

PREVENTIVE MAINTENANCE AND PERFORMANCE BASED MAINTENANCE CONTRACTS FOR ASSET MANAGEMENT OF RURAL ROADS

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Indian Road Network- Current Status (in km)

National Highway (NH) & Expressways	140,995
State Highways (SH)	171,039
Other Roads	6,059,813 (95%)
Total Road Length	6,371,847

PRADHAN MANTRI GRAM SADAK YOJANA (PMGSY)

- Road length Sanctioned – 774, 899 km (707,159 km completed)
- Value of the projects – Rs. 333, 766 Cr (US \$44,500 m)
- Road completed – 707, 159 km
- Connected habitations - 172,080
- Total expenditure – Rs. 277,634 Cr (US\$ 37,000 m)

Source: Annual Report, MORTH, 2021-22

Road Asset Management

- Roads – Largest community assets
- Tool for systematic process of maintaining, operating and upgrading road assets
- Organized and flexible approach for decision making
- Relate design to performance and cost implications
- Enable optimal design of road infrastructure
- Interact with public, top management and politicians
- Develop single and multi year M&R planning
- Quantify benefits of new materials and technologies
- Trade off between new construction vis-à-vis pavement preservation and maintenance

Components of Asset Management

- Goals and policies
- Inventory information of the road asset
- Condition assessment of the asset over time
- Engineering decision making on M&R treatments as well as the timing of the treatment
- Resources and budget availability (dedicated road fund)
- Feedback on decisions from performance of the road asset

Components of Asset Management

- Performance prediction models for alternative strategies and development of works programme
- Ensure data integrity; enhance data accessibility and provide data compatibility
- Remaining Service Life estimation
- Life-cycle cost analyses /Life Cycle Assessment
- Optimal pavement design as well as M&R Strategies
- Implementation and Feedback on effectiveness

Integration of Assets and Management

- Individual assets – roads, bridges, roadway safety appurtenances etc.
- Facilitates systematic and integrated approach
- Extensive data processing – Large road network; big data analytics
- Funds: Allocation of available funds across competing projects for new construction, augmentation/upgradation of infrastructure and for maintenance & rehabilitation

Need for Pavement Preservation

- Major demands on our rural road network are all-weather connectivity and satisfactory performance
- Road assets - to be maintained and preserved
- Huge investments to maintain desired level of service
- Delay in maintenance causes faster deterioration and increase in cost of maintenance
- Preservation treatments delay costly rehabilitation and reconstruction
- Preservation techniques Increase life of the pavement and decrease in agency costs significantly
- Need to introduce the concept of pavement preservation in rural road asset management

Decision Making – Timing of Treatments and their Choice

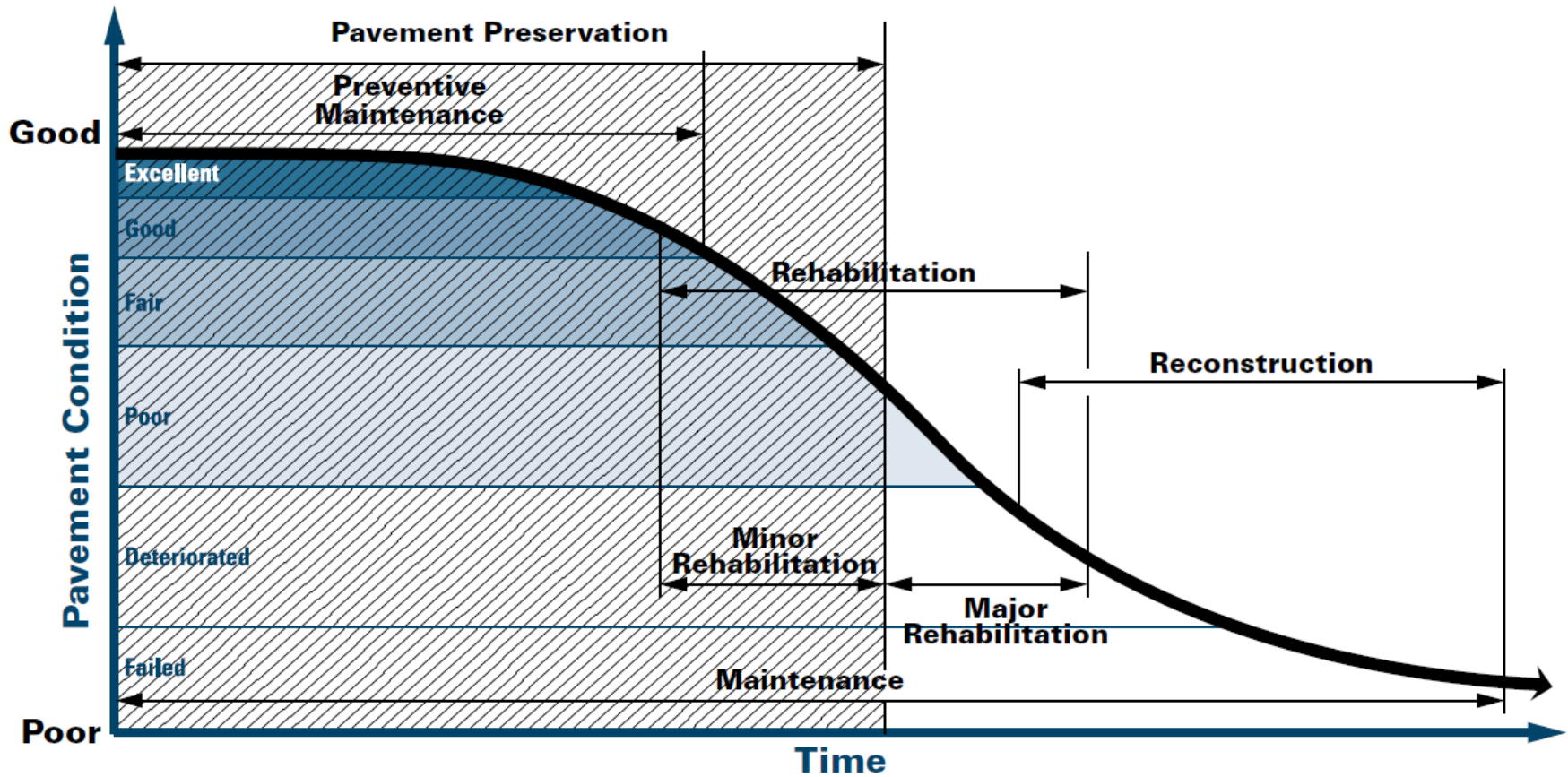
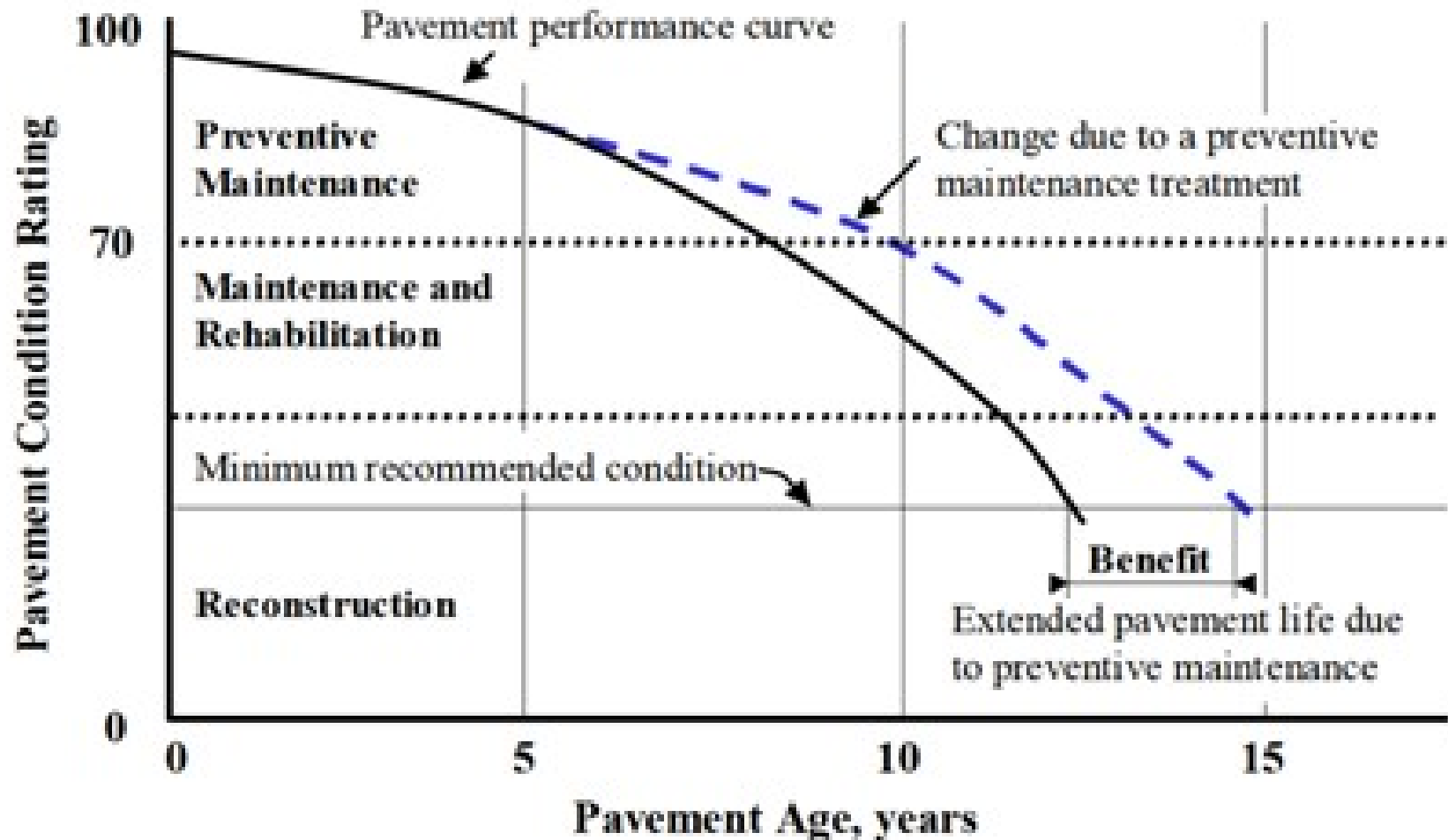


Figure 5. Appropriate preservation solutions at various stages of pavement service life

Quantification of Benefits Preventive Maintenance: Choice of Treatments and Timing



Performance Based Maintenance Contract

- Traditional contracting for road maintenance – based on a schedule of unit prices and estimates of quantities.
- Agency and contractor are accountable for the performance
- Performance Specified Road Maintenance Contract defines the minimum conditions of road, bridge, and traffic assets that have to be met by the contractor
- Contractor decides the timing as well as choice of the treatment and guarantees the performance
- Risk on performance transferred to the contractor from the agency
- Role of the agency is only a facilitator / manager

Performance Requirements for Rural Roads (IRC: 82)

Defects (type)	Range of Distress (Rural Roads)		
	Excellent to Good	Satisfactory to Fair	Poor to Fail
Cracking (%)	< 10	10-20	>20
Ravelling (%)	<10	10-20	>20
Potholes (number)	Nil to 1	>1 to 5	>5
Patching (%)	<5	5-20	>20
Rut depth (mm)	<10	10 to 20	>20

Maximum Permissible Range of Roughness Index (Rural Roads)

Surface Type	IRI (m/km)	RI (mm/km)	IRI (m/km)	RI (mm/km)	IRI (m/km)	RI (mm/km)
Surface Dressing	<4.27	<3200	4.27-4.98	3200-3800	>4.98	>3800
Open graded premix Carpet	<4.03	<3000	4.03-4.62	3000-3500	>4.62	>3500
Mix Seal Surfacing	<3.79	<2800	3.79-4.27	2800-3200	>4.27	>3200
Semi Dense Bituminous Concrete	<3.33	<2400	3.33-4.03	2400-3000	>4.03	>3000

Benefits of Performance Based Maintenance Contract

- Decision on choice and application of technology lies with the contractor
- New materials and innovation in construction practices possible; better quality control
- Higher risk to the contractor compared to the traditional contract arrangement,
- Improved efficiency and effectiveness of technology, process, design or management reduces the cost of achieving the specified standards

Challenges

- Rural road maintenance is funded by the States and not by the Central Govt.
- Defining quantifiable performance standards
- Equipment usage to be defined; harmonized
- Typical performance standards includes maintenance of the rural roads at minimum or desired Pavement Condition Index (PCI), ride quality, max. permissible values of rutting, cracking, number of potholes, patch area, shoulder condition etc.
- Payment for the work to contractor - linked to the quantity, quality as well as the committed performance standards

Benefits of Asset Management to a Citizen

- As a citizen and a tax payer, they deserve a road infrastructure that brings you the expected level of mobility, safety and level of service
- Road user evaluation of the performance
- Ensures asset is managed efficiently as a public utility
- Ensure that roads are considered on priority by all the concerned stakeholders
- Investments are made judiciously

Challenges

- Inventory of the road asset and performance for over six million km of 'other' roads (incl. rural roads) in India
- Harmonization of different equipment used for data collection and data interpretation for further analysis
- Periodical performance data collection
- Prediction of performance under varying traffic, climate and environmental conditions
- Relate as built construction quality to observed performance as well as performance prediction
- Project vis-a-vis network level asset management
- Quantification of benefits of timely maintenance and penalties of deferred maintenance

Summary

- Pavement preservation extends the life; improves performance and lowers rehabilitation cost
- Data on performance with new materials and innovative technologies; quantification of benefits based on performance ; extended life; lower maintenance needs
- Asset Management - framework to make the best-informed decision making to preserve rural roads
- Tool for decision making and efficient management of rural road assets
- Need for performance based rural road asset management system at district level in every state is the need of the hour



THANK YOU

