than one feature on same location , just finish capturing of 1st attribute and then select second attribute and capture the same while standing on same location.
3. Data can be edited on route itself. Once recorded it has a facility to edit values. Click on attribute icon on the map in background, the details of that point will appear. The same can be edited easily.
4. The data captured will automatically be uploaded on web system which can be used through Desktop application.

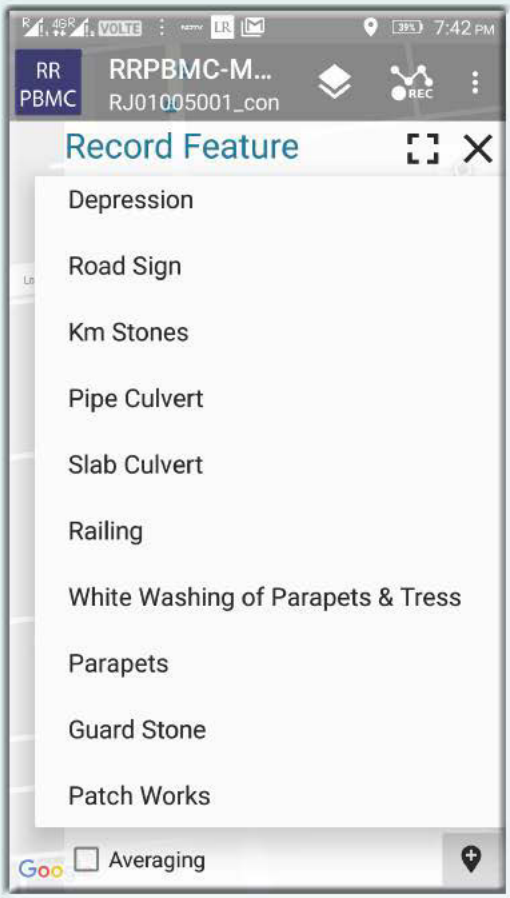
1.2 For Capturing Road Condition Data

1. **Select data Type:** Select Condition Survey in drop menu
2. **Select Road Code:** (If the state already has a Road list with road code available) Just link it through separate Desktop application which can be uploaded in server and Tap "Sync". The road list will automatically be available in APP). For uniformity we can import list from OMMAS in Excel format and link with application
3. **Tap: Load Project**

The Road Condition Survey Screen will appear.

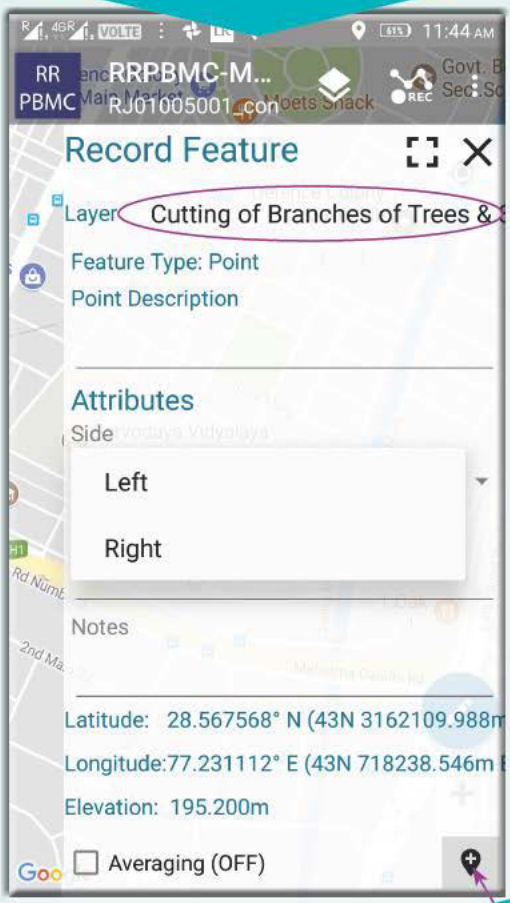


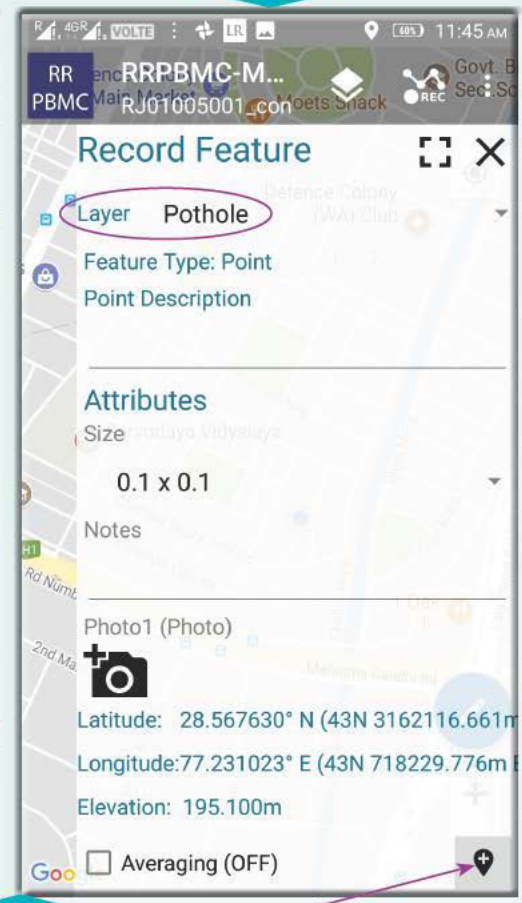




- Select location of tress
- Right/Left side of shoulders
- Enter No. of trees, add some reference note.
- Click two photographs of features also

- Enter size of pothole
- Enter Reference note
- Click Photos of potholes





After capturing data do not forget to click location icon. The GPS tag of attribute will be added in photographs

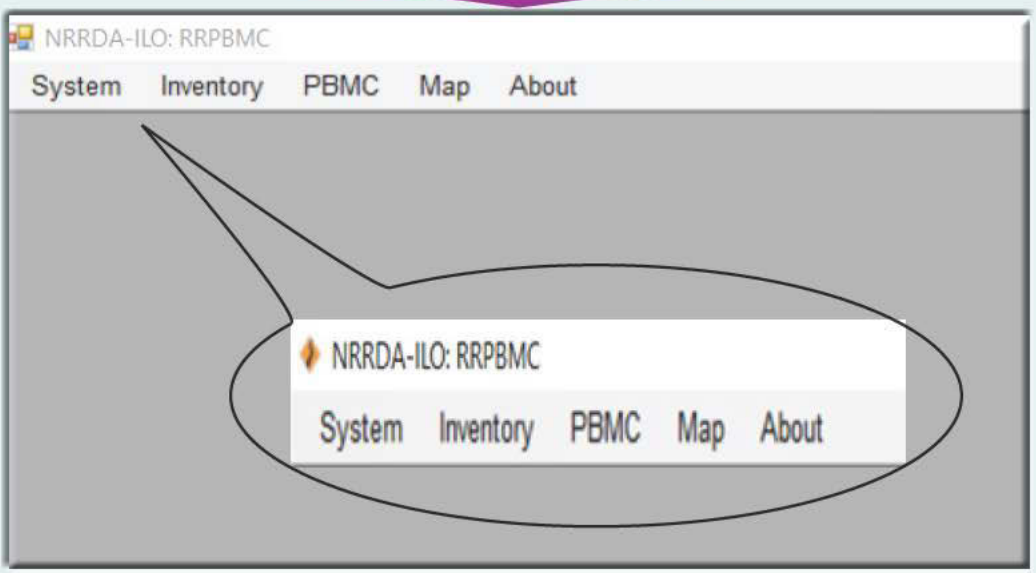
1. Similarly other condition attributes falling on the road which you want to record are selected and required data is captured
2. If, want to record more than one feature on same location , just finish capturing of 1st attribute and then select second attribute and capture the same while standing on same location.
3. Data can be edited on route itself. Once recorded it has a facility to edit values. Click on attribute icon on the map in background, the details of that point will appear. The same can be edited easily.
4. The data captured will automatically be uploaded on web system which can be used through Desktop application.

2. "AARAMBH" DESKTOP APPLICATION

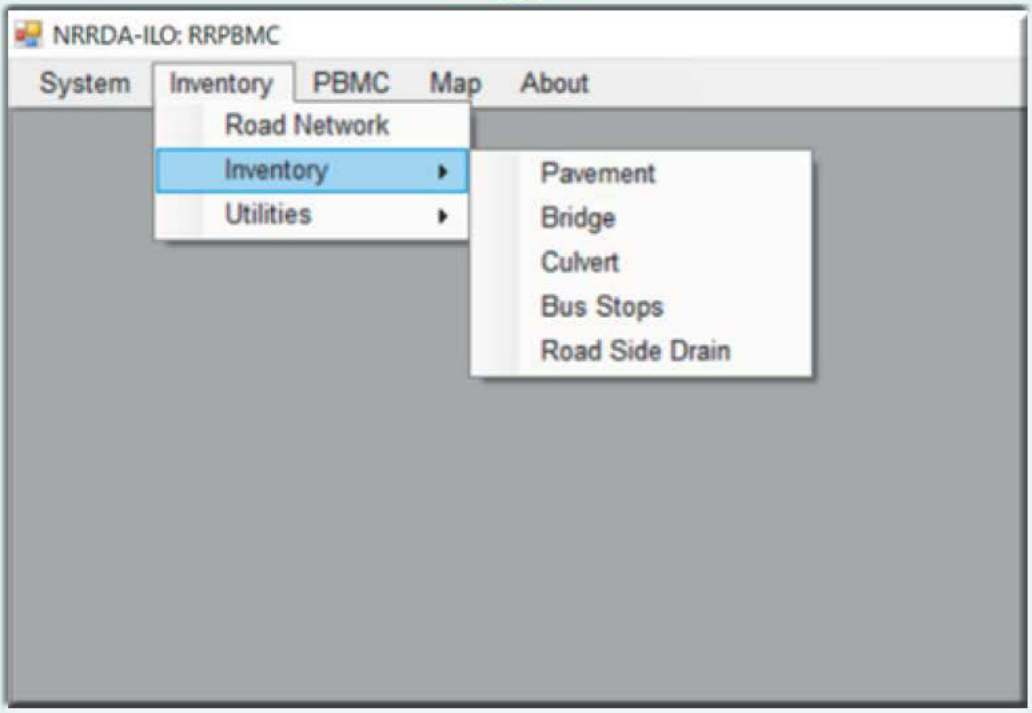
Aarambh Desktop Application is meant for processing of data collected through mobile phone. Inventory or Road Condition data is processed through it. Following are the features:

- Import the data captured by Mobile.
- Manage & edit Inventory or Condition data.
- On the basis of data prepare Road wise Bills of Quantities (BOQ).
- Manage contracts by adding/removing one or more than one contracts to form a contract package.
- Manage Contractors' data.
- Prepare Package wise Bills of Quantities.
- Manage/Edit the Rates of labour, material & machinery as per state norms including Carriage/haulage etc. Final rates of State/district whichever applicable may be entered in rate analysis.
- The analysis of Routine Maintenance activities has been taken from Ministry of Rural Development Standard data book Chapter 19.
- Estimates of Period-I (Initial Rectification) & Period-II (Routine Maintenance)
- Contractors monthly bill submitted though mobile.
- Monthly Inspection Report by Engineer and generation of Non-conformance bill for payment after deducting held up/deducted amount (submitted through mobile app).
- Managing variation orders.
- Extension of time of Contract.

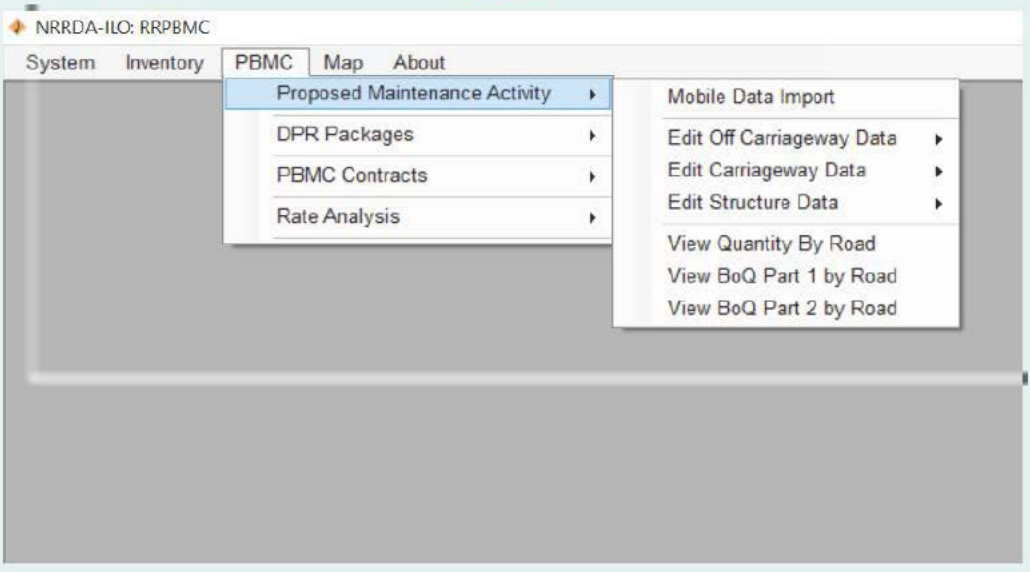
Desktop Main Page



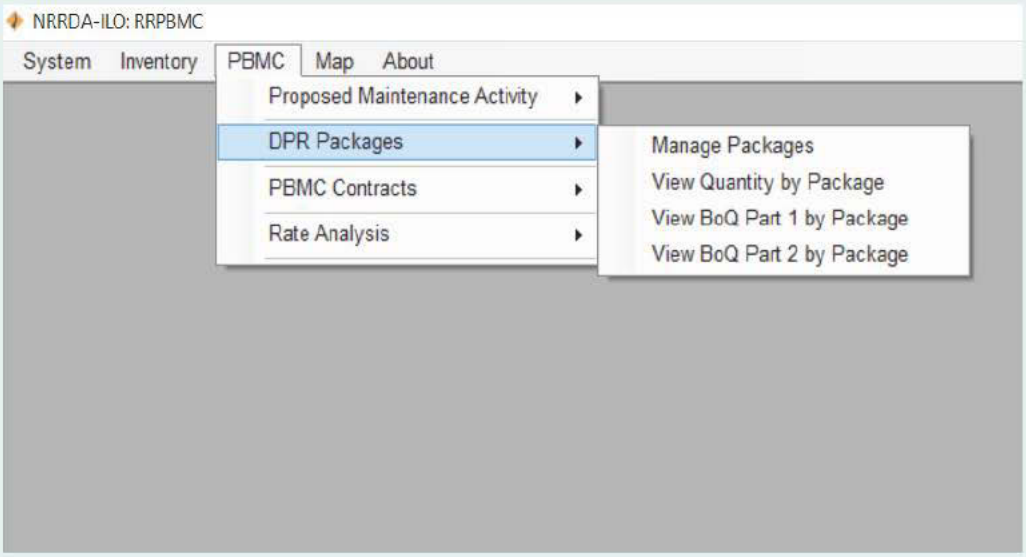
Inventory details can be checked, edited by the application



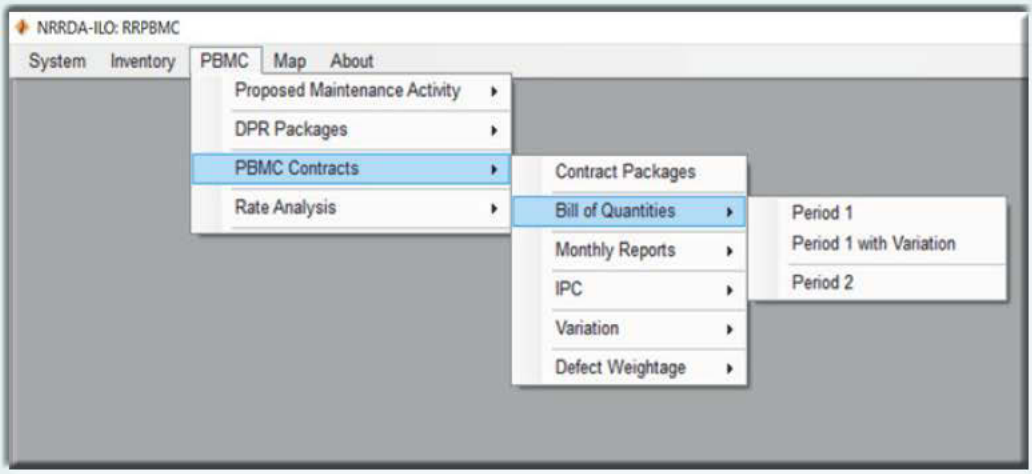
Importing Mobile Data
Editing of Collected Data
Road Wise BoQs



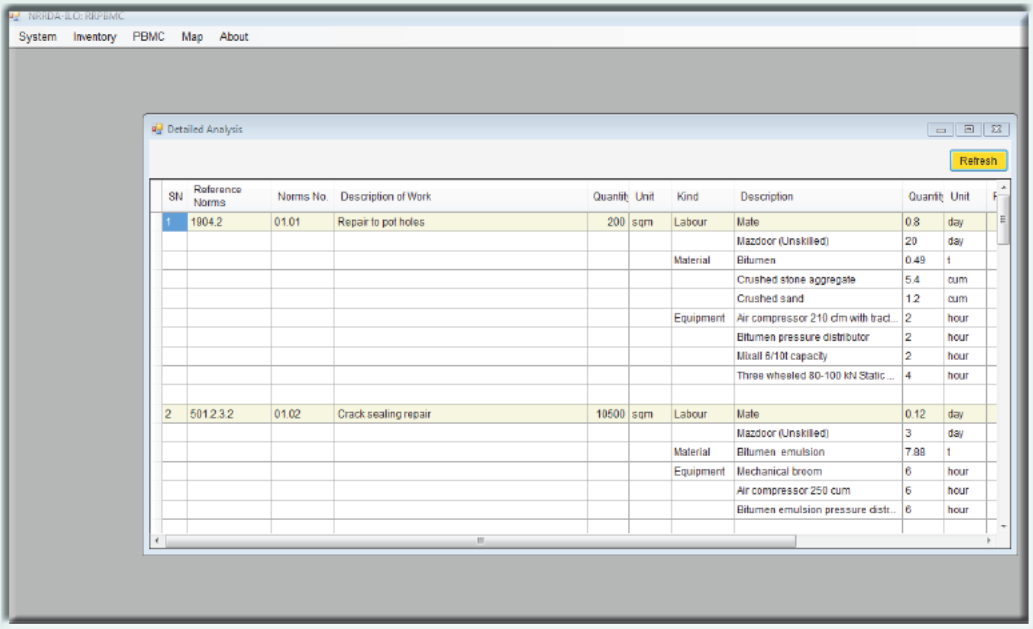
Manage Performance Based Maintenance Contract (PBMC) DPR Packaging, Prepare BoQs



Manage Contracts, Monthly reports, Variations, Monthly bills Weightages of Non Conformance Time Extension

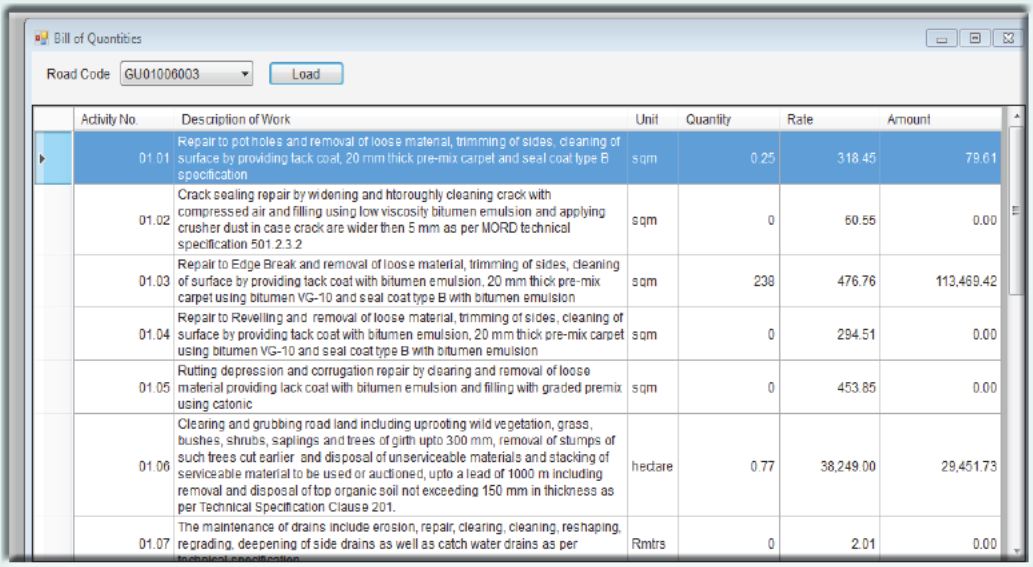


Manage/Edit Rates of Man, Material & machinery relevant in state. Export details in Excel



SN	Reference Norms	Norms No.	Description of Work	Quantity	Unit	Kind	Description	Quantity	Unit
1	1904.2	01.01	Repair to pot holes	200	sqm	Labour	Mate	0.8	day
							Mazdoor (Unskilled)	20	day
						Material	Bitumen	0.49	t
							Crushed stone aggregate	5.4	cum
							Crushed sand	1.2	cum
						Equipment	Air compressor 210 cfm with tract...	2	hour
							Bitumen pressure distributor	2	hour
							Mixall 6/10t capacity	2	hour
							Three wheeled 80-100 kN Static ...	4	hour
2	501.2.3.2	01.02	Crack sealing repair	10500	sqm	Labour	Mate	0.12	day
							Mazdoor (Unskilled)	3	day
						Material	Bitumen emulsion	7.88	t
						Equipment	Mechanical broom	6	hour
							Air compressor 250 cum	6	hour
							Bitumen emulsion pressure distr...	6	hour

Prepare BoQ



Activity No.	Description of Work	Unit	Quantity	Rate	Amount
01.01	Repair to pot holes and removal of loose material, trimming of sides, cleaning of surface by providing tack coat, 20 mm thick pre-mix carpet and seal coat type B specification	sqm	0.25	318.45	79.61
01.02	Crack sealing repair by widening and htoroughly cleaning crack with compressed air and filling using low viscosity bitumen emulsion and applying crusher dust in case crack are wider then 5 mm as per MORD technical specification 501.2.3.2	sqm	0	60.55	0.00
01.03	Repair to Edge Break and removal of loose material, trimming of sides, cleaning of surface by providing tack coat with bitumen emulsion, 20 mm thick pre-mix carpet using bitumen VG-10 and seal coat type B with bitumen emulsion	sqm	238	476.76	113,469.42
01.04	Repair to Revelling and removal of loose material, trimming of sides, cleaning of surface by providing tack coat with bitumen emulsion, 20 mm thick pre-mix carpet using bitumen VG-10 and seal coat type B with bitumen emulsion	sqm	0	294.51	0.00
01.05	Rutting depression and corrugation repair by clearing and removal of loose material providing lack coat with bitumen emulsion and filling with graded premix using catonic	sqm	0	453.85	0.00
01.06	Clearing and grubbing road land including uprooting wild vegetation, grass, bushes, shrubs, saplings and trees of girth upto 300 mm, removal of stumps of such trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned, upto a lead of 1000 m including removal and disposal of top organic soil not exceeding 150 mm in thickness as per Technical Specification Clause 201.	hectare	0.77	38,249.00	29,451.73
01.07	The maintenance of drains include erosion, repair, clearing, cleaning, reshaping, regrading, deepening of side drains as well as catch water drains as per technical specification	Rmtrs	0	2.01	0.00

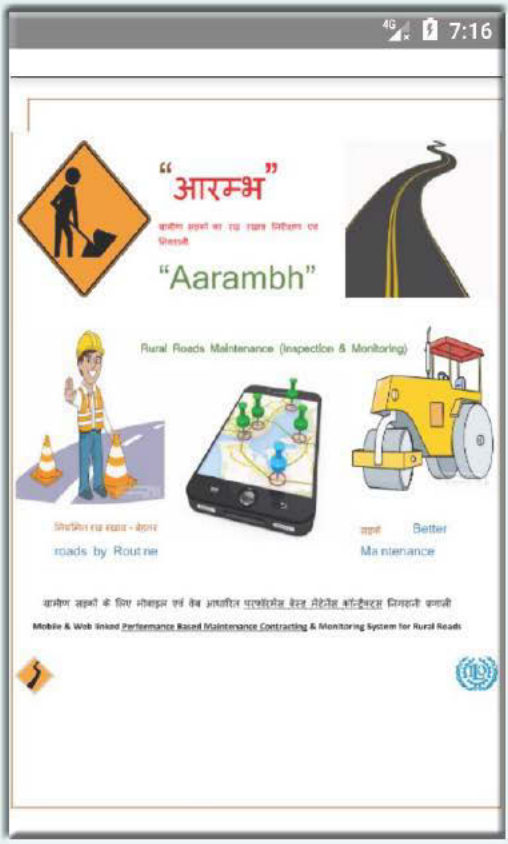
3. "AARAMBH CSM" MOBILE APP FOR INSPECTION & MONITORING

This mobile 'App' is also available in Google Play store and used for inspection of roads by Contractor, Engineer or general public. It can be used by:

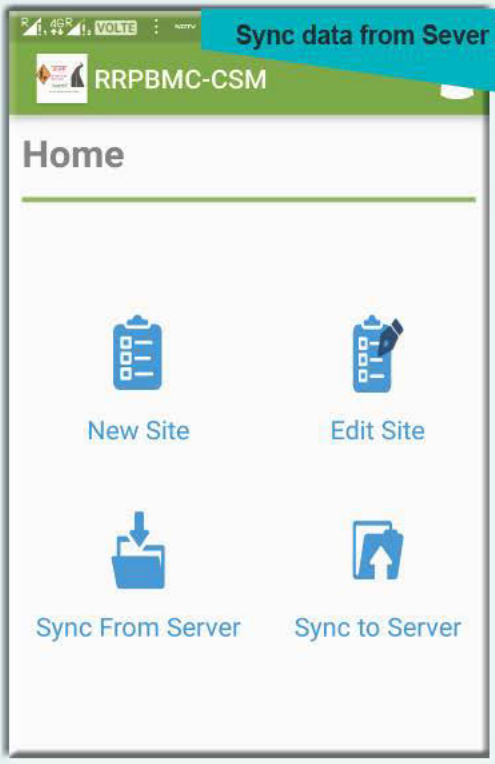
- Contractor through his login by submitting monthly inspection report raising an Interim Payment Certificate (IPC)/ Bill for maintenance of road.
- Engineers can comment of the same bill by visiting the road in question and recording non-conformance (if any) of routine maintenance activities using this App.
- Once the visit report including any non-conformance is finalized by the Engineer, the same is uploaded on web system and monthly payment certificate is prepared.
- All reports can be submitted/sent to higher level officers or to the contractor through email/SMS.

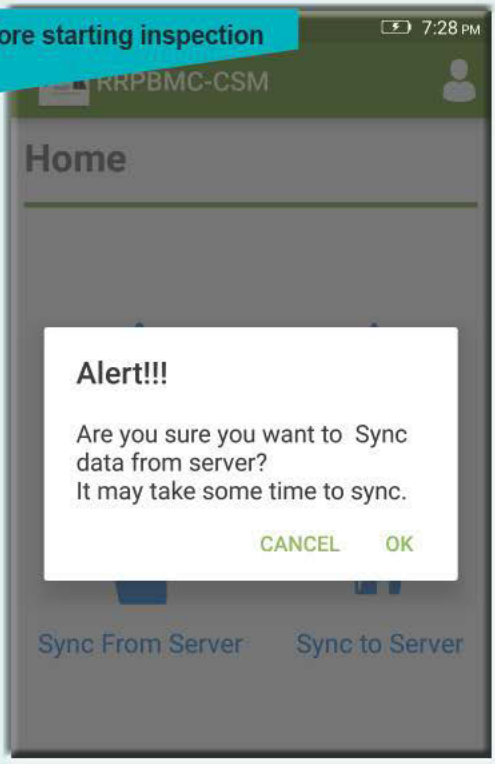
Features are given as under:

- **Separate Login for Contractors for bills submission**
- **Login for General inspection**
- **Login for Engineers verifying the contractor's bill**

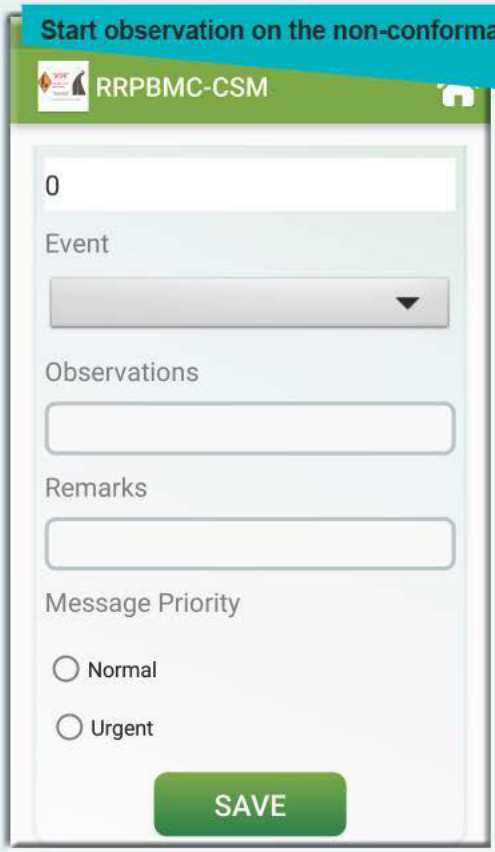


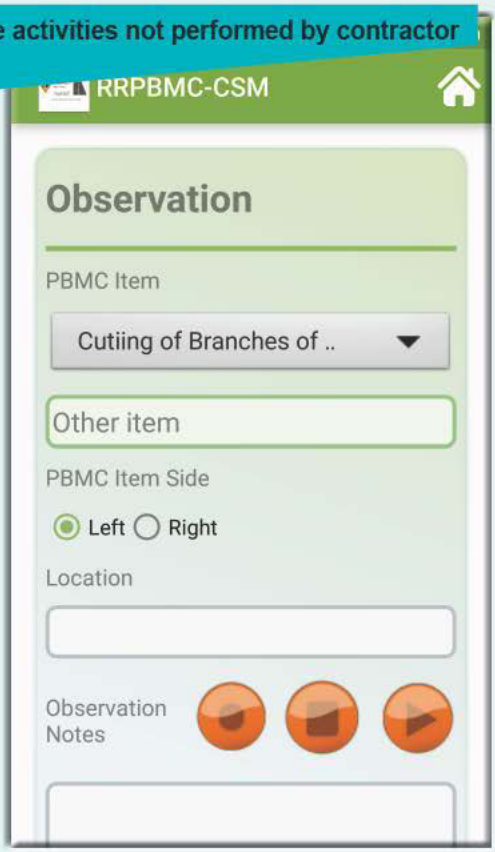
Sync data from Sever before starting inspection



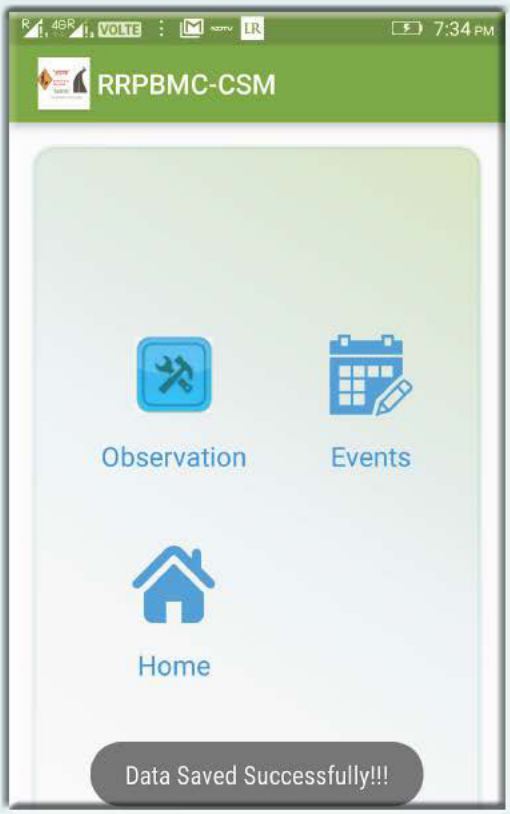


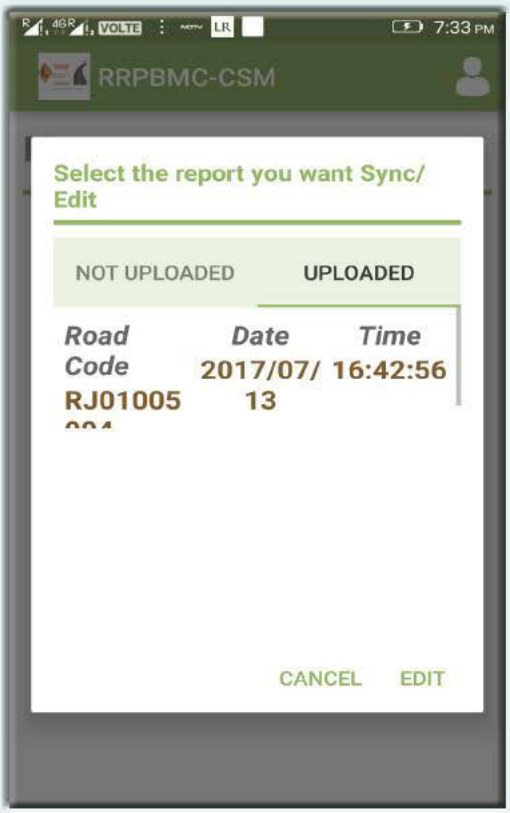
Start observation on the non-conformance activities not performed by contractor





Finalize Non-conformance report and upload to server





4. "AARAMBH" WEB APPLICATION FOR MAPPING & MONITORING

- Web based application is monitoring system of PBMC and Community Contracting contracts which also depicts and register the road condition attributes on GIS platform (maps). User can check it on Google map layers also. Conformance / Non-conformance of any road maintenance activity by the contractor can also be viewed through it.

- It also depicts the inspection reports by any departmental engineer any time including specific inspection for certification of road maintenance activities by the contractor.

ADVANTAGES OF MOBILE & WEB BASED APPLICATION "AARAMBH"

- It is a versatile application which can be used by different users/agencies for different purposes according to their requirements & preparedness.

- A system which is flexible and suits to the needs of various states at different preparedness levels is required. This System can be customized as per the state's requirements:

  – User can use it for capturing/building Road Inventory & Condition data only;

- Some states may have road inventories & condition surveys in place, they can use application for preparing estimates for Performance Based Maintenance Contracts and Community Contracting Contracts;
- Some states have not only prepared inventories & condition data but have also floated tenders on PBMC and Community Contracting basis. In such cases, Aarambh can be used for managing the contracts and monthly billing process.

- The data once collected through mobile app is permanently stored in the Server which can be accessed through any computer system having Log-In ID. The possibility of data loss due to any reason in individual computer system is avoided.
- The system/data is secure because of secure logins is provided to the users as per their role i.e. Field officers, Administrators, Contractors etc.
- Transparent & accurate system of data collection with GPS & date-time tagged Photographs lead to preparation of accurate DPRs & inspection reports.
- Easy data Transfer facility of editing of data collected on the route;
- Creates GIS data for the entire rural road network in the state as per the progressive usage by the field staff;
- A dedicated website to keep track of Maintenance activities;
- Cumbersome process of chaining & associated possibilities of error in paperwork is avoided;
- Locations and condition of maintenance requirements are accurate;
- Use of GPS technology increases authenticity of data. The data cannot be cooked up by sitting in the office.
- Friendly/Easy application. Can be used with minimum of training.
- Measurements & paperwork at the time of very monthly bill avoided/reduced.
- More transparency in the system.

WAY FORWARD

This is an attempt to simplify the procedures for carrying out Routine Maintenance. This system may be requiring customization for use in different states. The application can be improved further after the use for some time by various agencies.

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INTERNATIONAL LABOUR ORGANIZATION
ILO DWT for South Asia and Country Office for India
India Habitat Centre
Core 4B, 3rd Floor, Lodhi Road
New Delhi–110 003, INDIA

NATIONAL RURAL ROADS DEVELOPMENT AGENCY
Ministry of Rural Development, Government of India
5th Floor, 15-NBCC Tower
Bhikaji Cama Place
New Delhi–110 066, INDIA