City Road Asset Management System

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***Abstract*— There are a large number of efforts around the world to obtain more net benefits from road infrastructure assets. The road network constitutes one of the largest community assets and is predominately government-owned. Road administrations must maintain, operate, improve, replace, and preserve this asset while, at the same time, carefully managing the scarce financial and human resources needed to achieve these objectives. All of this is accomplished under the close scrutiny of the public who pay for and are regular users of the road network, and who increasingly demand improved levels of service in terms of safety, reliability, environmental impact and comfort. Asset management as applied to the roads sector represents "a systematic process of maintaining, upgrading and operating assets, combining engineering principles with sound business practice and economic rationale, and providing tools to facilitate a more organized and flexible approach to making the decisions necessary to achieve the public's expectations". Governments are placing greater pressures on road administrations to improve the efficiency of, and accountability for, the management of the road network. Indeed, in many countries, local highway authorities face formal accountability and reporting requirements on how they manage their assets. Asset management systems offer the prospect of significantly improving road network management outcomes. This report is a review of asset management systems as applied to the roads sector and an analysis of the responses to a survey conducted among those countries represented on Working Group on Asset Management Systems.**

***Index Terms*— Smart City, Pune, RAMs, Asset management systems**

INTRODUCTION

Pune is the second largest city in the Indian state of Maharashtra, after Mumbai. It is the ninth most populous city in the country with an estimated population of 7.1264 Million. Pune is situated at approximately 18° 32" north latitude and 73° 51" east longitude. The city's total area is 252sq. km. Fig 1. Shows the roads in Pune city and suburban areas.

The population of the Pune has been growing rapidly, between 2001 and 2011; the city grew by 12.6%, increasing from 2.5 million to 3.5 million. The decadal growth rate of Pune for the last 10 years has been at least 12.5% and it's estimated that population in 2019 is 7.1264 Million. There has been an unprecedented increase in the traffic volume over recent years. The number of motor vehicles registered in the Pune has reached to 36.27 lakh, from 33.37 lakh the previous year (2016-2017).Currently, the road network in the Pune is one of the main options to serve the growing needs of the transportation from the public and private sectors. Other modes, such as metro are in the process of development. Therefore, maintaining roads in the Pune at a high level of service is greatly needed.

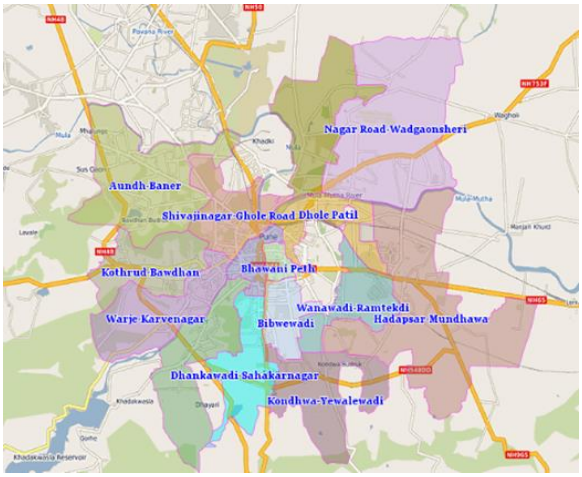


Fig 1. Map showing road network of Pune City

A. Objectives and Contributions

The primary goal of Road Asset Management is to think, plan and act on the basis of long-term decisions aiming at optimizing maintenance while keeping costs at a minimum and contributing to other political objectives while modernizing the network.

1.Efficient Road Data Collection

Data driven decision at an affordable cost. Start collecting standard IRI and PCI with your Smartphone toady.

2.Asset Tracking and Monitoring

Advanced Reporting

Predictive Maintenance

3.Data Driven paving and Maintenance decisions at affordable cost.

RAMs is generally to optimize the economic benefits by minimizing the sum of maintenance cost and road user cost

4. Municipal authorities for planning budgetary requirement based on Scientific and rational analysis of present road condition

5. Perfect and very easy to Prepare Estimate, Planning, Programming.

II. ASSET OF ROAD

A. Road Inventory data-

1. Name of Road
2. Road ID
3. Width of MVL
4. Width of footpath
5. Type of footpath
6. No. Of Lane
7. Type of carriageway
8. Type of median
9. Type of shoulder
10. Condition of footpath, Road Marking
11. Roughness of Road
12. +10 More

B. Structure Inventory data-

Bridge, Culvert, Flyover, Underpass, Grade separator, ROB, RUB, Skyway etc.

1.Object ID
2.Road Name
3.Bridge Name
4.Bridge Type
5.Name of crossing Element
6.Construction Year
7.Number of span
8.Span width
9.Clear roadway width
10.Wing wall
11.Road width
12.Total length of Bridge
13.Sub structure Type
14.Slab thickness
15. Parapet Type
16. Parapet thickness
17. wearing coat type
18. Pier top thickness
19.Pier bottom tk.
20. Pier height
21. Foundation type
22. Bed protection
23.Vt. Clearance
24. Flow direction
25. HFL
26. Low water level

C. Under Ground Utility Data

This Data collected by manually by survey team in filled in TAB to connected to RAMs App. Like Road Nome, Location, pipe type, Pipe Dimension etc.

D. Traffic data collection

The most important point measurement is the vehicle volume count. Data can be collected manually or automatically. In manual method, the observer will stand at the point of interest and count the vehicles with the help of hand tallies. Normally, data will be collected for short interval of 5 minutes or 15 minutes etc. and for each type of vehicles like cars, two wheelers, three wheelers, LCV, HCV, multi axle trucks, non-motorized traffic like bullock cart, hand cart etc. From the flow data, flow and headway can be derived. Modern methods include the use of inductive loop detector, video camera, and many other technologies. These methods help to collect accurate information for long duration. In video cameras, data

is collected from the field for 72 hrs, and is then analyzed in the lab for obtaining results.

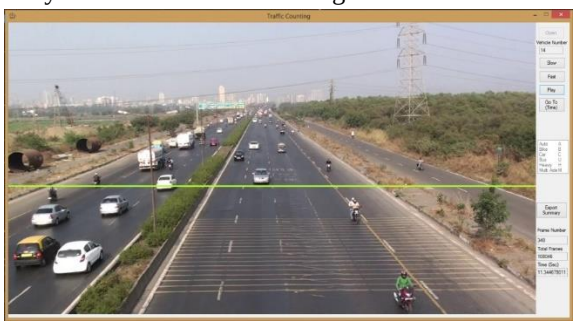


Fig.2 Traffic counting

III. ROAD ASSET MANAGEMENT (RAM) OFFERS A SOLUTION

Road Asset Management provides decision makers with the necessary tools for efficient and sustainable management of roads. The process goes through the following steps:

- Establish a complete inventory of all road networks with all its elements
- Provide a clear picture of the current condition/performance of the road network
- Estimate the value of the asset
- Predict future demand of traffic and service needs
- Estimate maintenance needs and costs
- Prioritise objectives related to the desired quality and performance of the road network
- Set up funding scenarios for the regular and timely maintenance and upgrade of the road asset
- Define a strategy (RAM Plan)
- Implement the RAM Plan

A. Potential benefits from implementing an asset management system

The many benefits and expected outcomes available to a road administration upon implementation of an asset management system can be placed into the following categories:

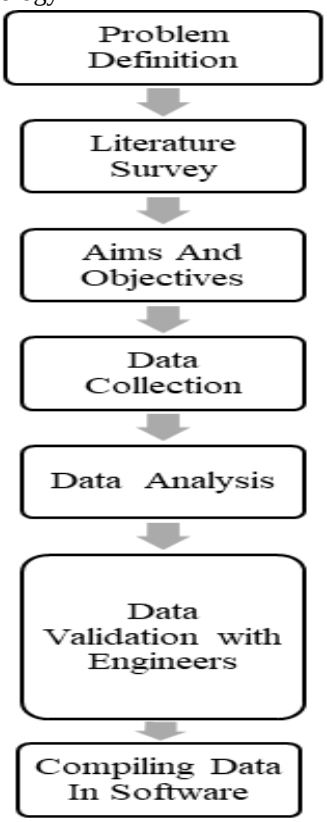
- Communications (both internal and external to the administration).
- Asset inventory, condition and level of use.
- Road network performance.
- Asset management tools.
- Budget process.
- Staff development.

IV. PROBLEM STATEMENT AND METHODOLOGY

A. Problem Statement

The road authorities in the Pune are in smart city project the challenge of maintaining the road network at its highest level of service while investing the minimum amount of money. To achieve this requires searching for and adopting efficient and cost-effective road maintenance approaches. One such approach is the PBC to help to enhance the innovation and technologies related to road maintenance methods, reduction in cost, and substantial shift of risk from client to contractor, and increased overall satisfaction of the road users.

B. Methodology



V. PROCESS OF ROAD ASSET MANAGEMENT

Infrastructure is ageing due to use and time. It requires maintenance, renewal and modernisation, which depend on specific needs and lifetime of each part of the asset. An inventory stating the condition of each asset, values and maintenance needs are the basics for

an effective management, for political decision making and for transparency towards the community.

A. Full inventory

An inventory of roads is a prerequisite for improving the quality of the network in an efficient way. It should contain all the roads elements including historical data on construction and use. It should also be updated regularly. Visually the condition of many roads may superficially be satisfactory. However, only in a few Member States political decisions on investment and network management are accompanied by any sort of quality survey data. Management system has to fit to the infrastructure which is managed. For example, in the case of urban roads, elements related to the management of public transport services, energy, water and telecommunication have to be taken into consideration. This might not be relevant for motorways. Nevertheless, the RAM strategic approach applies in all cases. The table hereunder displays different elements of the road infrastructure that are considered in the establishment of the inventory

B. Evaluate/calculate the asset

In order to make right decisions in prioritising investments, authorities need to estimate the value and condition of their road asset. When they do so, they often discover that roads are their biggest asset in infrastructure.

Course values may significantly differ from one place to the other due to:

- Price Level (Different Costs of Labour, Raw Material)
- Density of Population (Ground, Noise Avoidance)
- Environmental Aspects
- Topography (Tunnels, Bridges)
- Technical Characteristics (Number of Lanes, Equipment,)
- Method of calculation (depreciation, replacement value.)

C. Data of Pavement Condition and Maintenance Treatment in Pune

This topic discusses the details of the data concerning pavement condition and various road maintenance treatments applied in the Pune city under smart city. The road authorities Municipalities and Department of Transport regularly collect the pavement data with the help of third party consultants. The Pune Municipal Corporation (PMC) data is used as a case study in this project. PMC includes in excess of 2400 km of greater Pune city's roads. The approximate asset value of PMC would be over 5700 crores, making it among the most valuable assets owned by Pune Municipal Corporation (PMC). The residents of Pune including workers, students and visitors use the PMC, whether as pedestrians; on bicycles or motorcycles; in buses, taxies, or cars; or as truck drivers. The mobility and safety of over 3.5 million people residents of Pune depend on proper maintenance and rehabilitation of the PMC. This section presents information about the pavement data collection equipment and methodology, total road survey is 1700km as our survey vehicle minimum range is 4m.

In the Pune, the art equipment including IRSM are used to assess the structural and functional conditions of the pavement. From the IRSM testing: roughness (ride), rut depth, surface macro texture and surface distress results were collected and layer modulus and remaining structural life were calculated and reported. Also Motion study the current axle loading was determined for evaluating remaining life

Fig 2. IRSM

Fig 3 IRSM output

VI. CASE STUDY

A. Case study on Pune City Nagar Road Ward Office Selected Road:

Dhanori road was selected for case study this road Data

Fig.4 IRSM vehicle survey with PMC Engineers

Collected by IRSM vehicle. all data in table format save in hard disk then this data validation with PMC Engineers and store in PMC Portal. for used one click information.

B. Structural data: Also collected structural data on that road that is culver structure, this collected data format is given bellow.

Rams Structural Data Culvert Parameters Information	
Parameter	Details
OBJECTID 1	163
Join Count	3
Target FID	164
OBJECTID	164
Sr No	164
Road Name	Dhanori Road
Culvert Type	Pipe
Wearing Coat Type	BT
Slab Thickness	0.9
Carriageway Width	8.19999999999999
Culvert Width	8.75
Wearing Coat Thickness	0.07
Head Wall Thickness	0.68
Head Wall Length	15.6999999999999
Height Above Bed Level	2
Maintenance Details	0
Start Latitude	18.4761183
Start Longitude	73.8082706
End Latitude	18.4666500999999
End Longitude	73.8152556
Entry Date	43313.674375
RID	17980

C.Data Validation: after that data validation with PMC and PSCDCL Engineers data is valid then data fill in PMC Portal.

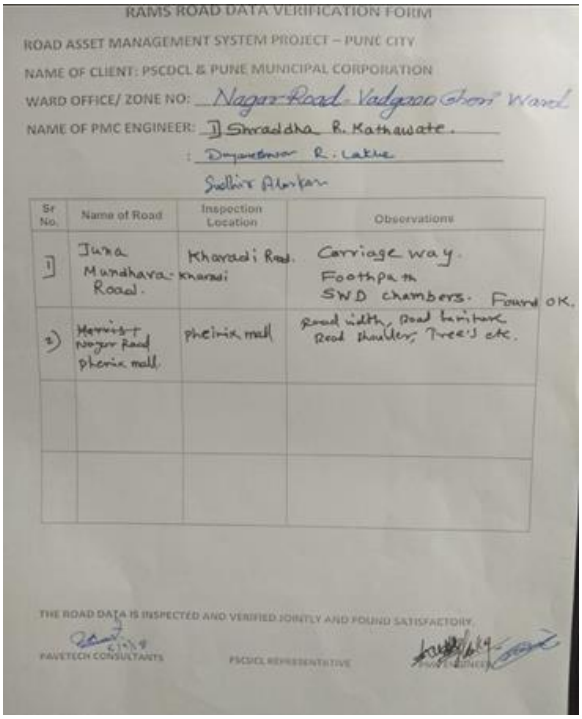


Fig 5 Data Validation

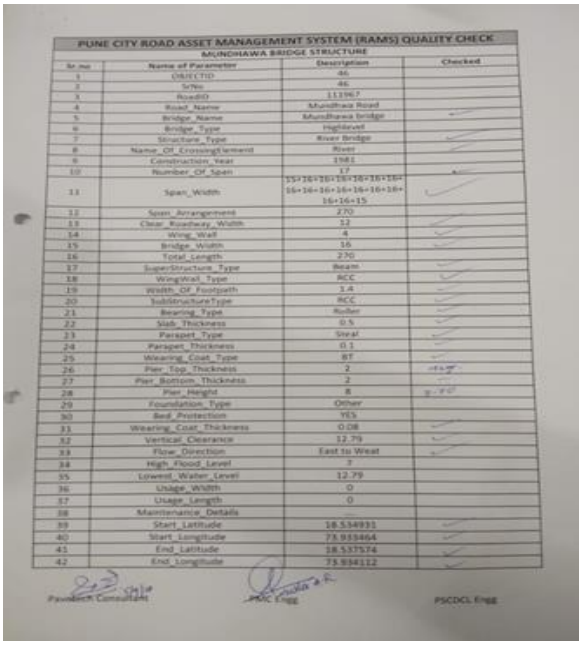


Fig 6 Bridge Data Validation

D. Compiling Data In Software:

After Validate Data Fill in PMC portal for engineer daily used and addition on that for revised data.

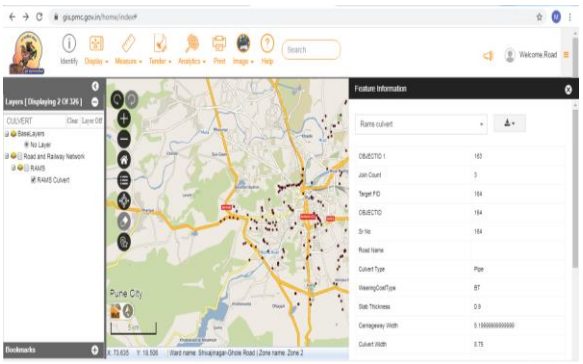


Fig 7 Dhanori Road culver output

VII. CONCLUSION

This project describes the process and Implement the RAM Plan. Detailed explanation of Road Asset Management. The primary goal of Road Asset Management is to think, plan and act on the basis of long-term decisions aiming at optimizing maintenance. One such conclusion in the Rams to help to enhance the innovation and technologies related to road maintenance methods, reduction in cost, and substantial shift of risk from client to contractor, and increased overall satisfaction of the road users. The many benefits and expected outcomes available to a road administration upon implementation of an asset management system. This system very efficient for budget provision of city.

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