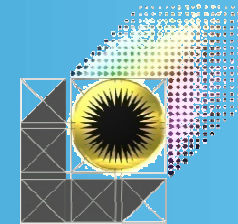


LISBOA 2010
MAY 25/28
16th World Meeting

DEVELOPMENT OF A NATIONAL ROAD ASSET MANAGEMENT SYSTEM FOR THE KINGDOM OF SAUDI ARABIA

Hazim M Abdulwahid
Abdullah Al Kahtani
Mustafa Abdulaziz



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- Methodology

- Pavement Management System Development

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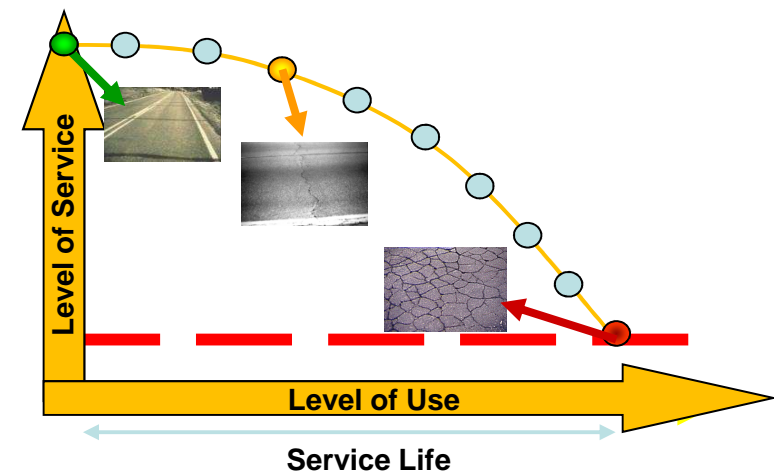
Introduction

MOMRA Challenges :

- ❑ **Preserving** the huge investments made in building an urban roadway network.
- ❑ Setting up maintenance priorities and achieving the **best return** of the invested funds.
- ❑ Best use of the limited available funds in a **cost effective** manner to provide **safe, smooth and economic** roadway network.
- ❑ Meeting **policy goals** with respect to the desired level of performance.



Over 86000 km of road network



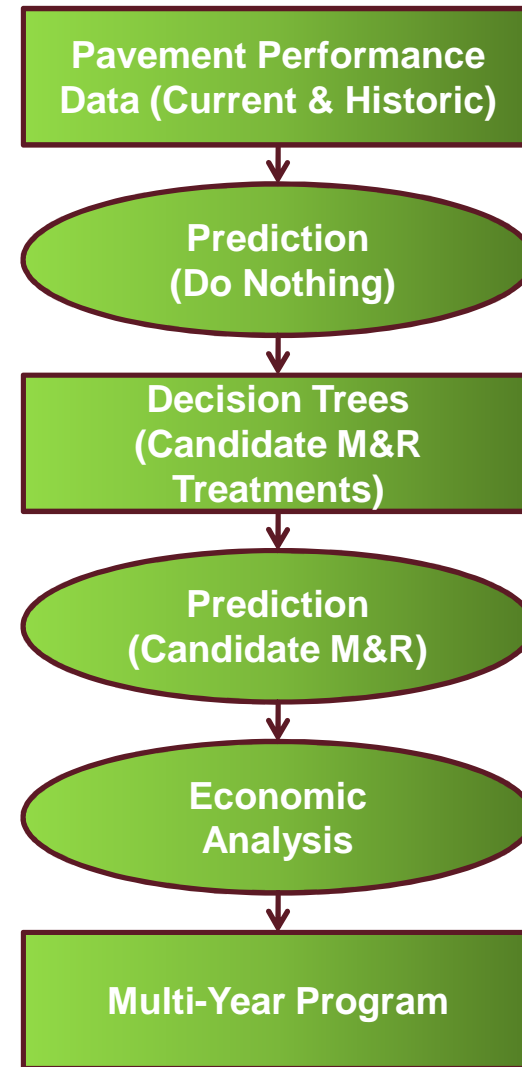


Introduction

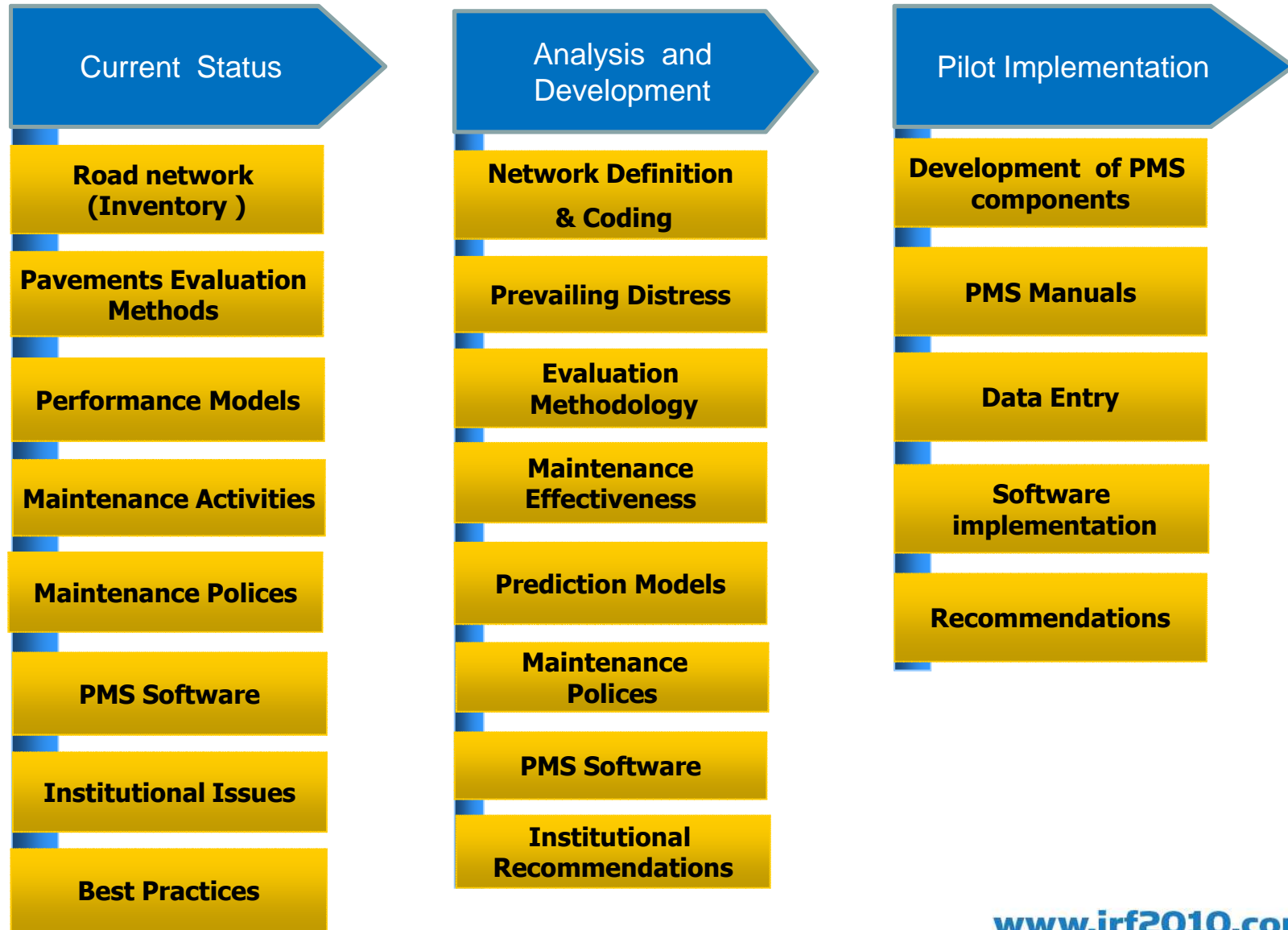
Approach

Utilize an Asset Management approach :

- Strategic Approach.
- Driven by policy goals and objectives.
- Relies on systematic assessments of asset performance and cost in making decisions on future actions.



Methodology

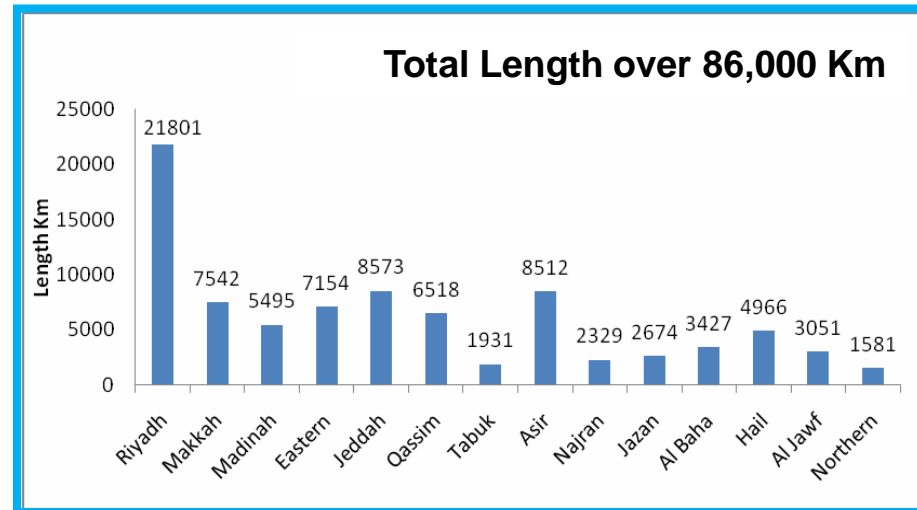


Current Status

Road network (Inventory)

Over 86,000 km owned by 14 Amana/160 municipalities .

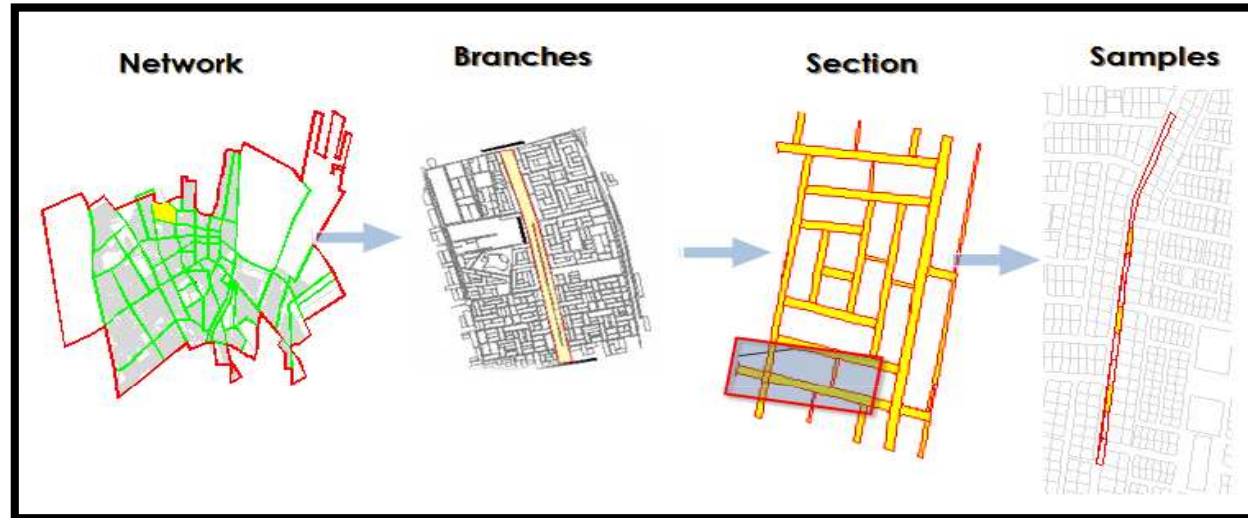
Collected inventory data from available drawings, satellite images, GIS and site surveys.



Current Status

• Network Definition and Coding System

- Sampling :
 - Per lane
 - Full road width

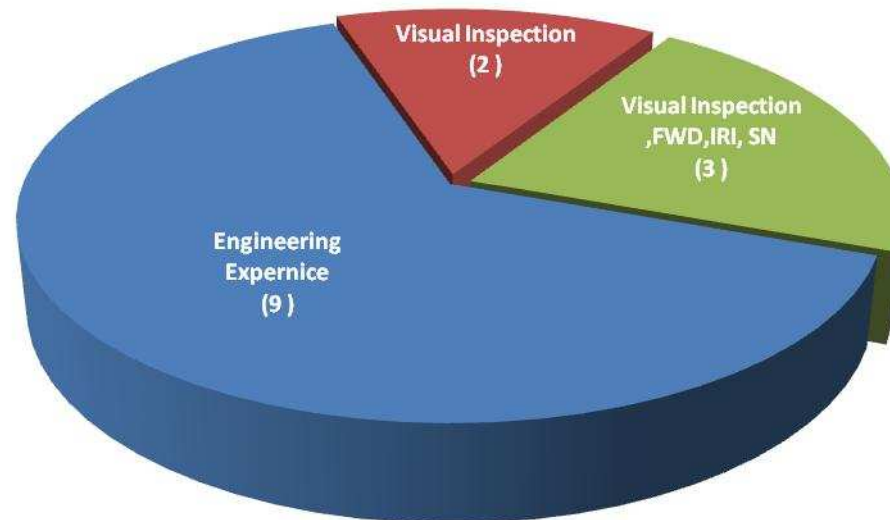


Municipality	City		Region		Area		Road			Section		Lane		Feature	
Arriyadh	√	√	√	√	√	√	√	√	√	√					
Makkah	√	√	√	√	√	√	√	√	√	√	√	√			
Madinah	√	√	√	√	√	√	√	√	√	√	√	√	√		
Qaseem	√	√	√	√	√	√	√	√	√	√	√	√	√		
Dammam	√	√	√	√	√		√	√	√	√	√	√	√	√	√
Others	No System														

Current Status

Pavements Evaluation Methods

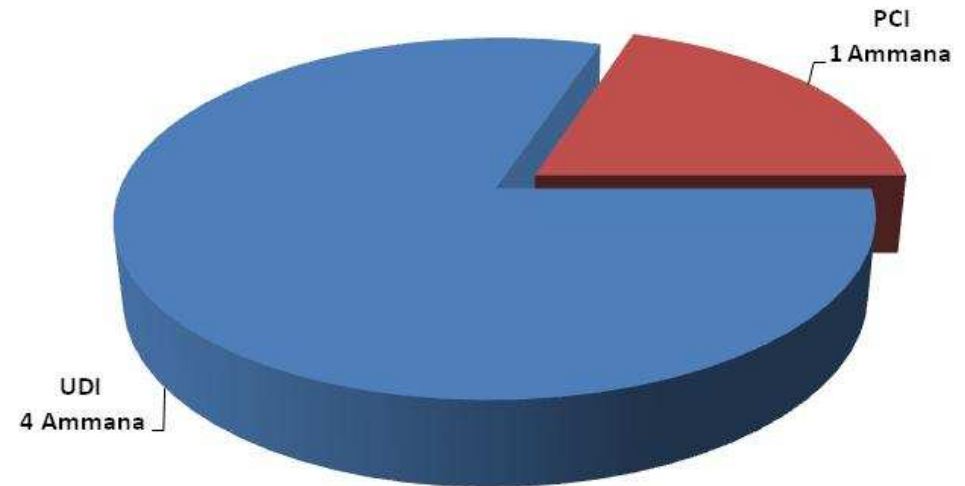
- Visual ,Functional and Structural Evaluation .



“Evaluation methods in the 14 Ammanah”

Pavements Evaluation Methods

- Implemented visual inspection methods (5 municipalities)
 - Urban Distress Index (UDI)
 - Pavement Condition Index (PCI)
- Implemented sampling methods
 - 100%
 - Statistical sampling methods
- Some Municipality inspect per lane and other inspect all section

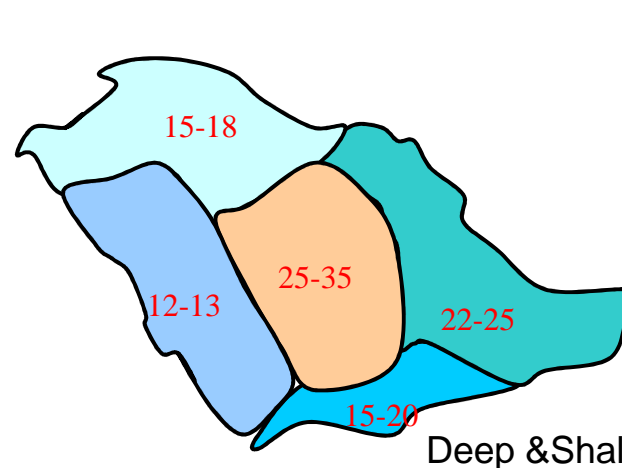


Current Status

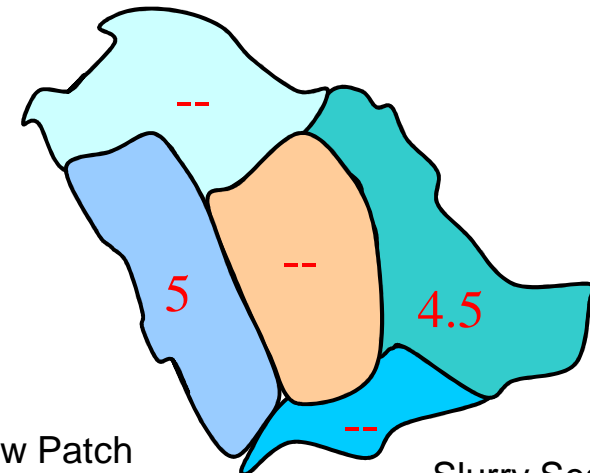
Maintenance Activities

Maintenance activities and associated costs vary from one region to another.

M&R No.	Description
1	Do Nothing
2	Apply Hot sand and Roll
3	Crack Sealing
4	Surface Patching
5	Deep Patching
6	Slurry Seal
7	Milling and Repave
8	Base Repair and Repave
9	Thin Overlay
10	Structural Overlay



Deep & Shallow Patch



Slurry Seal

Current Status



PMS Software

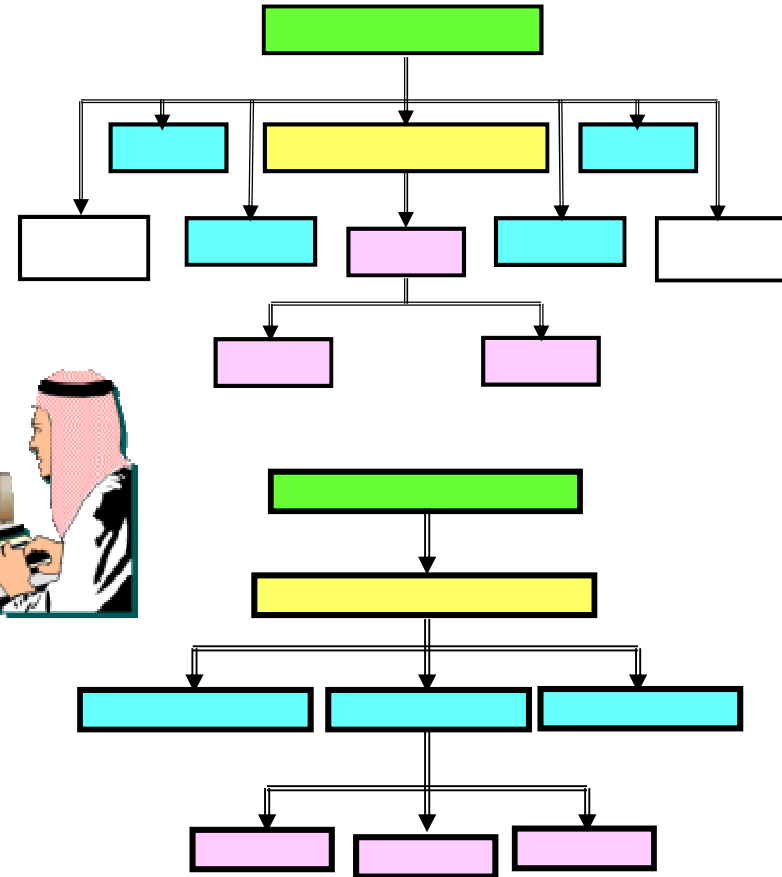
Riyadh, Dammam,
Makkah, Madinah and
Qaseem



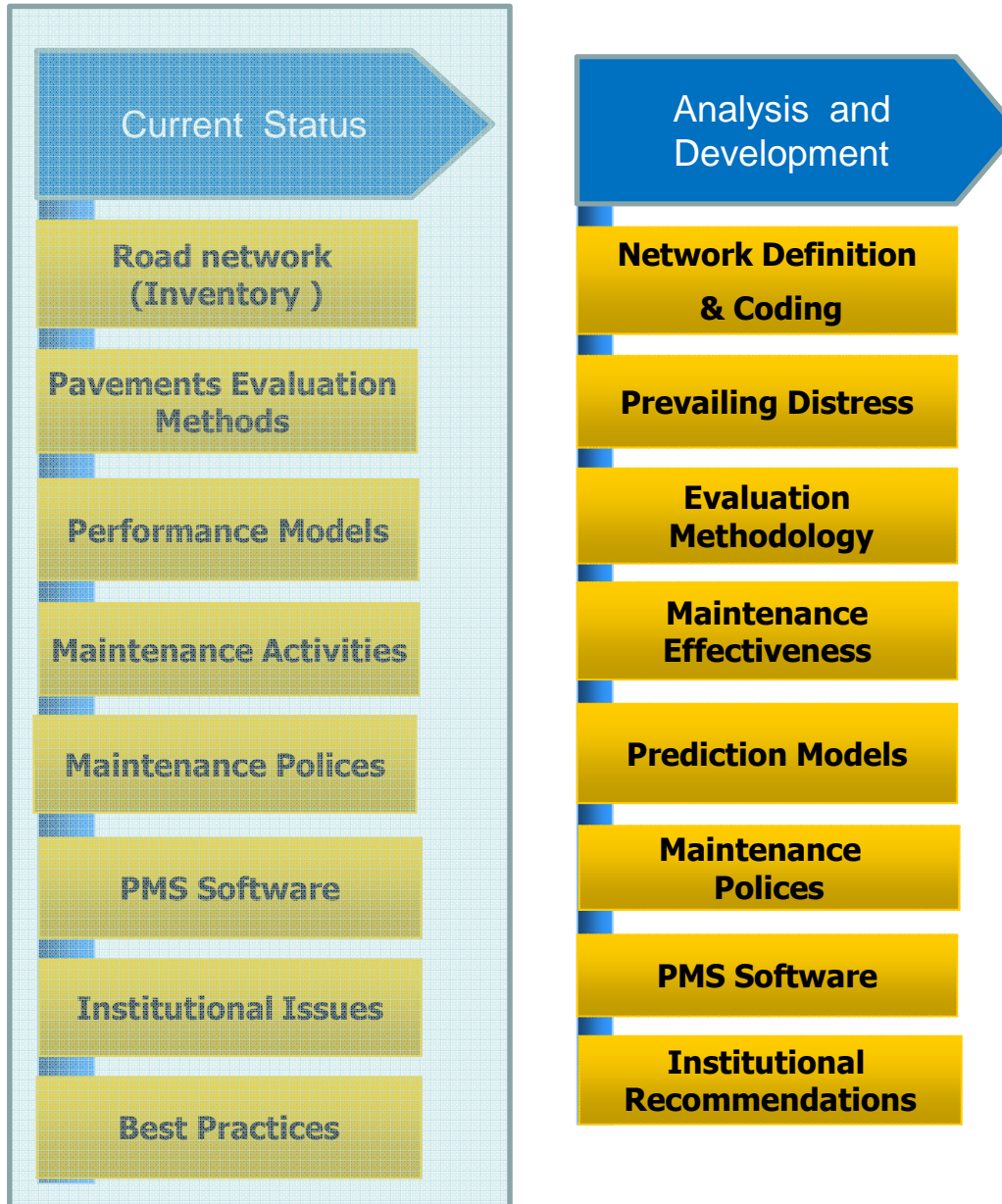
Current Status

- Institutional Issues

- Structure
- Systems
- Human resources



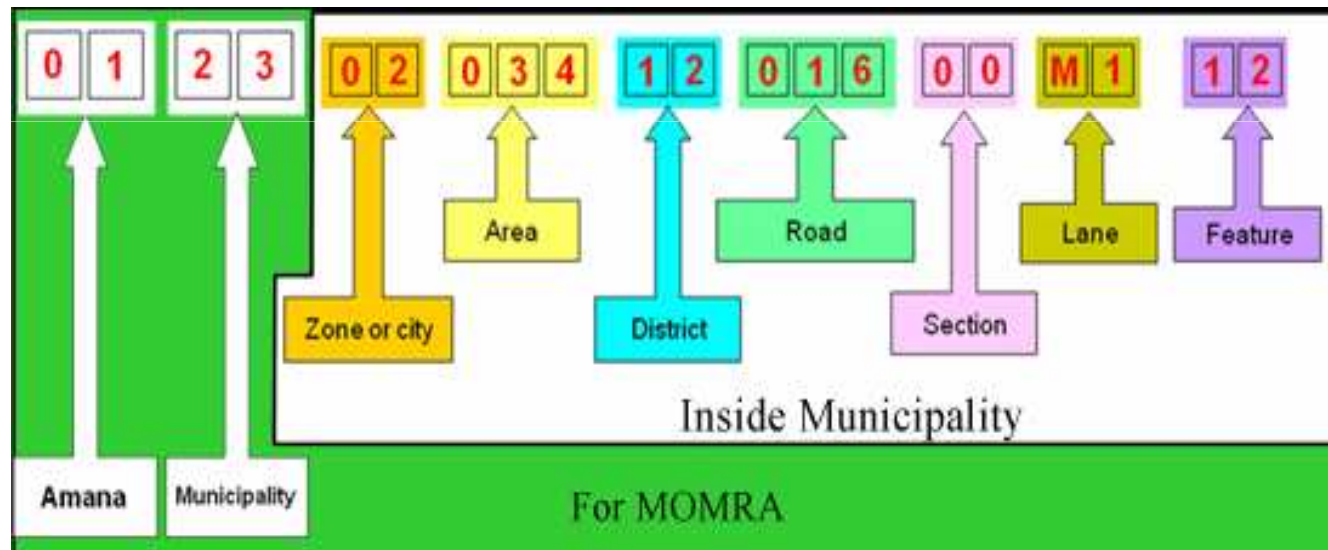
Methodology



Analysis and Development

Network Definition and Coding

The suggested pavement identification code consists of nine parts.

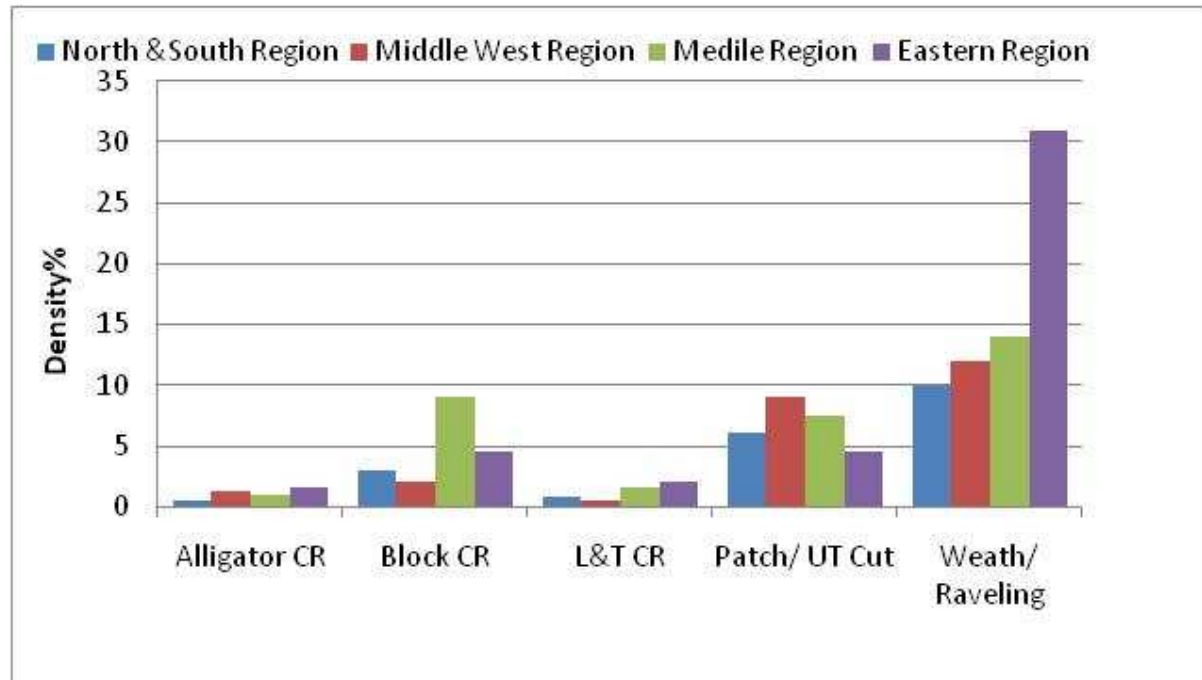




Analysis and Development

Prevailing Distresses :

A sample taken from 14 cities and includes 1500 pavement units.

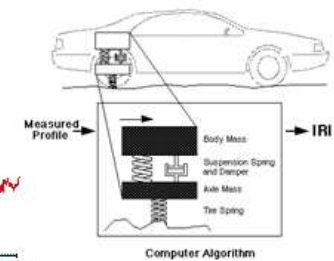
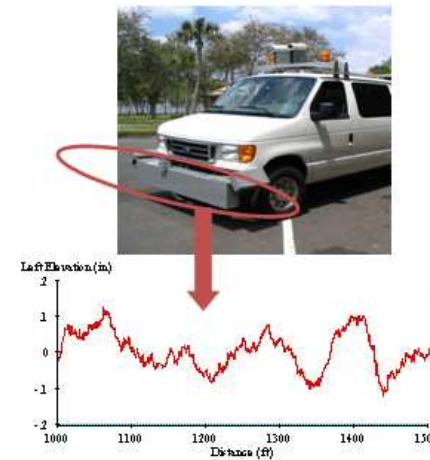
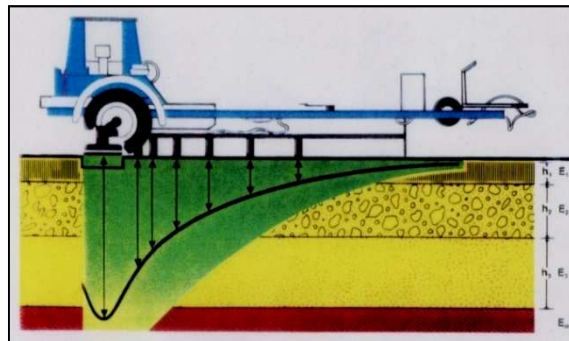
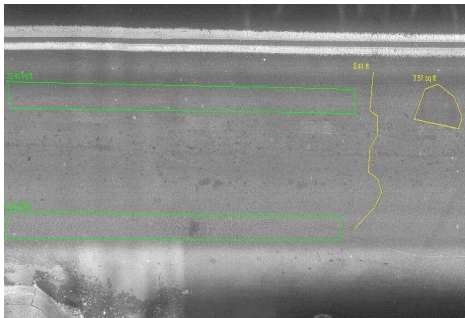


Analysis and Development

Pavement Evaluation Methodology

- PCI , FWD ,IRI, SN
- Relationship was developed between UDI method and PCI

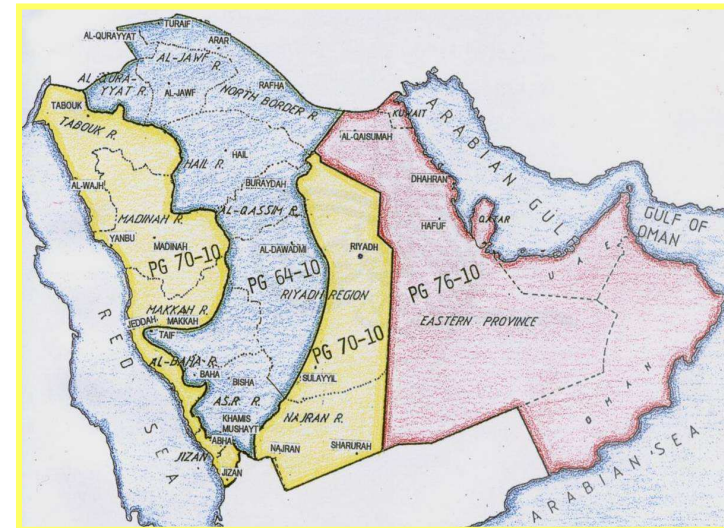
$$PCI = 0.58 UDI + 31.266$$



Analysis and Development

Performance Models

- Divide the Kingdom into 4 regions based on geographic location , climate , and quality of material “
- Sample was selected from each region based on road class , drainage and utilities cut
- Prediction models were developed “ age and PCI “





Analysis and Development

Maintenance Policy

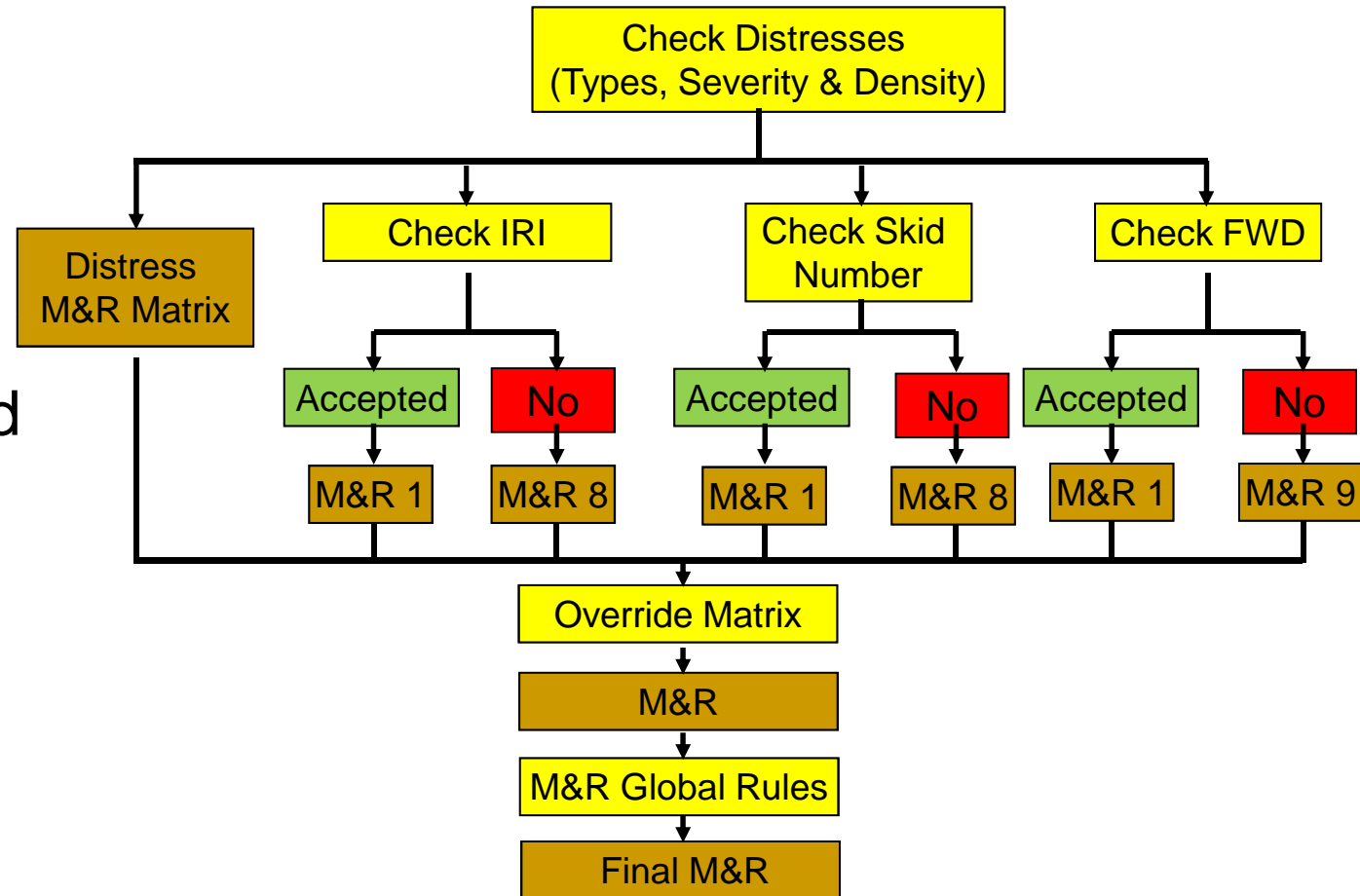
- M&R treatments was based on :
 - Availability
 - Cost
 - Service life

M&R No.	Description
1	Do Nothing
2	Apply Hot sand and Roll
3	Crack Sealing
4	Surface Patching
5	Deep Patching
6	Slurry Seal
7	Milling and Repave
8	Base Repair and Repave
9	Thin Overlay
10	Structural Overlay

Analysis and Development

Maintenance Policy

- Maintenance decision tree was based on distresses, FWD, IRI, and SN





Analysis and Development

Priority Index

$$PI = \sum W_i * F_i$$

PI = Priority index

W_i = Priority factor weight

F_i = Priority factor

Factor	weight
Road Class	0.15
Pavement Condition	0.20
Operating Traffic	0.15
Riding Quality	0.15
Safety Condition	0.15
Maintenance Cost	0.10
Importance to Community	0.10

ADT	F_i
0 - 99	10
100 - 499	20
500 - 999	30
1000 - 1999	40
2000 - 4999	50
5000 +	100



Analysis and Development

PMS Software

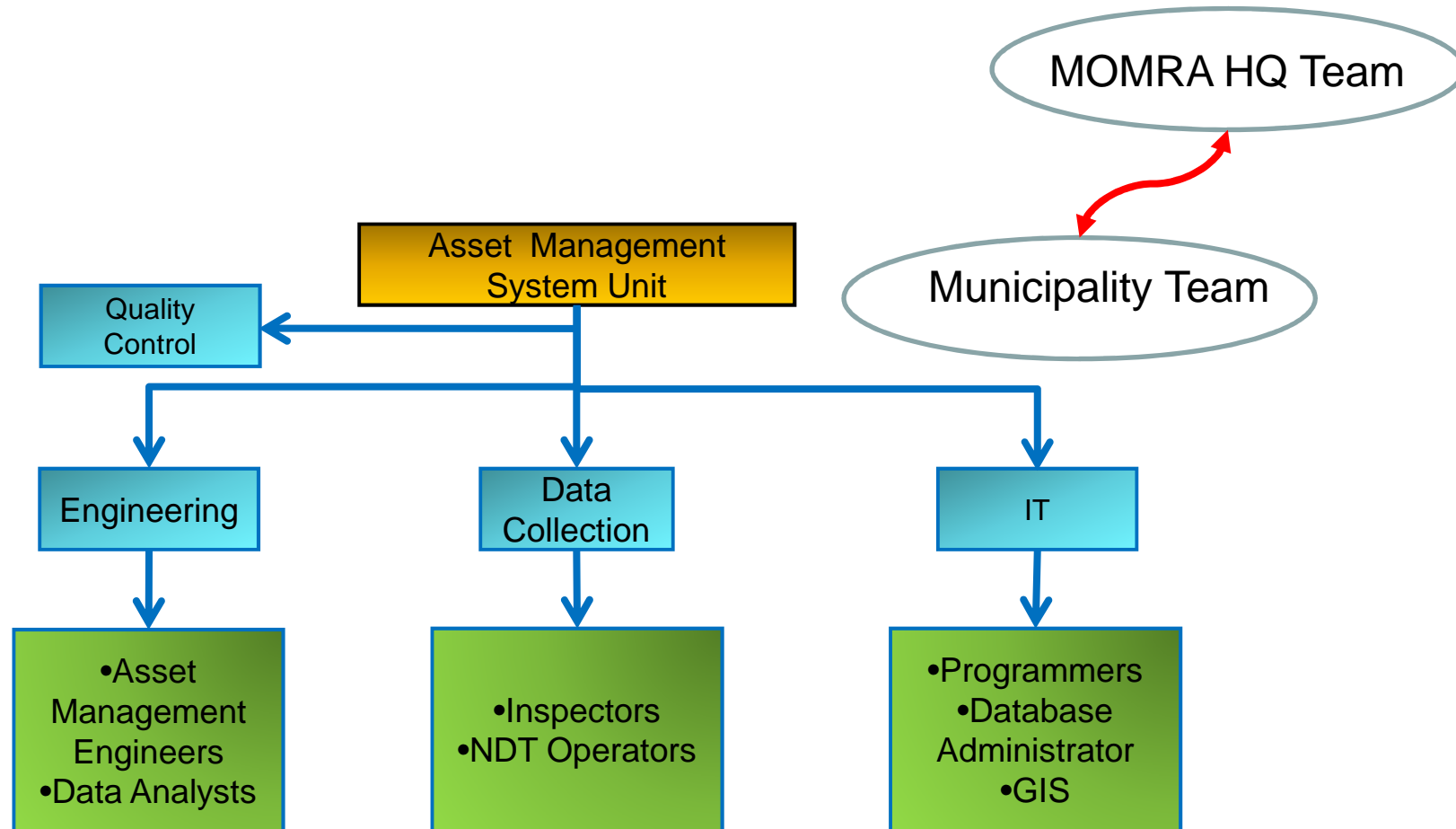
The challenge to select the PMS software included :

- Technical requirements
- User friendly
- Flexibility
- Data transfer
- Cost
- Future Development

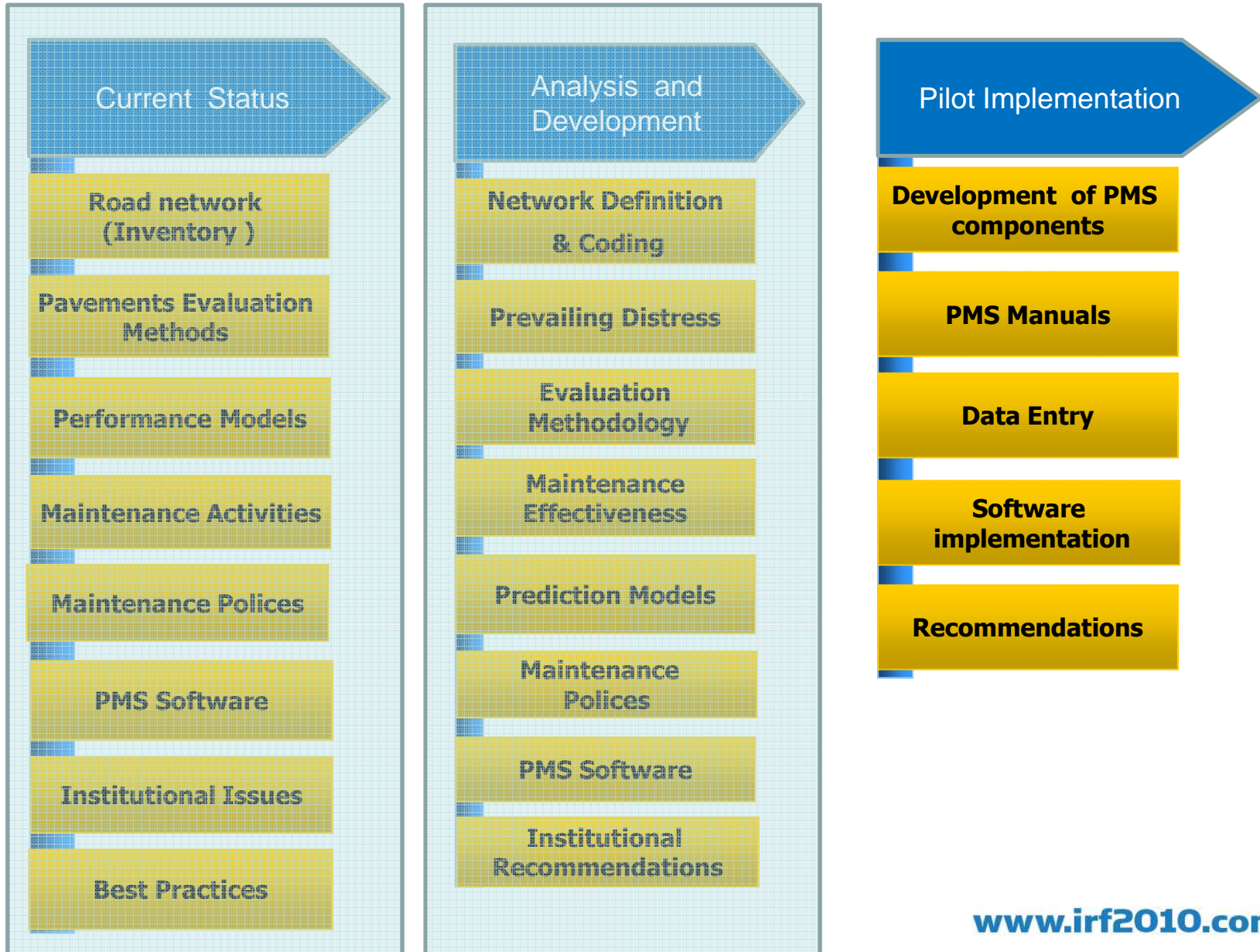
“ Develop a new system for MOMRA “

Analysis and Development

Institutional Recommendation



Methodology



Implementation

Development of PMS components :

MOMRA-PMS (c) Ministry of Municipal and Rural Affairs, Saudi Arabia.

Home | Parameters | Archived | Help | About

Selection Matrix: Suggested M&R for Pavement

Distress: **13-Potholes** Sidewalk & Median

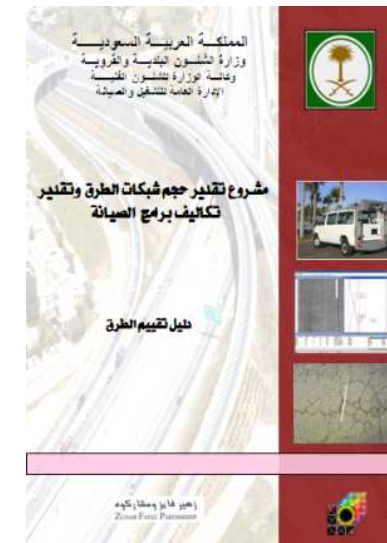
Previous Next

Severity Level	Density (%)			
	≤10	>10 - 30	>30 - 60	>60
Low	1	1	1	5
Medium	5	5	5	5
High	6	6	6	6

Implementation

PMS User Manuals

- Pavement Evaluation
- Maintenance Activities
- Software User Manual





Conclusions and Recommendations

- **PMS was developed to allow MOMRA :**
 - Preserve the urban roads network investment .
 - Effective fund allocation among the 14 Amana
- **The PMS to be implemented in all Amana/municipalities (Phase 2)**
- **Feedback to be utilized for further system components calibration**



Sharing the road

**16th
World Meeting**
International Road Federation

THANK YOU

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