

# **PAVEMENT PRESERVATION AND ROAD ASSET MANAGEMENT SYSTEM**

# BACKGROUND

- Phased development of Roads in India
- Pavements in terminal condition stage
- Road pavements – nations highway assets
- Tremendous challenge in preserving & enhancing pavements assets
- Value of timely preventive maintenance
- Benefits and cost effectiveness of preventive maintenance of pavements

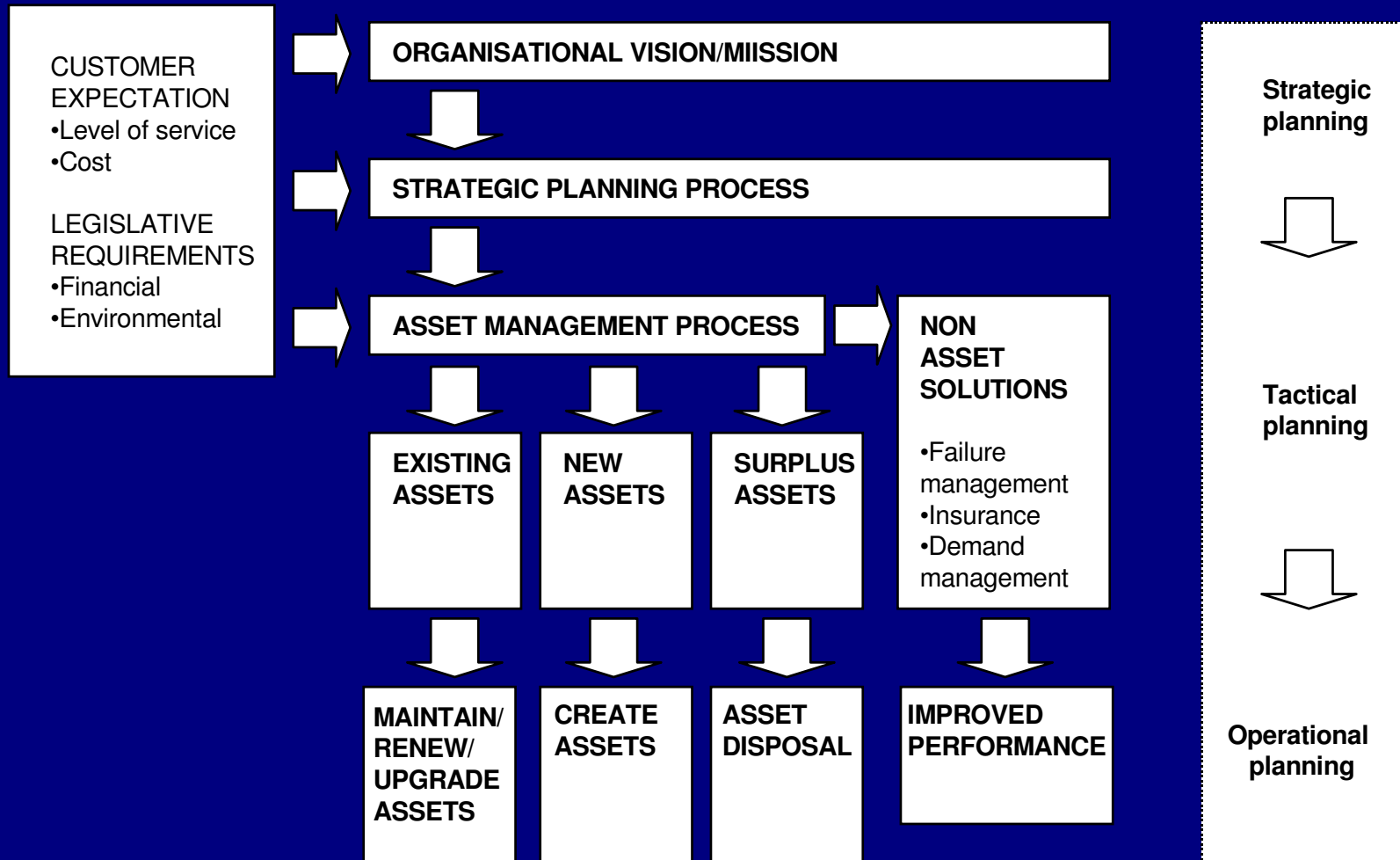
# Pavement Preservation in Asset Management

- A program of activities aimed at preserving investment in the nation's highway system, enhancing the pavement performance, extending pavement life, & meeting customers' needs
- Excludes capacity improvements and new or reconstruction of pavements
- Change in philosophy from reactive to proactive maintenance
- Applying the right treatment to the right road at the right time

# Asset Management

- Move to Asset Management
  - A systematic / strategic process of maintaining, upgrading and operating physical assets cost-effectively
- Highway Asset Management
  - Insight
  - Asset Management Planning
  - Benefits of Asset Planning

# Asset Management Planning



# Flexible Pavement Preservation Concept and Techniques

- **Proactive approach of preventive maintenance**
- **Preventive maintenance to pavements in good condition**
- **Reduce the rate of deterioration**
- **Cost effective way of pavement maintenance**

# Implementing the Pavement-Preservation

- Dedicated funding
- Universal – Regionally dependent

# FLEXIBLE PAVEMENT DETERIORATION / PERFORMANCE

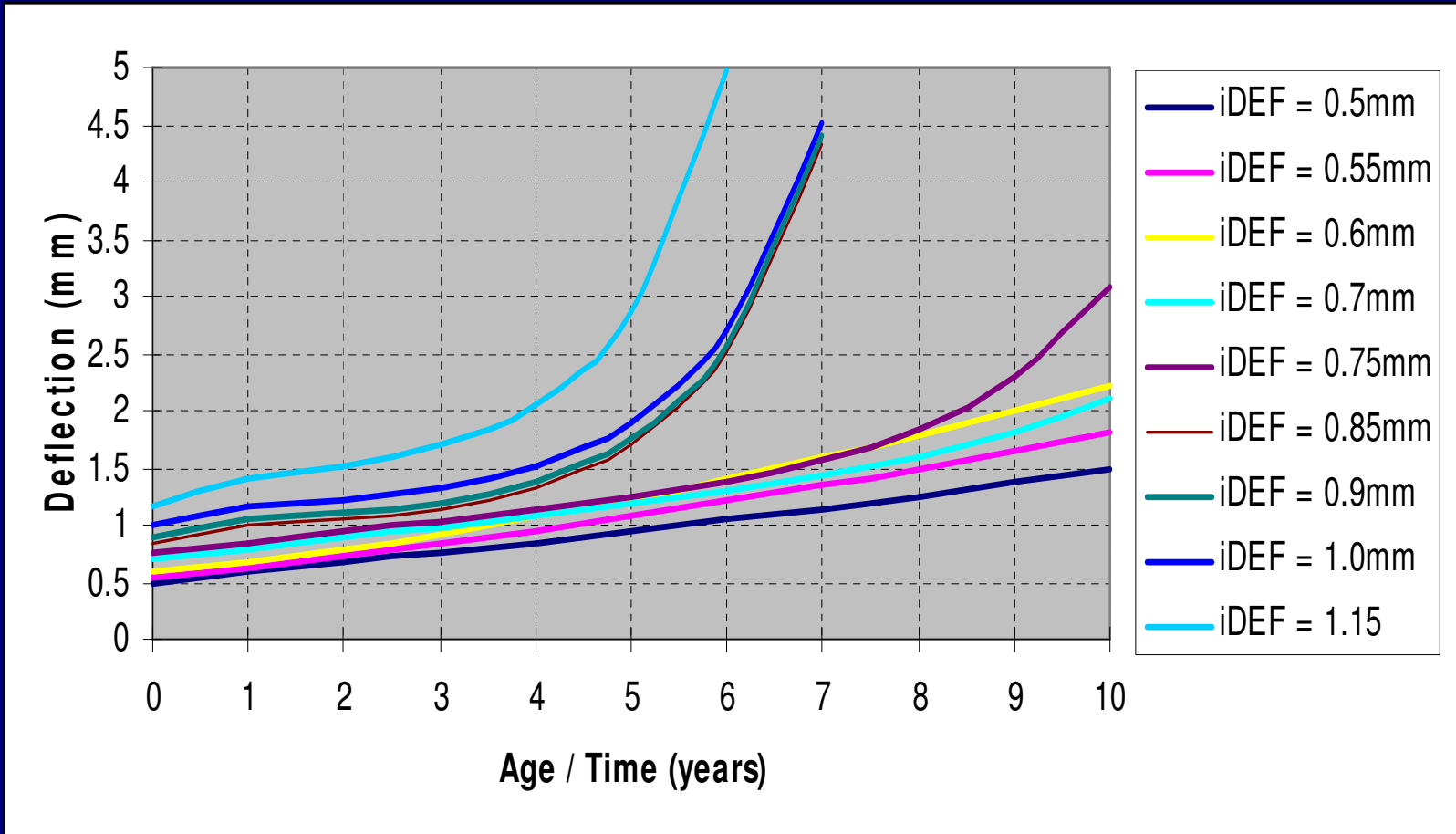
- **Performance Based Prediction Models**

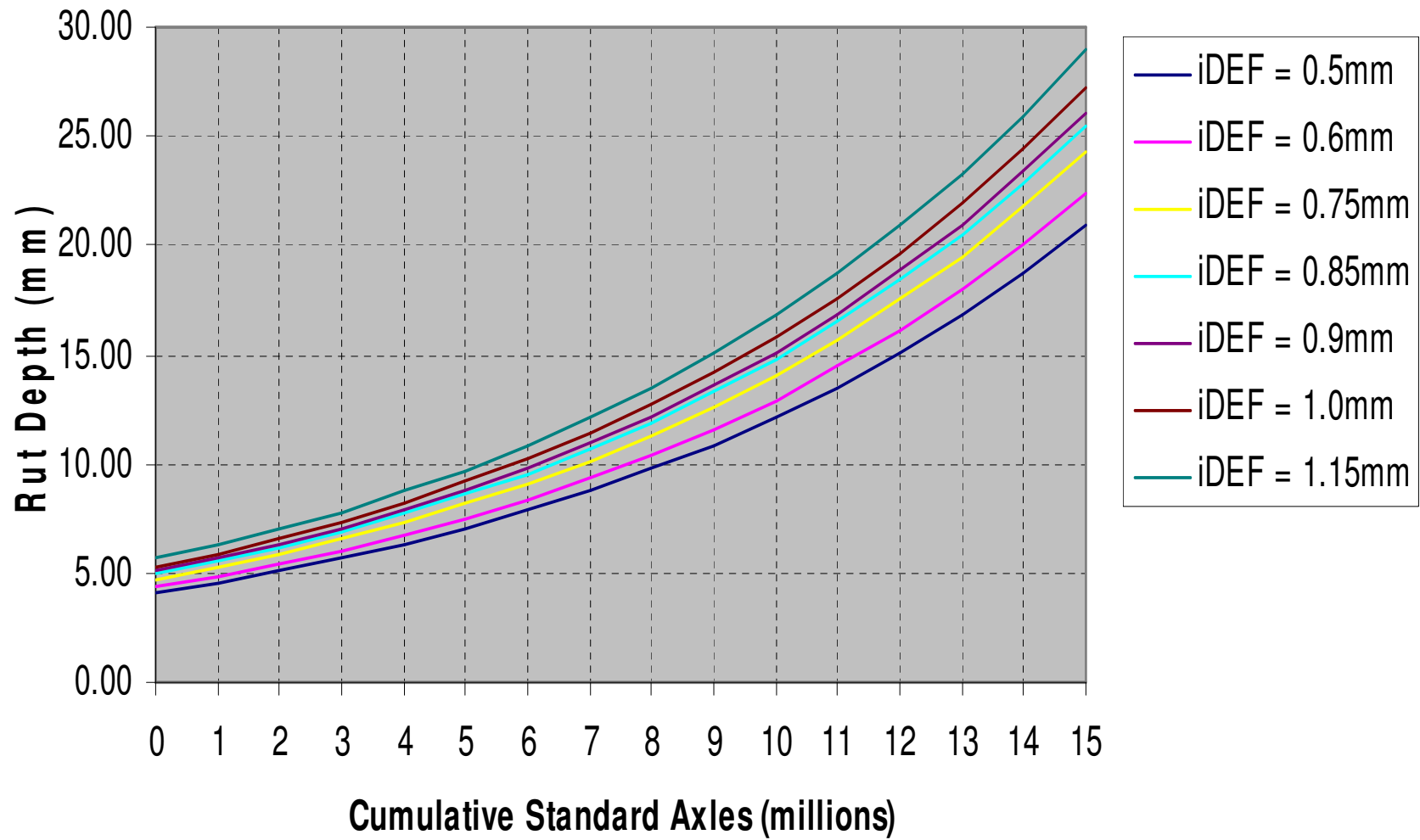
**deflection,  
riding quality - unevenness / roughness  
distress modes - crack area (%) and  
rut depth (mm)**

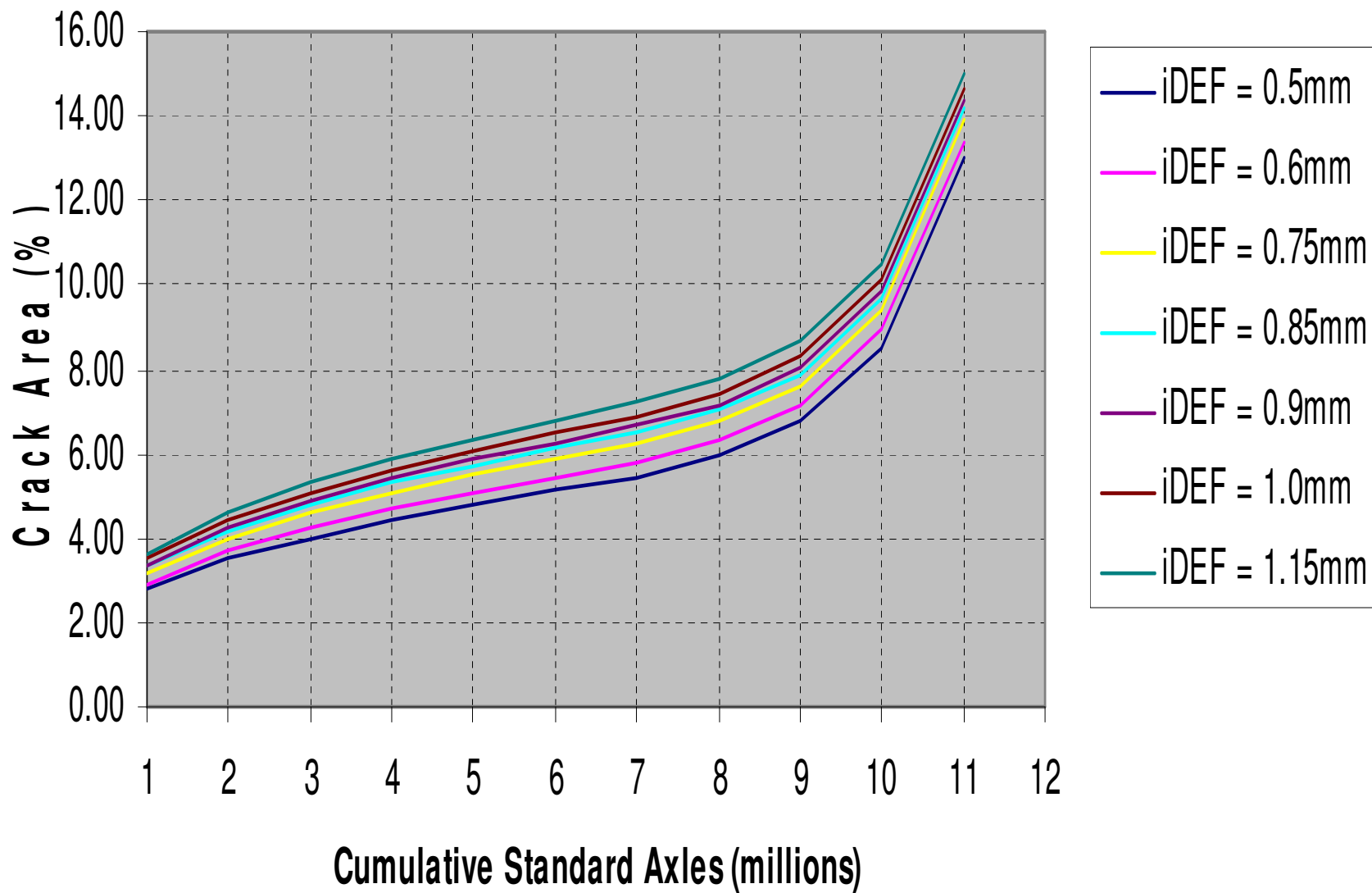
- **influencing parameters such as  
traffic intensity and loading - cumulative  
standard axles  
pavement age (years) since last renewal /  
strengthening**

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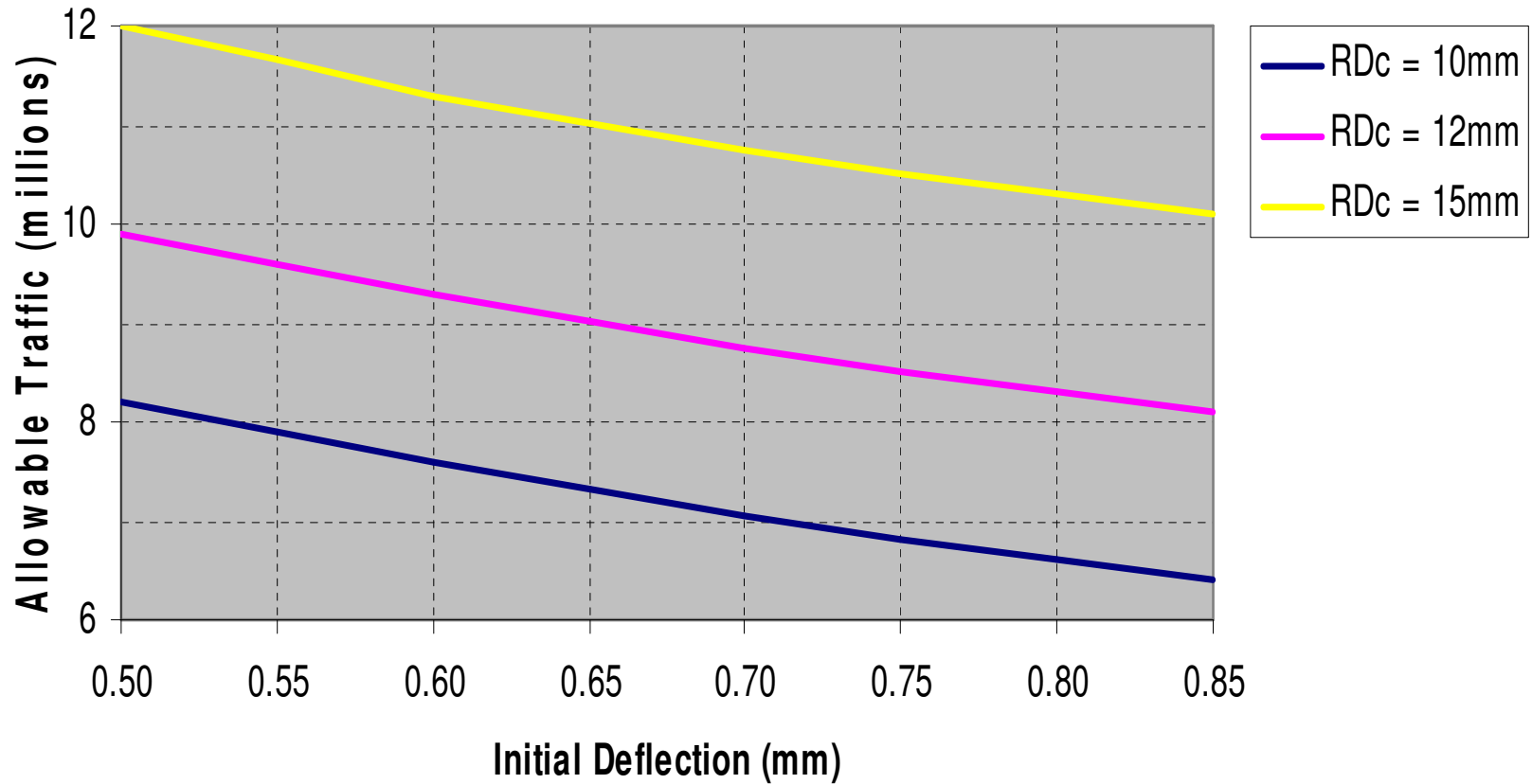
# Structural Performance of Flexible Pavements



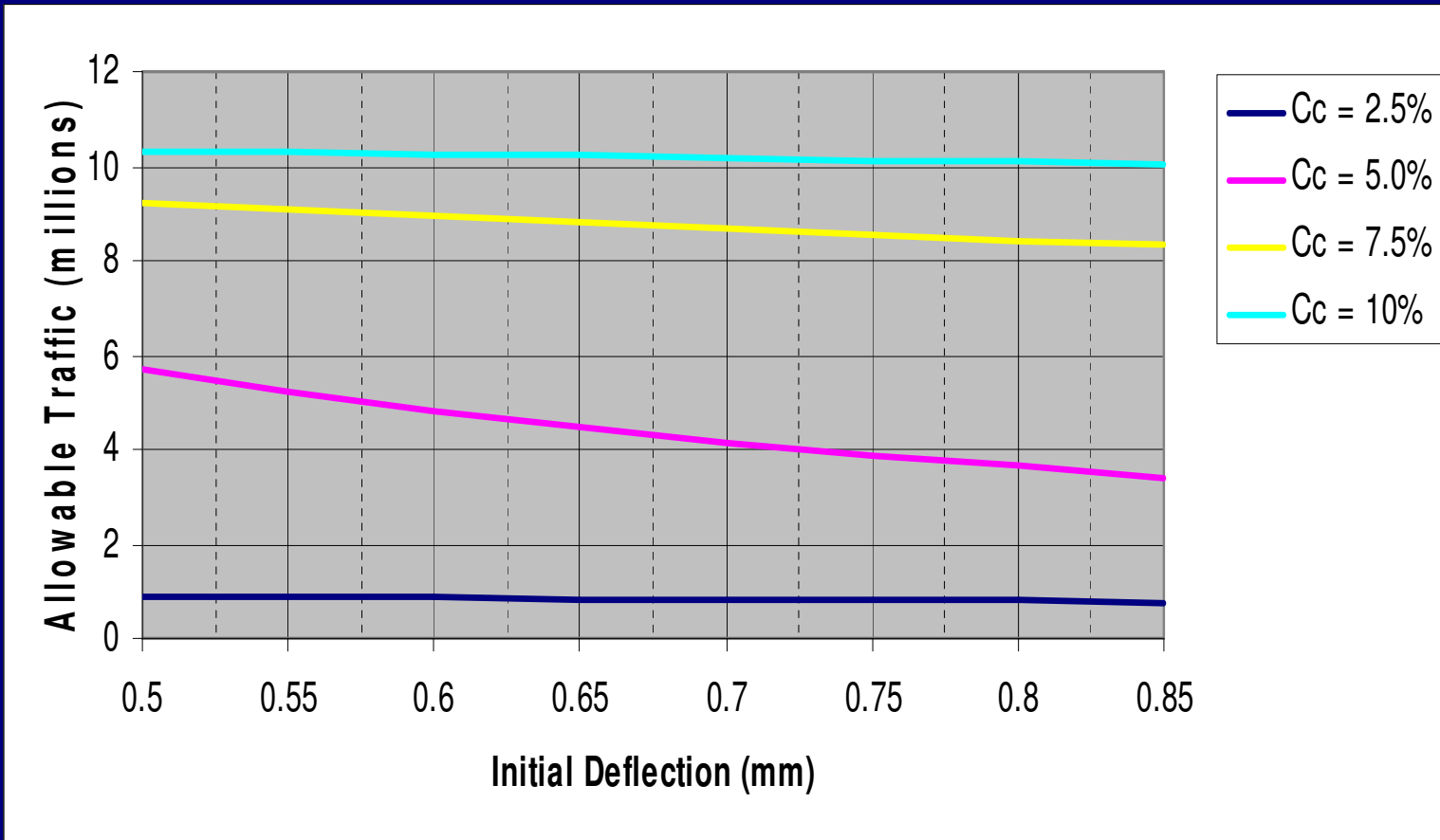




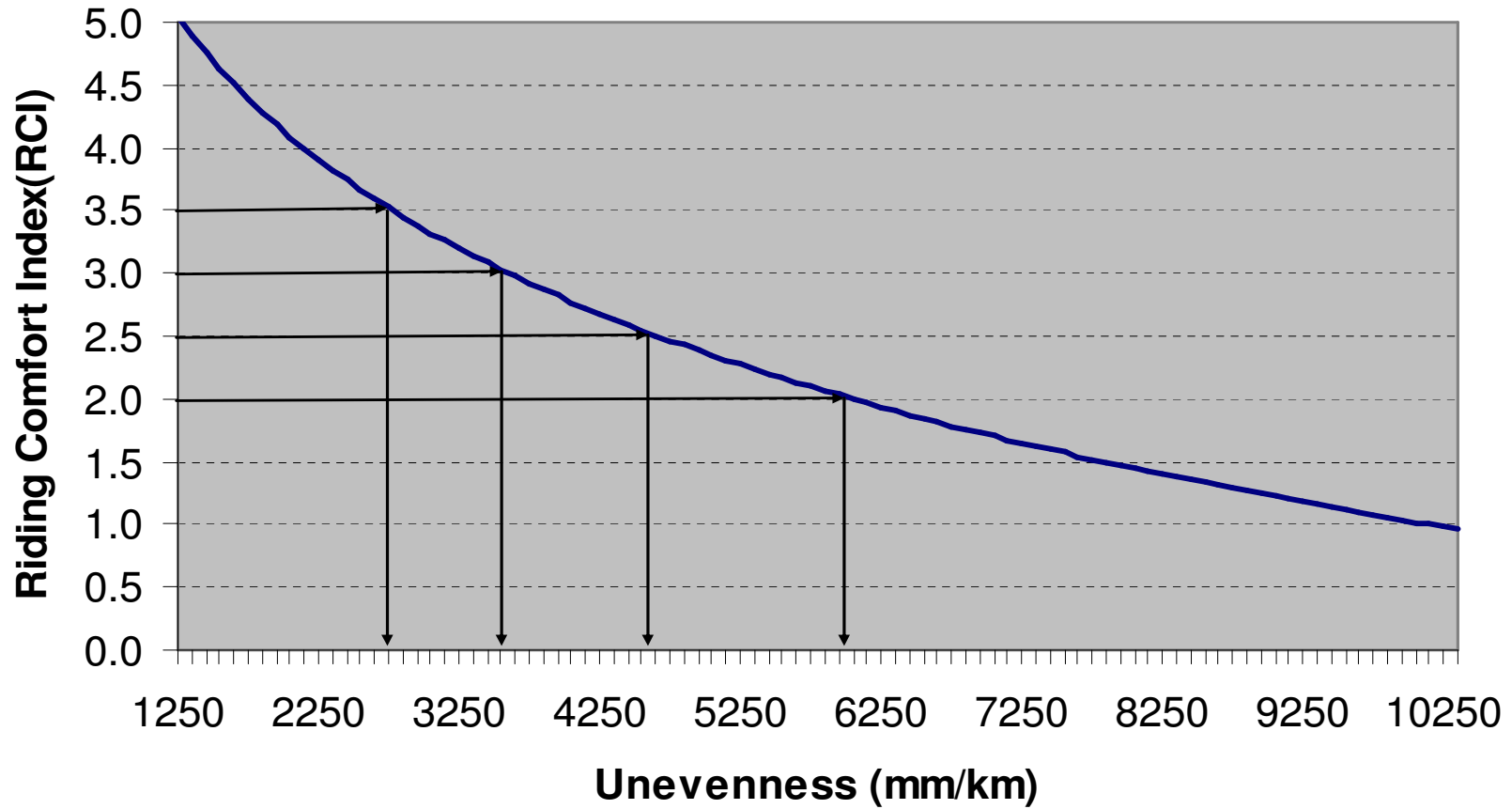
# Rutting Life Criteria – Allowable traffic

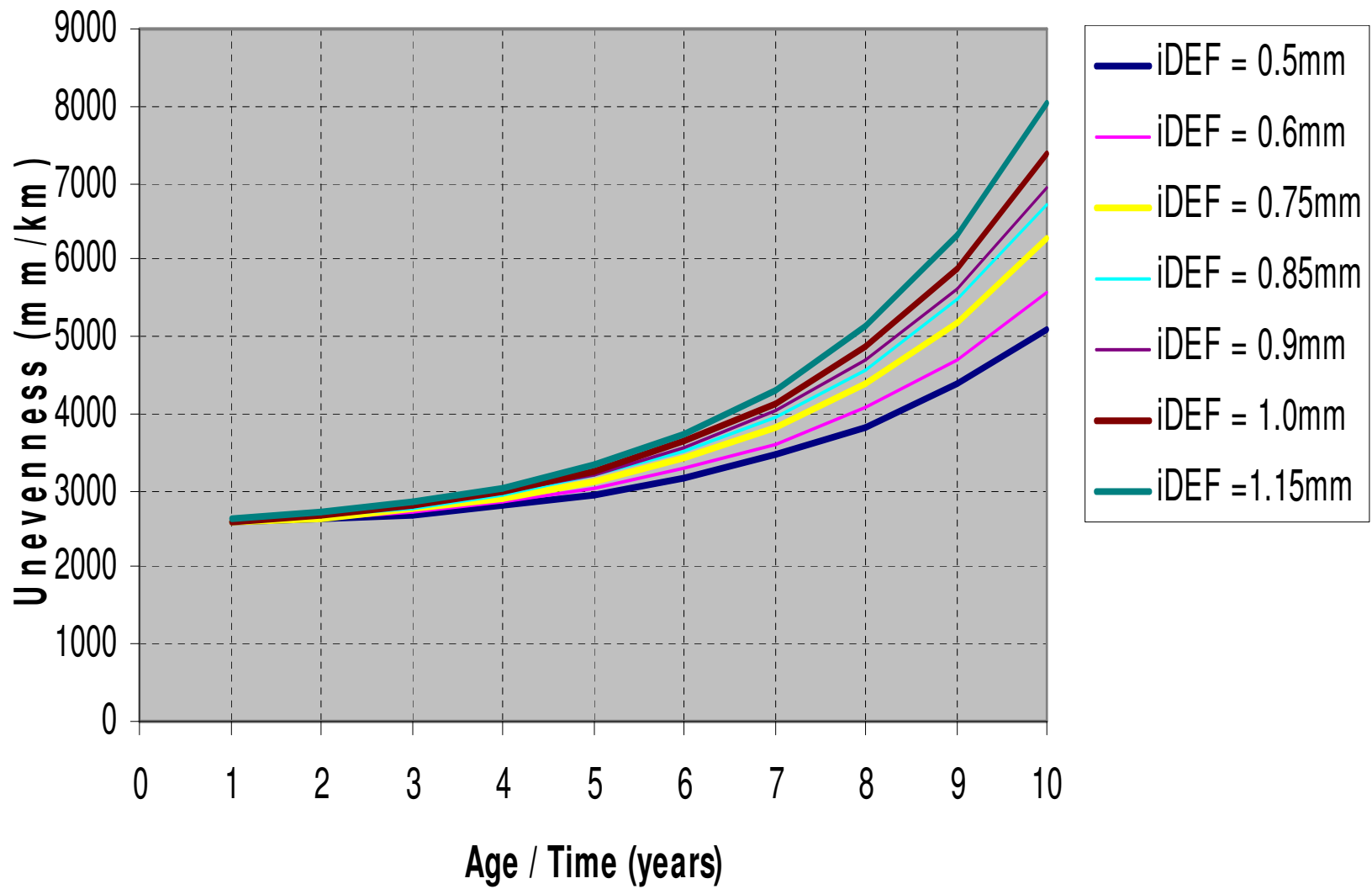


# Cracking Life Criteria – Allowable traffic



# Functional Performance of Flexible Pavements





# Definition of Flexible Pavement Condition Categories

Category	Definition
1	<i>Sound</i>
2	<i>Some deterioration</i>
3	<i>Moderate deterioration</i>
4	<i>Severe Deterioration</i>
5	<i>Failed</i>

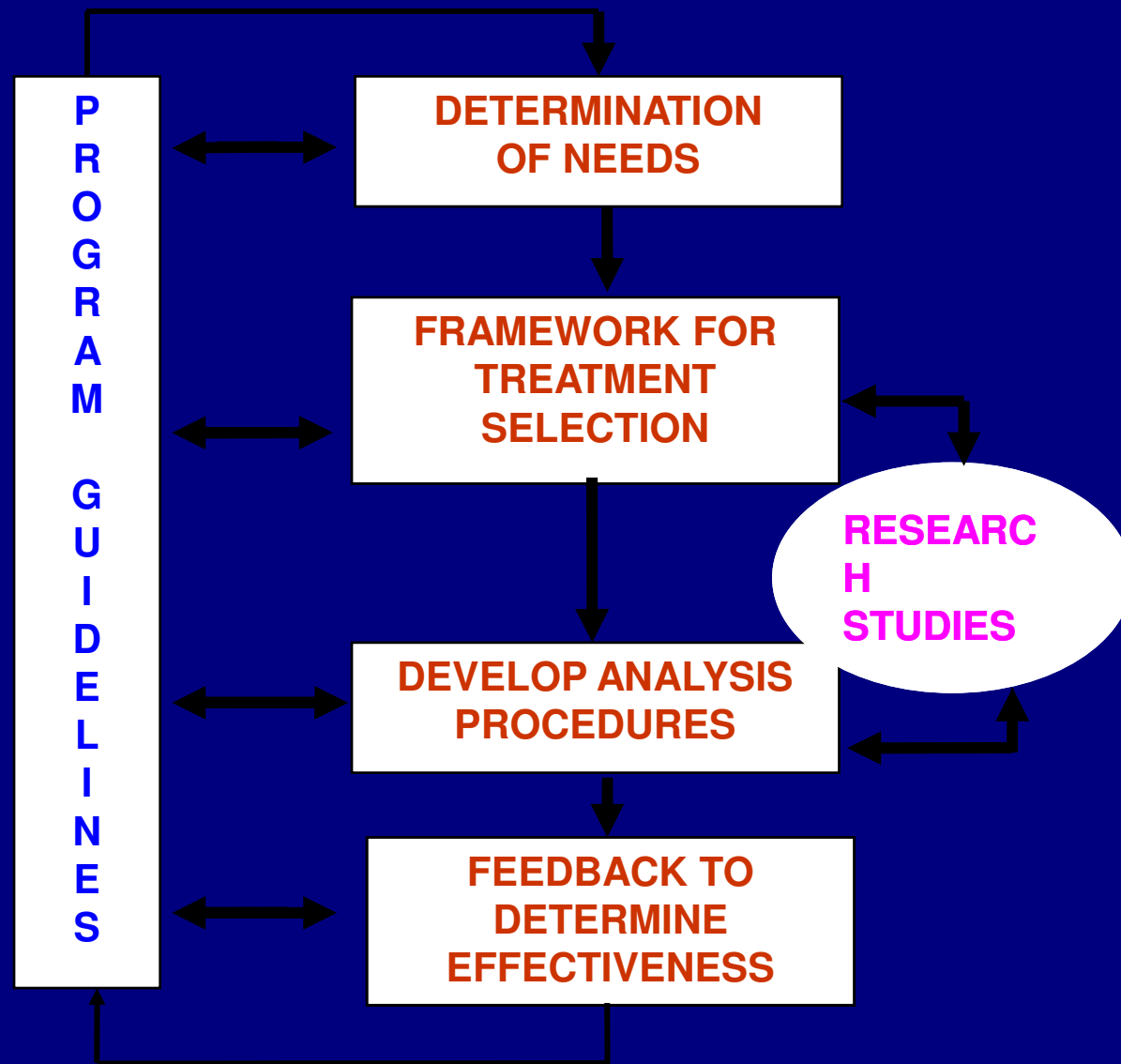
# Flexibles Pavement Performance Standards

Category	Threshold Value				
	1	2	3	4	5
Rut Depth (mm)	9	12	15	20	
Cracking (% Area)	2.0	5	7.5	10	
Riding Comfort Index (5 – 0)	4	3	2.5	2	
Unevenness, mm/km (IRI)	2100 (2.89)	3600 (4.68)	4750 (5.99)	6000 (7.37)	

# **PAVEMENT PRESERVATION – ASSET MANAGEMENT FOR INDIA**

- **Pavement Preservation - Asset Management (PPAM)**
  - **Commitment of maintenance agency**
  - **Customer focused comprehensive training**
  - **Dedicated Funding**

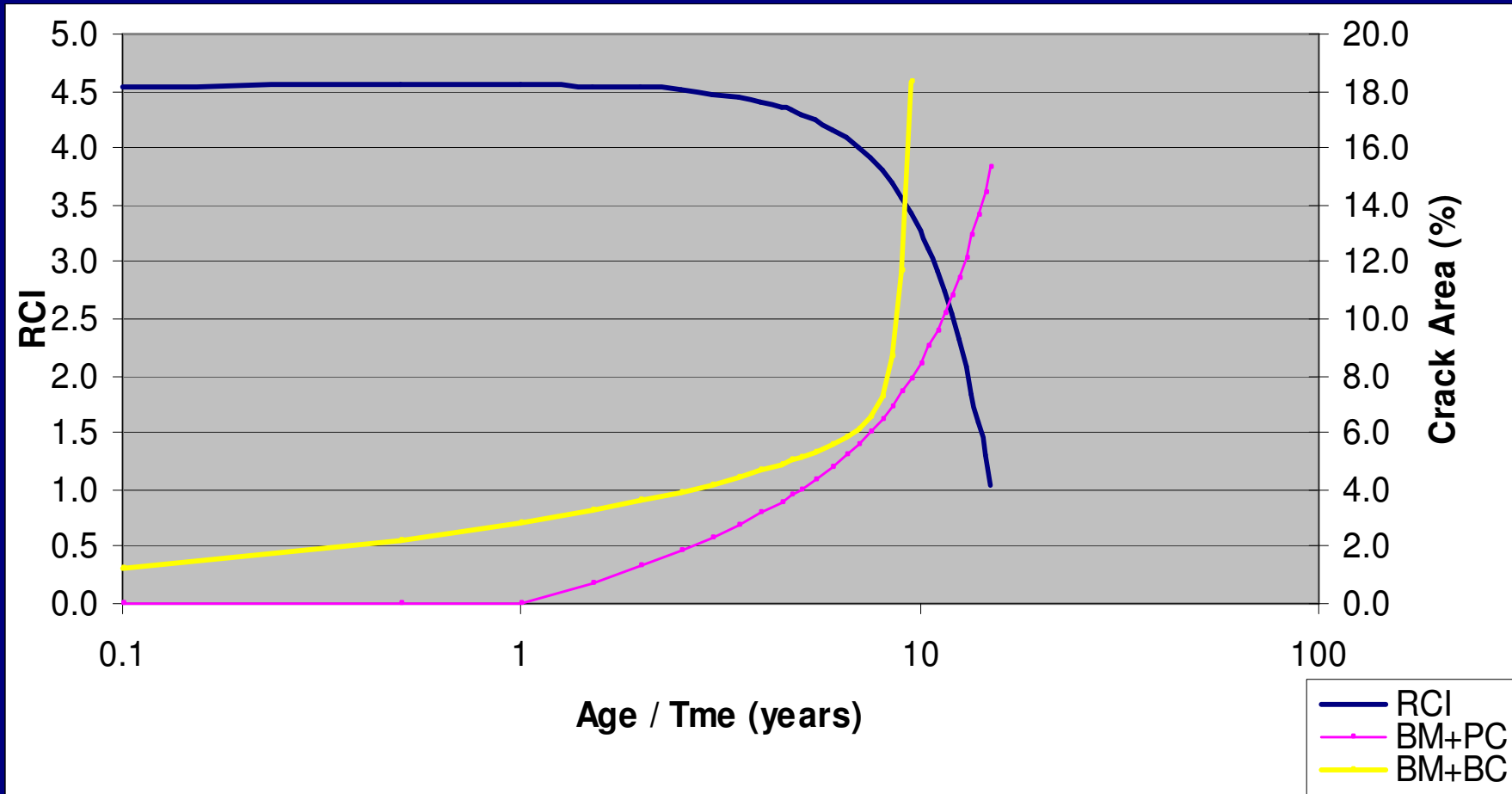
# Pavement Preservation Program – Needed Approach



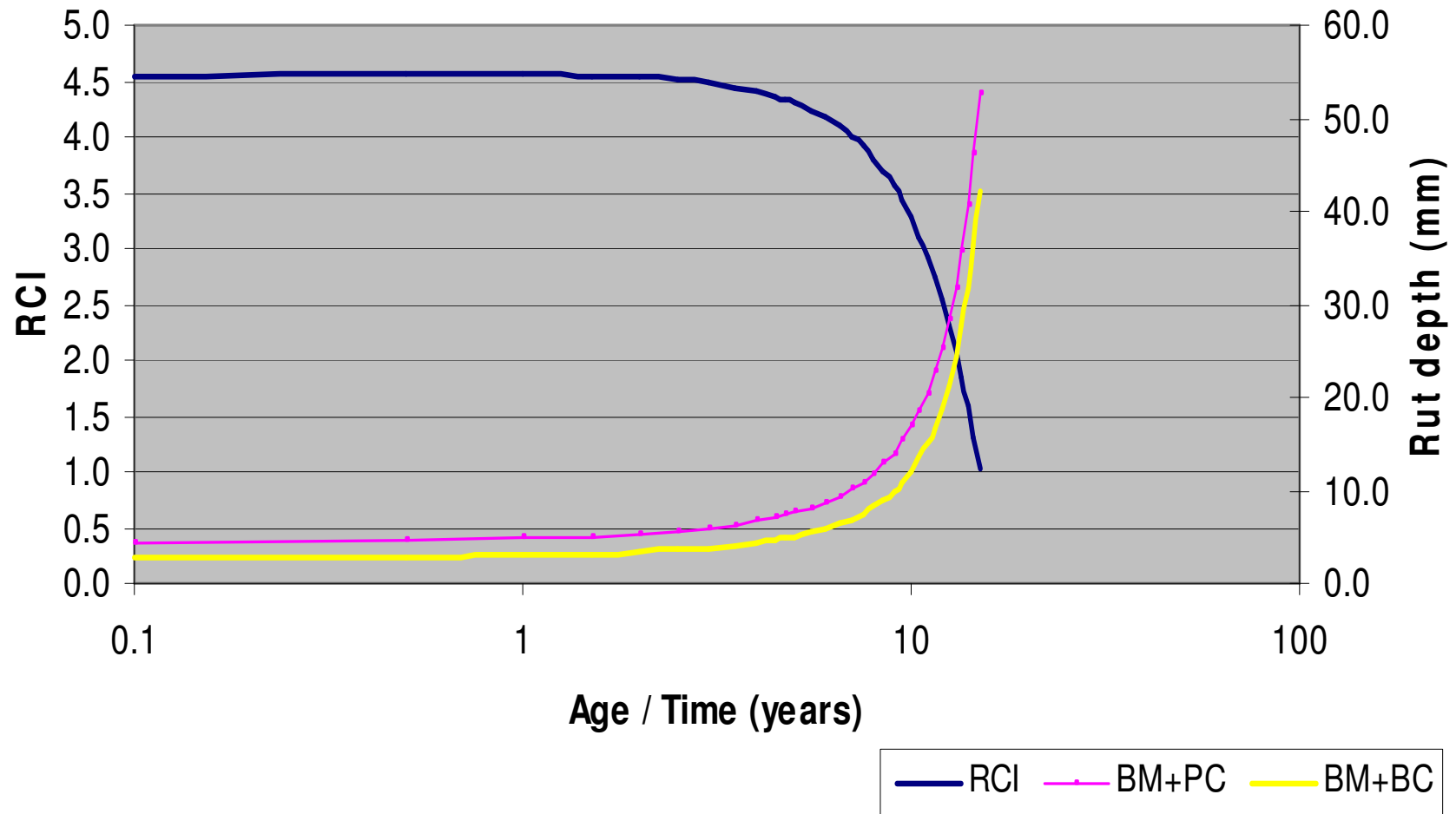
# Available Tools for Development of PPAM

- Pavement performance / condition data collection
- Pavement performance / deterioration prediction models
- Pavement performance in terms of structural and functional condition
- Performance standards and maintenance trigger values
- Methodology to estimate remaining service life of pavements
- Prioritization methodology for maintenance
- Life cycle cost analysis

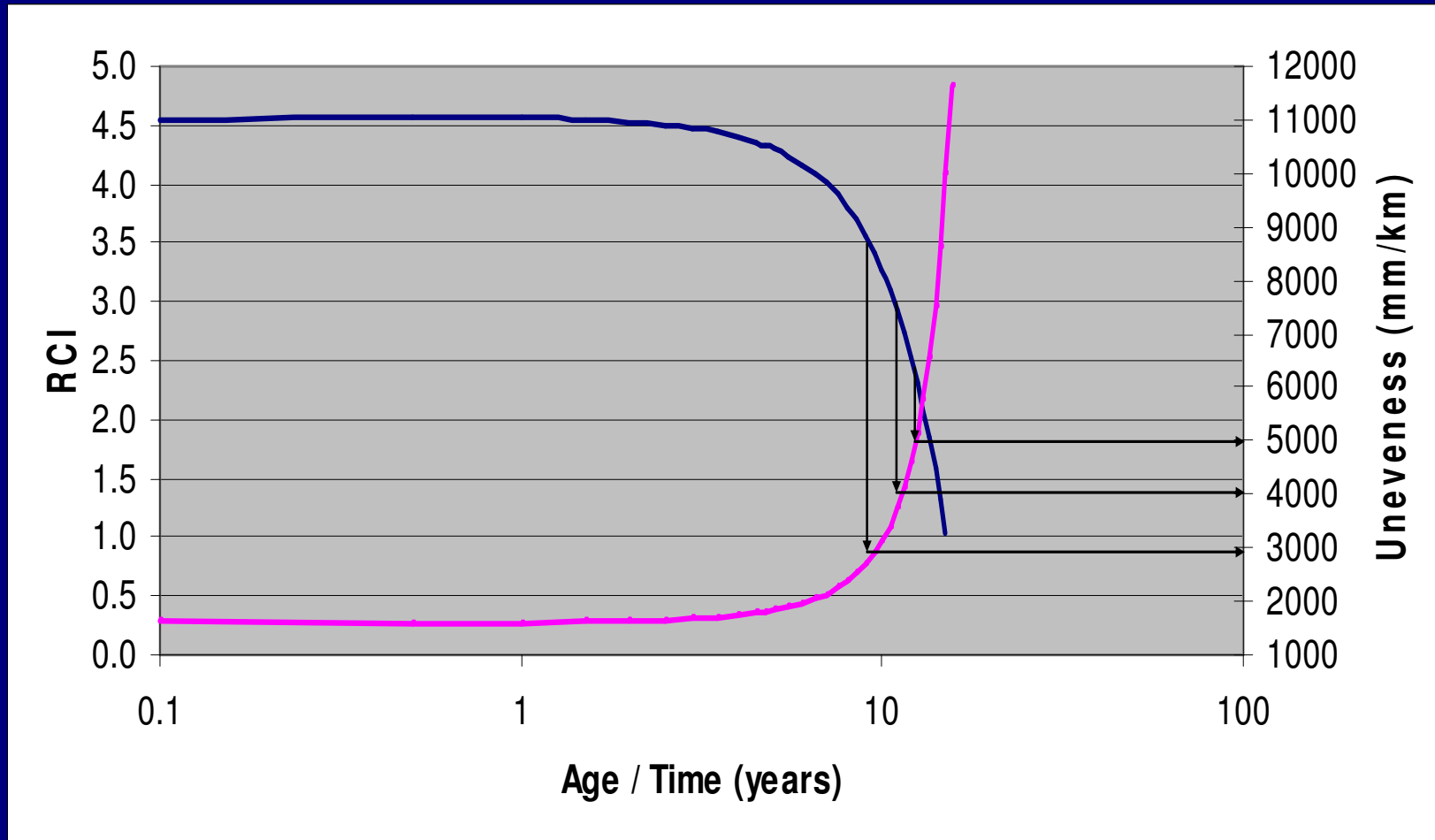
# Crack area envelops with RCI



# Rut depth envelopes with RCI



# Functional Life Criteria



# Practical Application of Pavement Preservation - Asset Management

- The initial condition characteristics of pavement and traffic details are:

Initial deflection (iDEF) = 0.6mm

Initial Unevenness (iUI) = 1200 – 1300mm

Pavement surface: Bituminous Concrete  
(Asphalt Concrete)

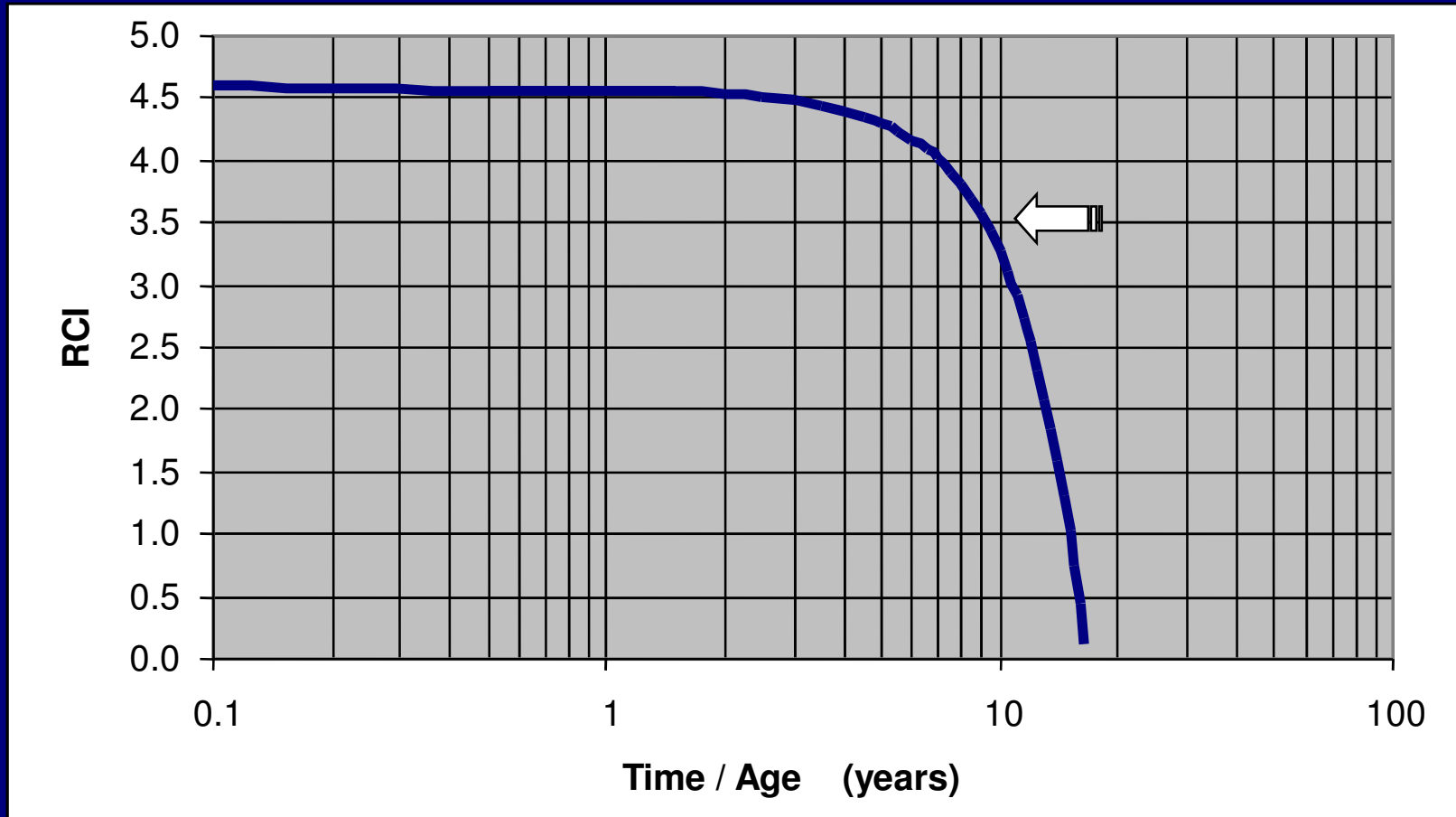
Traffic (A) = 3000 cvpd

Traffic growth factor = 0.075

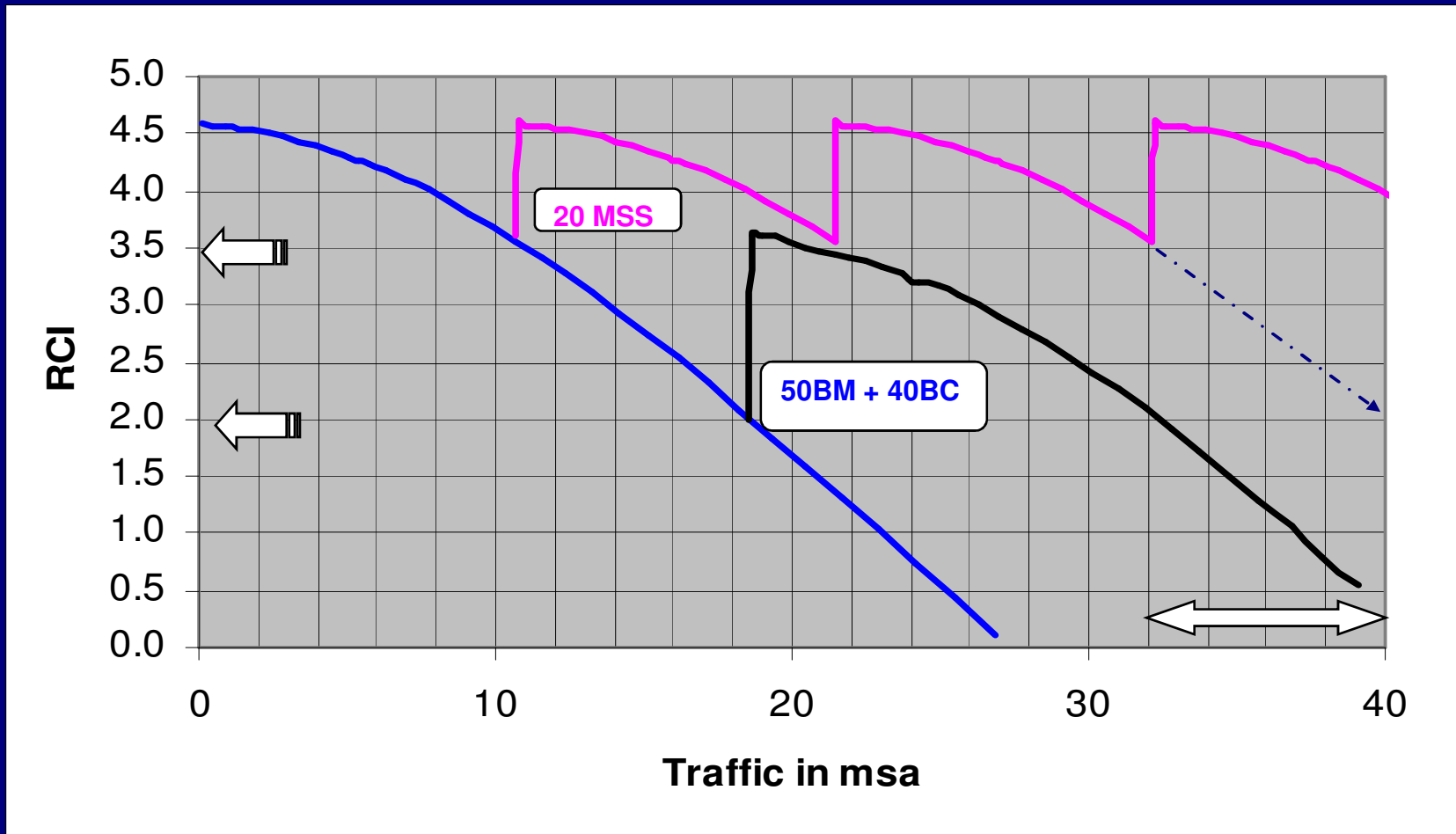
Vehicle Damage Factor (VDF) = 4

Transverse Distribution Factor (TDF) = 0.2

# Variation of RCI with the Ageing of Pavement



# Performance based Pavement Preservation



# Resulted Benefits

- **Better riding quality** : RCI of 3.5 against 2.0, thus better serviceability
- **Extended service life** : 8 msa (> 5 years) at 2.0 RCI for comparison at 40 msa
- **Savings in Total costs** : about 70 million Rs. Per two lane km, due to the preventive maintenance adopted in this case

# DISCUSSIONS

- Highway pavement performance database and over ten-year-long experience in the deflection, rut depth, crack area, unevenness and other surface distress measurements
- Pavements with lower value of initial deflection - for longer life periods
- Functional condition deterioration - functional performance and life of in-service flexible pavements to establish the timing for maintenance so as to improve the riding quality of flexible pavements
- Pavement preventive maintenance is just one of pavement preservation concepts

- **Preventive maintenance programs emphasize cost effective treatments and understanding the life cycle cost implications of different strategies**
- **The treatment performance is greatly affected by the condition of the pavement when treatment is applied**
- **The benefits of preventive maintenance better known and accepted**
- **To study the successful countries experience and to share with other agencies**
- **A comprehensive training program in the area of pavement preservation policy, programming, and techniques is needed**

# CONCLUSIONS

- **Models to predict the pavement performance of the overlaid pavements developed**
- **Deflection life relationship is capable of predicting at any time, the life expectancy of pavement**
- **Deflection has significant effect on IRI growth**
- **Critical condition envelopes for structural condition - to estimate the timing for major strengthening / rehabilitation**

- Functional condition envelopes - to estimate the optimum timing for resurfacing/ maintenance and vehicle operation costs
- **Pavement Performance Standards**

<b>Condition</b>	<b>RCI values</b>	<b>UI Range mm/km (IRI)</b>
Sound	3	3000 – 4000 (4-5)
Critical	2.5	4000 – 5000 (5-6)
Failed	2.0	6000 – 6500 (7-8)

- Pavement preservation by preventive maintenance treatments - restore pavement surface and extend its service life by 5 to 7 years - delay the need for the more costly pavement rehabilitation, allowing additional rehabilitation projects to be funded

- Proper implementation of a pavement-preservation program - other issues must be addressed
- The success of a pavement preservation program is based on selecting the right treatment for the right pavement at the right time
- Performance-related specifications and associated performance-level warranties, the contractors may be required to guarantee the performance of a pavement for a specified service life
- To ensure this level of performance, the contractor will be responsible for performing maintenance or preservation activities on an elective basis.



*Thank You All*