

# Lecture 1

## Introduction: Management System in Road and Pavement

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**Pavement Engineering**

**Road Management System**

**Pavement Management System**

**Pavement Evaluation (Assessment)**

**Pavement Rehabilitation**

## Terminology used in Pavement Engineering

Pavement Materials	Classification, quality assurance testing (specifications) and material design
Pavement Design	<ul style="list-style-type: none"> <li>• Design of structural layers for New Pavements and Pavement Rehabilitation</li> <li>• Assess in-situ pavement material properties and layer thickness</li> </ul>
Pavement Construction	Construction practices of new pavements and pavement rehabilitation including specification development and quality assurance
Pavement Management	Monitoring post-construction condition, timing preventive maintenance and rehabilitation treatments and economic analysis of alternatives

## Road Management System, RMS

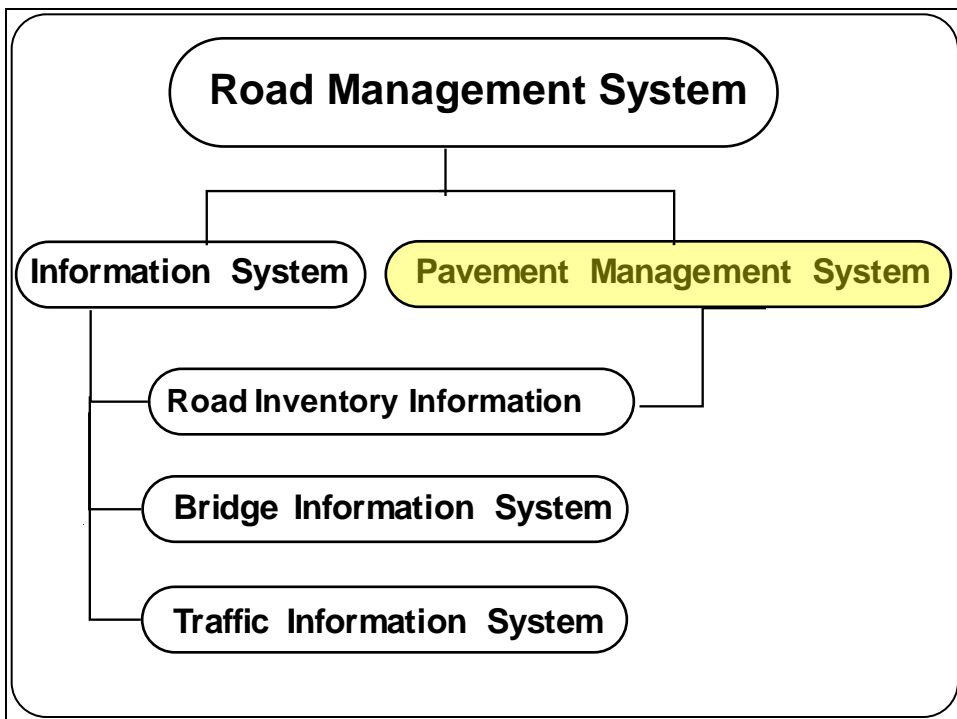
- **A System**, used to store and process road data for highway planning and programming
- **The Methodology**, to identify, priorities and address maintenance and planning decisions of road network using computerised technical tools systematically

## Objectives of RMS

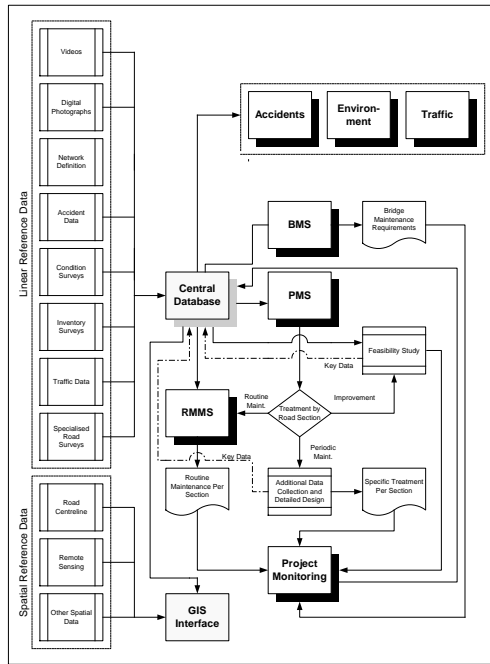
- Operating road network with minimum cost and high efficiency
- Life cycle support to the road network management
- Accurate Information to the managers
- **Managing Road Asset is important for economic development**
  - **Cost effective**
  - **Strategic**
  - **Efficient**

## RMS in the Planning Process

- Reliable database
- Rational work programmes
- Field inspections to refine the programme
- Forward Programming



# RMS Framework



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# RMS Functions

- Major activities include:
  - Needs Assessment;
  - Strategic Planning, including budgeting for new development and asset preservation
  - Development, under budget constraints, of multi-year works expenditure programs
  - Data collection



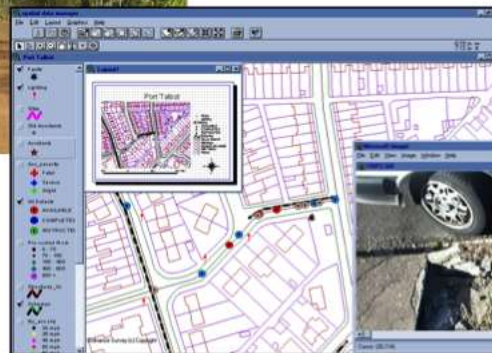
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# Road Information System



- Road Inventory Information
- Road Asset Information
- Road Condition Information
- Traffic Information
- Bridge Information
- Accident Information

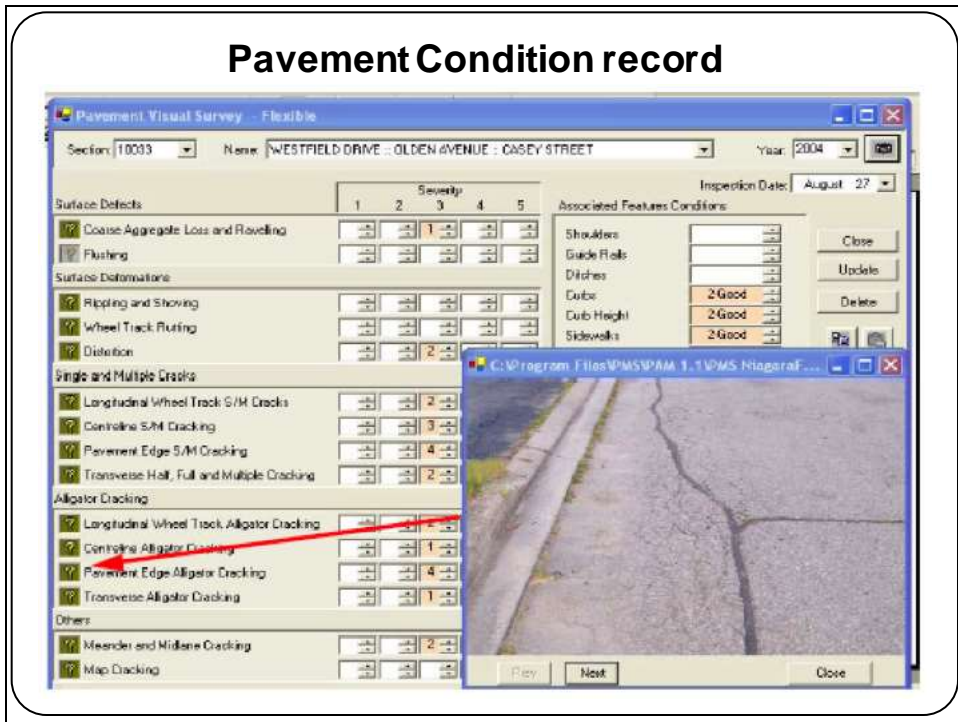
# Multi-media Data



**Store and display multi-media data, often through GIS**



## Pavement Condition record



## A Pavement Management System is...

- ...a set of tools or methods that assist decision-makers in finding optimum strategies for providing, evaluating, and maintaining pavements in a serviceable condition over a period of time.

*AASHTO Guide for Design of Pavement Structures (1993)*

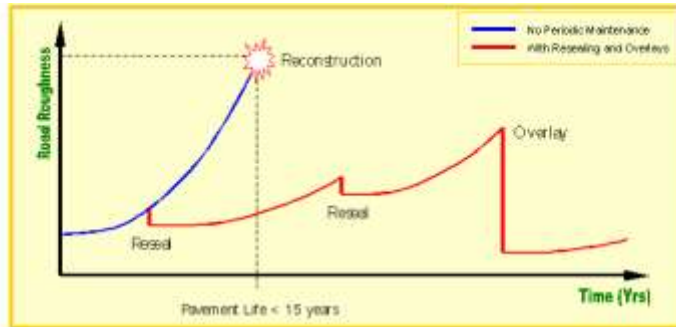
## Use of Pavement Management

- Identify and prioritize maintenance and rehabilitation needs
  - Select projects and treatments on an objective, rational basis
- Assist agencies in determining cost-effective treatment strategies
  - Allocate funds so an agency can get the most “bang for the buck”
  - Demonstrate impacts of alternate strategies

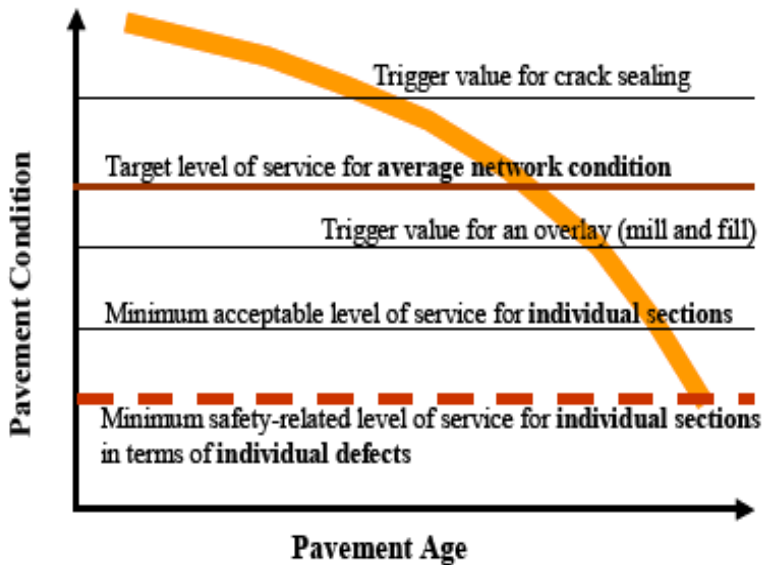
## Pavement Management System

- Optimisation & Prioritisation of upgrading & maintenance works including budget planning
- Life cycle cost approach
- Uses the inventory and traffic information
- Computerised planning tools

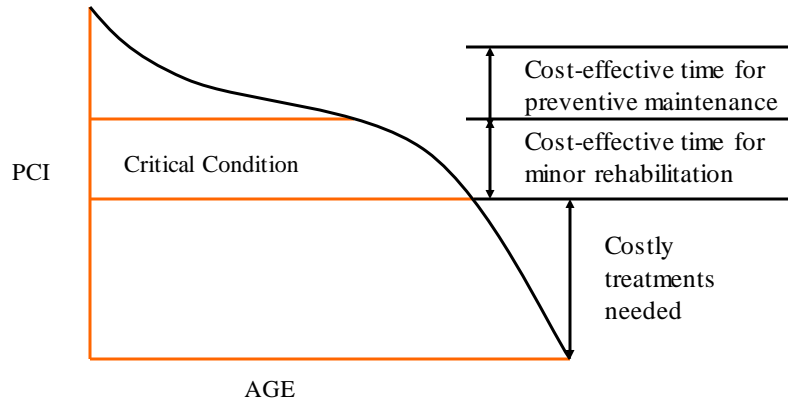
# Life Cycle of Pavement



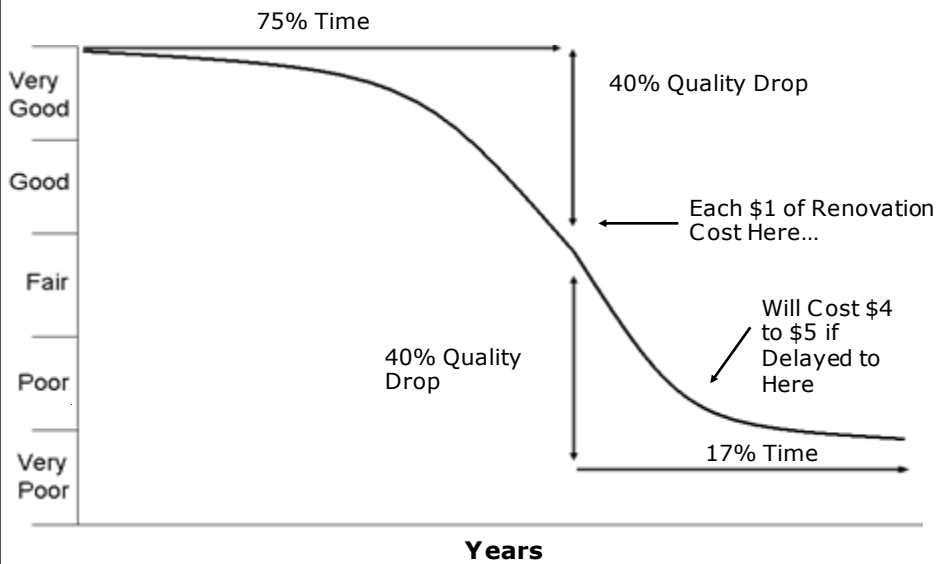
# Criteria for Pavement Management



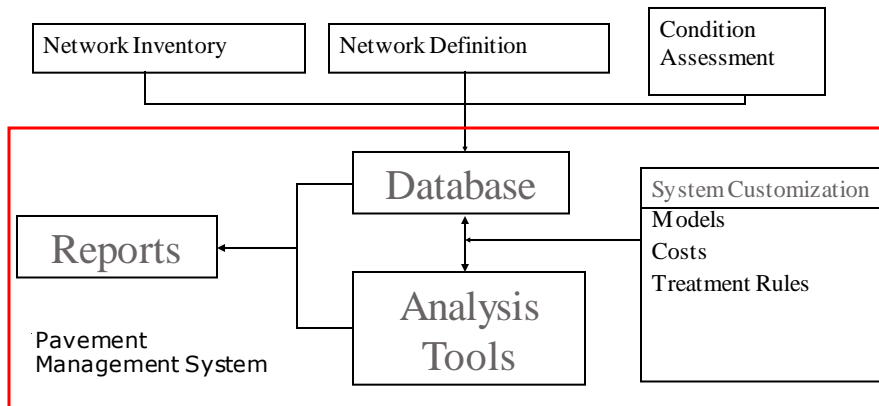
# Managing Pavement Deterioration



# Normal Pavement Deterioration



# Pavement Management Components



## Network Inventory

- Type of Data to be Collected
  - Physical characteristics
  - Construction and maintenance history
  - Traffic levels
  - Climate information
  - Soils information
- Minimal Amount of Information Required
  - Surface type
  - Last construction date
  - Physical dimensions

## Network Definition

- Used to link network inventory information to a physical location in the field
- Determine section boundaries by evaluating the road characteristics. Sections should be similar in terms of surface type, structure, and traffic
- Identify beginning and end points and width

## Condition Assessment

All system recommendations are based on the current and predicted conditions of the sections in your network

Therefore, **the assessment of current condition MUST be objective and repeatable**

BUT, it must also match available resources



## Types of Pavement Condition Data Collected

- Surface distress (cracking, surface deform)
- Roughness (ride)
- Faulting
- Rutting
- Skid resistance
- Structure (pavement strength and deflection)

## Approaches to Collecting Pavement Condition Data

- Manual
- Semi-automated
- Automated



## Pavement Condition Survey Equipment

### Profiler

roughness, distress,  
rutting, noise,  
pavement cracking



Structural  
Capacity

### Skid Trailer

Pavement  
friction



FWD



### GPR

Layer  
Thickness



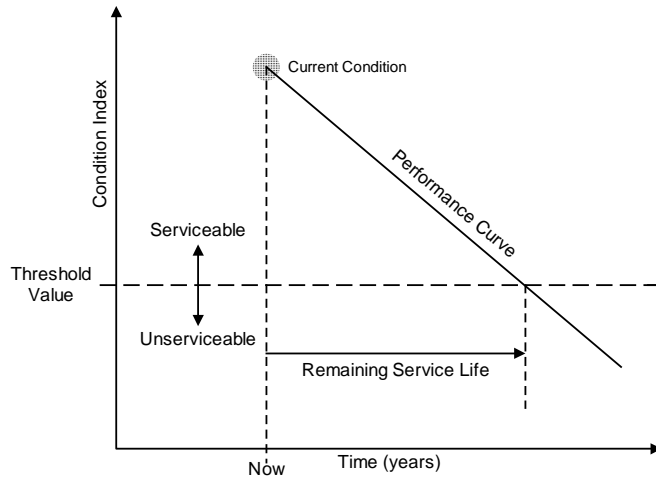
Equipment Demo  
Last Day

## Condition Indices

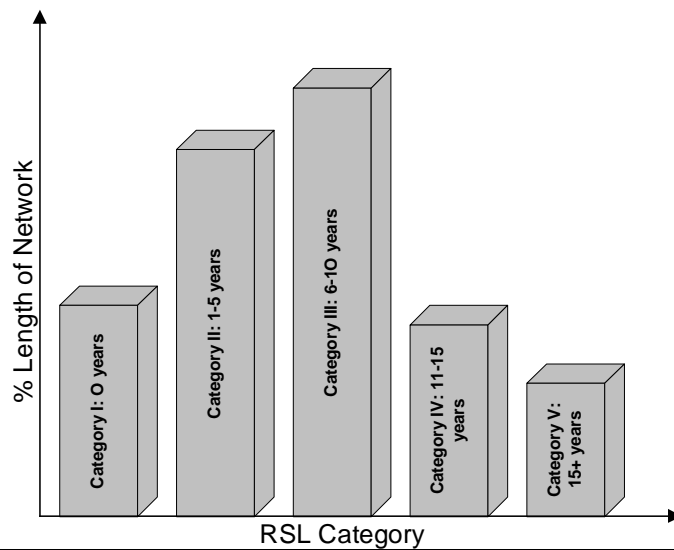
- Individual Indices
  - Ride Index
  - Structural Index
  - Cracking Index
- Composite Index
  - 40% Ride + 40% Structural + 20% Cracking
  - $\Sigma$  (Deduct points associated with a distress type, severity, and extent combinations)



## RSL Calculation



## RSL Distribution



## Database

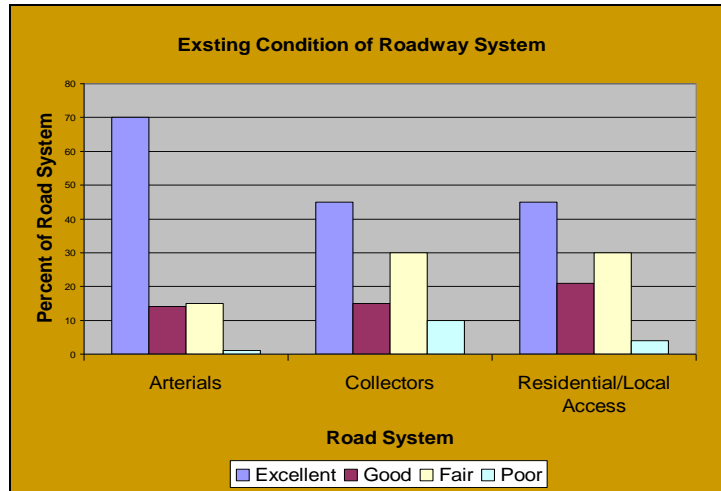
- Inventory Data
- Condition Data
- Record Retrieval and Reporting



## Capabilities Once The Database Is Established

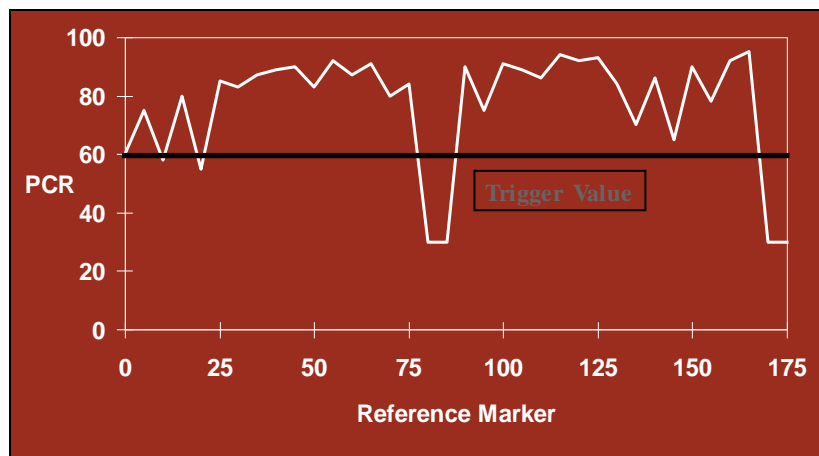
- Inventory reports
- Condition ratings
  - By functional classification
  - By surface type
- Pavement distress data analysis
  - Overall condition
  - Rate of deterioration
  - Cause of deterioration
- Ranked lists of road needs
  - Worst first or weighted rankings

## Condition Summary on a Network Basis



## Condition Summary - By Route

PCR Values for State Route 286 Eastbound



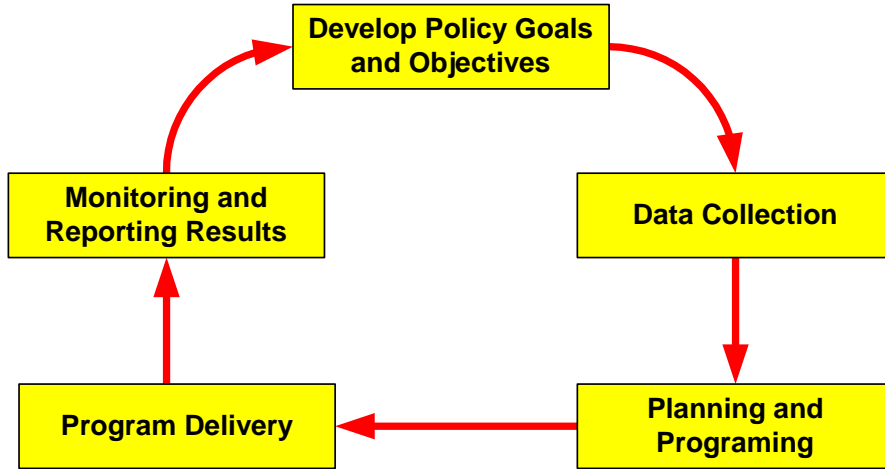
## Condition Reports Through a Map Link



## Key elements of RMS

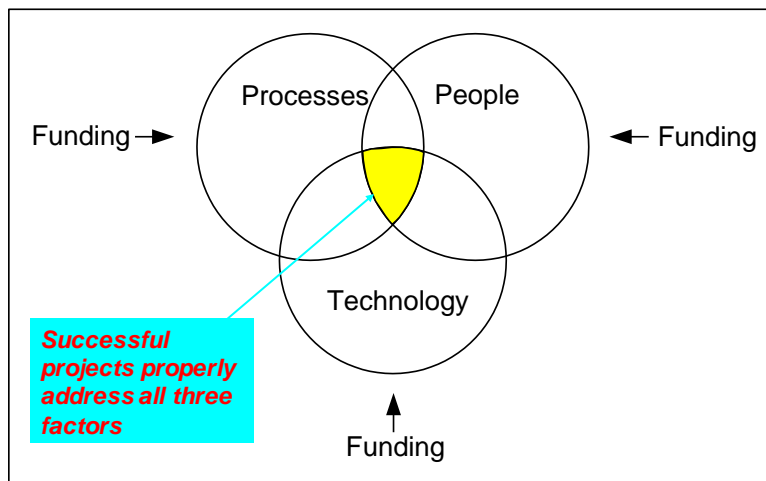
- Strategic Goals
- Inventory
- Performance Indicators
- Prediction tools
- Decision analysis
- Optimisation tool
- Links to budget process

## ROAD ASSET MANAGEMENT CYCLE



*Asset management is a process to strategically manage a transportation system in a cost-effective and efficient manner*

## The Key to Success



## Processes

### Success Factor

- The RMS must have an active role in the agency

### ✦ To Achieve this,

- The RMS must be an integral part of the agency's monitoring and planning process
  
- Outputs should be used to prepare annual reports to ensure data are regularly collected and the system applied

## Technology

### ✦ Key Success Factor:

- **The IT components should be appropriate**

### ✦ To Achieve This:

Need a strong IT division – or outsource

RMS must fit into IT strategy

# People

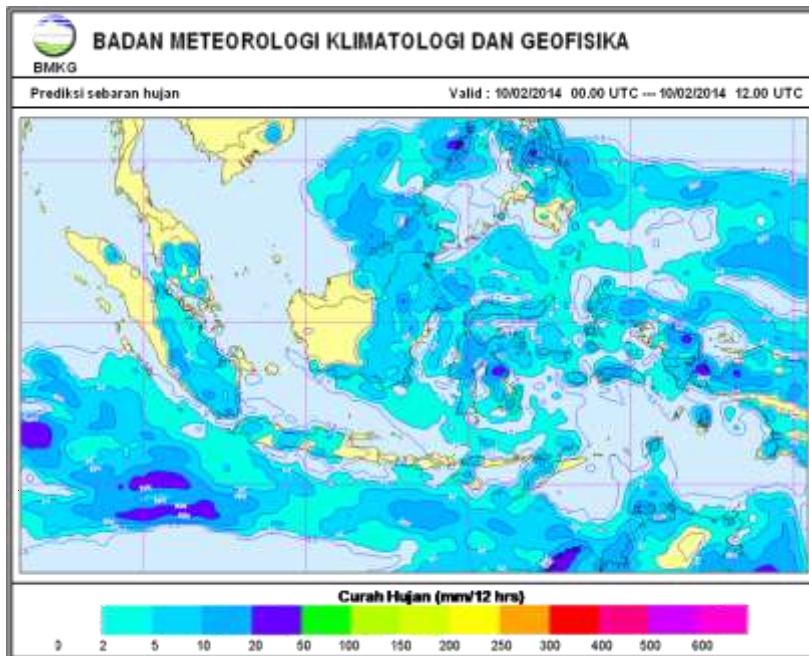
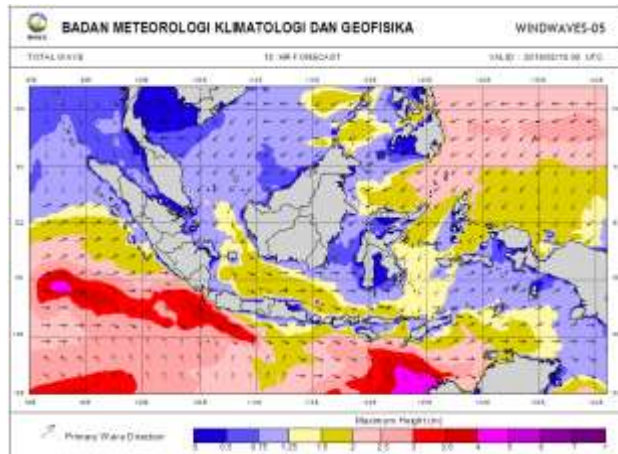
- ✦ Key Success Factor:
  - **The RMS must be fully institutionalized and supported**
  
- ✦ To Achieve This:
  - There must be an organizational unit to manage, monitor and continually improve the RMS

## DISCUSSION ON NEXT WEEK !

- Write a short observation presenting the condition of existing road-pavement in Jakarta Highway System and Northern Java-Highway Link (Pantura, Jalur Pantai Utara) di Jawa.
  - Effects of Rain Season and Flood Events in Some Towns
  - What's the significant factors affecting the deteriorations of pavement?
  - Rate the pavement condition based on your observation.
  - What should we do and plan to renovate and rehab the pavement backs to previous condition or be better ?

# Current Situation

- Climate Change, Rainfall Intensity and Duration, Flood







## Flood on highway and road networks



Note: Banjir yang melanda Subang, Jawa Barat, sejak Sabtu (18/1/2014). Source: Tribunnews

More ...

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After ...

