

R&D FOR FUTURE ROAD IN KOREA

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Project 1 :

THE TEST ROAD OF KOREA

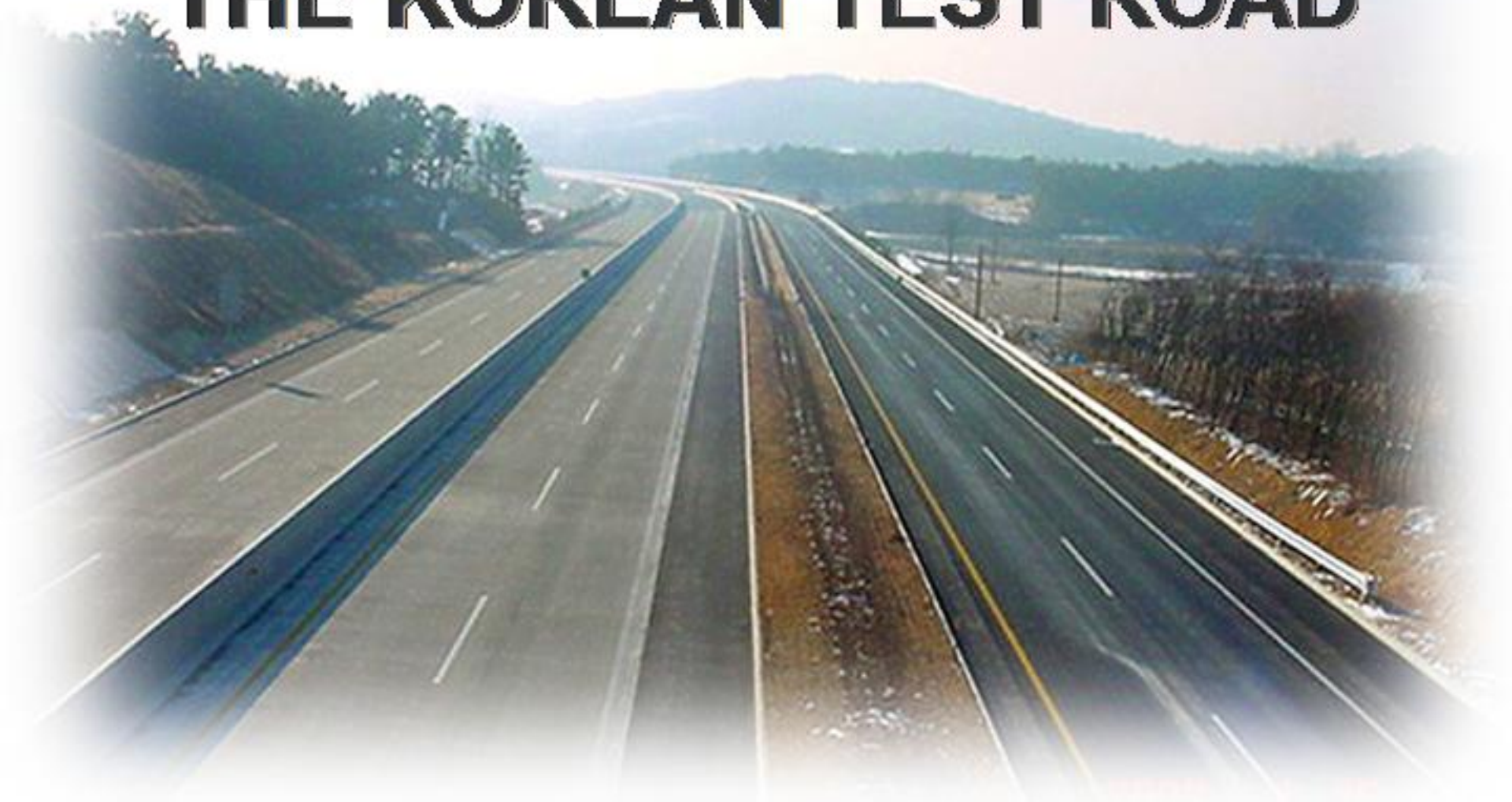
Project 2 :

DEVELOPMENT OF MATERIALS AND
DESIGN-CONSTRUCTION TECHNOLOGIES FOR
THE SUSTAINABLE AND MULTI-FUNCTIONAL PAVEMENT

Project 3 :

SMART HIGHWAY PROJECT

THE KOREAN TEST ROAD



Contents

- ✓ INTRODUCTION
- ✓ TEST SECTIONS
- ✓ INSTRUMENT AND EQUIPMENT
- ✓ MEASURING SYSTEM
- ✓ PLAN OF RESEARCH

INTRODUCTION

- Objectives
- Outline
- Overall View

Objectives

To Develop Korean Pavement Design Guide



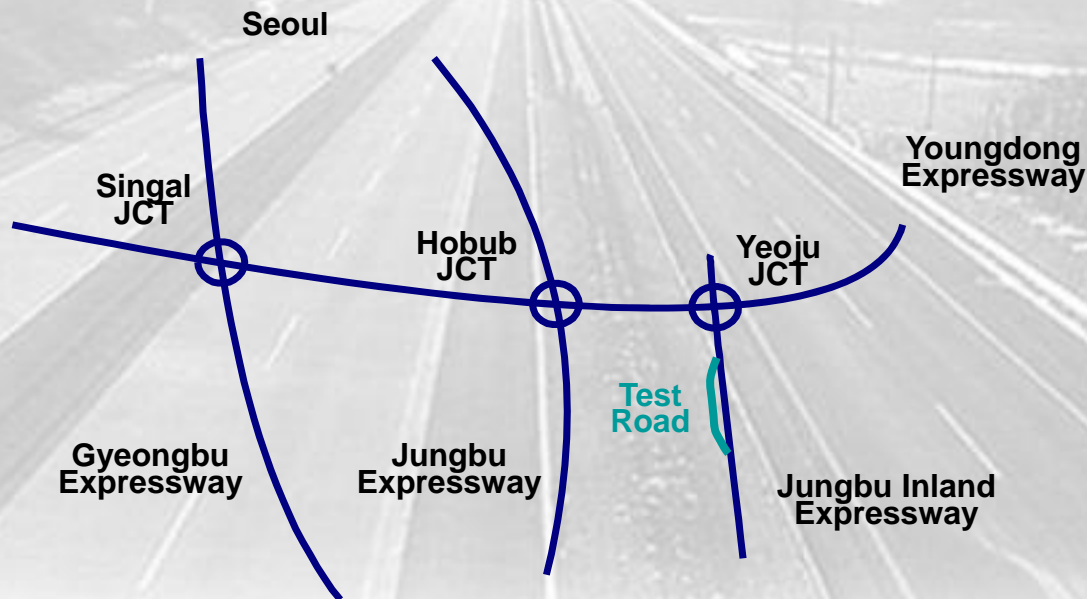
**To Improve Pavement Performance
& Increase Service Life of Pavement**



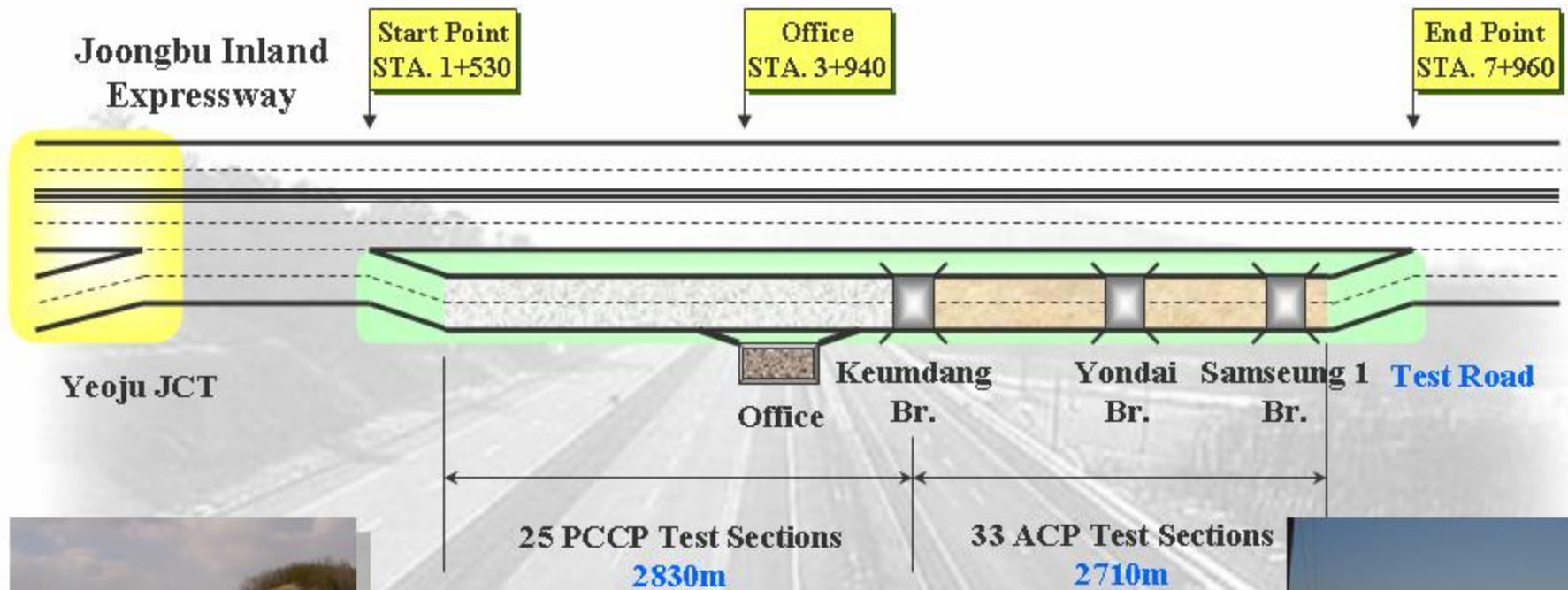
To Reduce Construction and Maintenance Costs

Outline

- ❖ 7.7km Long Two-Lane Expressway
- ❖ Construction Period : Jan. 1998 ~ Dec. 2002
- ❖ Construction Cost : US\$19,000,000
- ❖ Research Expenses : US\$3,750,000



Overall View



TEST SECTIONS

- Variables
- PCCP Sections
- ACP Sections



Variables

PCCP

**Pavement
Type**

**Slab
Thickness**

**Subbase
Material**

**Subbase
Thickness**

**Total
25
Section**

ACP

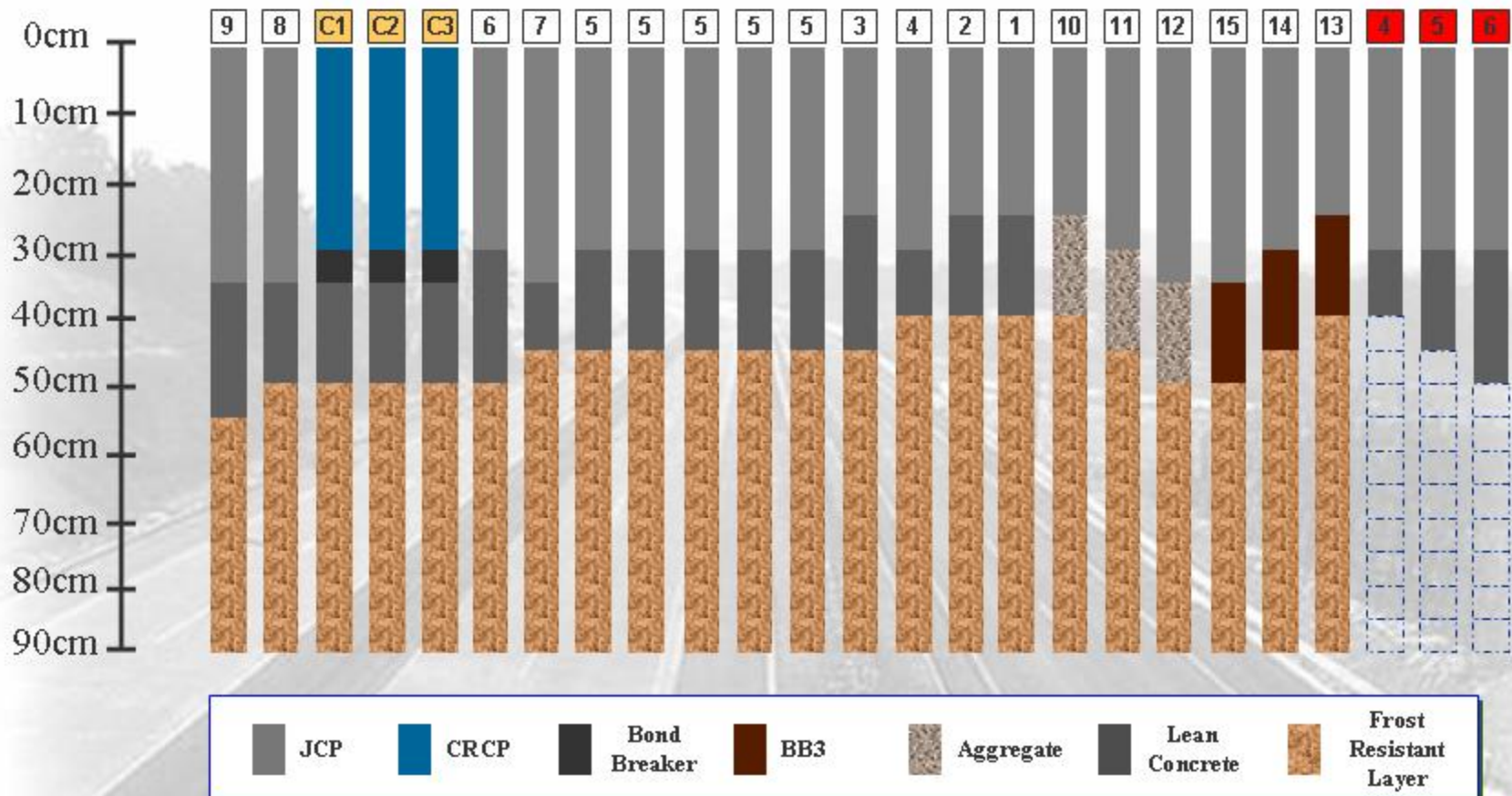
**Surface
Material**

**Base
Material**

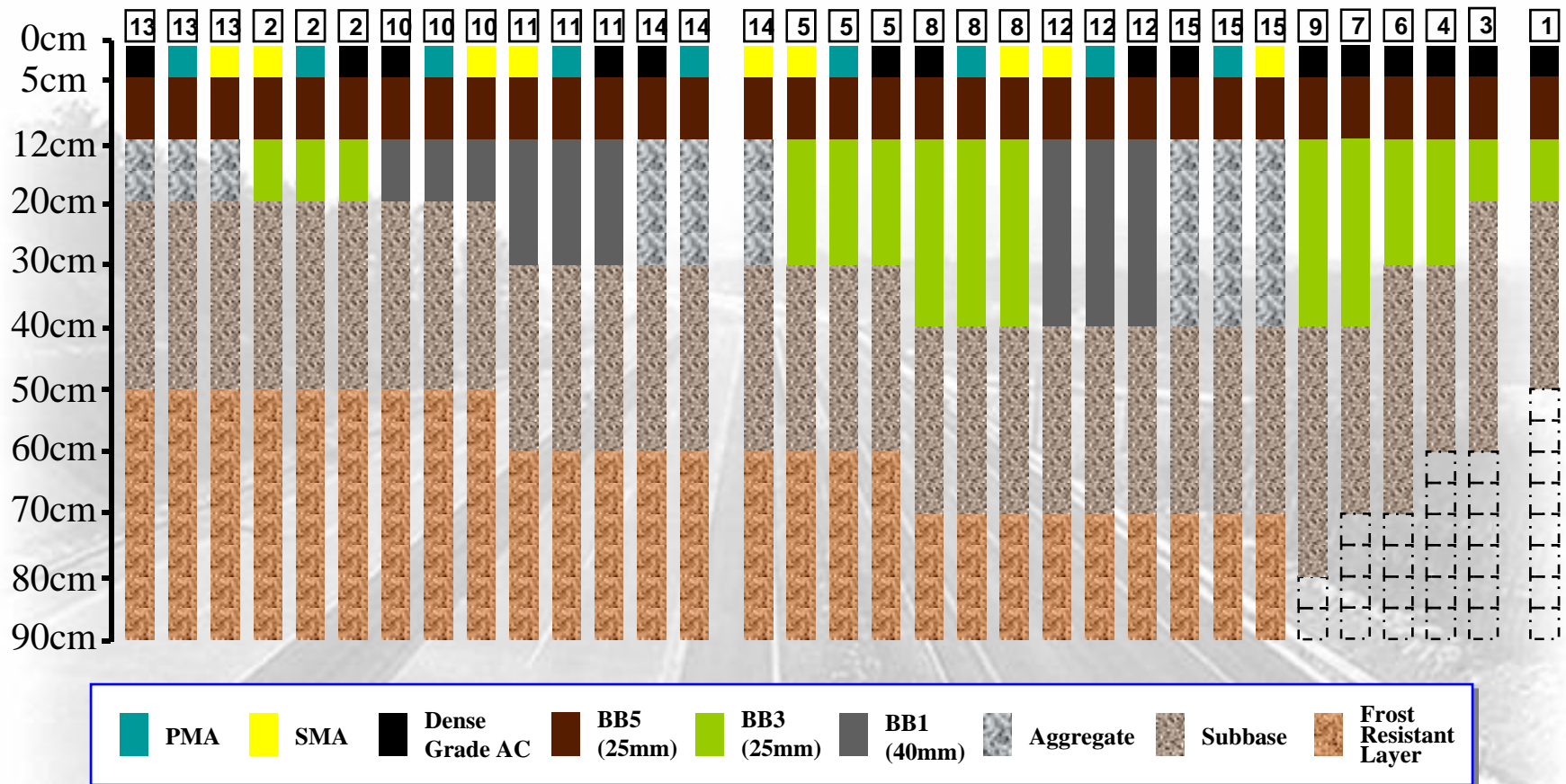
**Base
Thickness**

**Total
33
Section**

PCCP Sections



ACP Sections



INSTRUMENT AND EQUIPMENT

- **Sensors**
- **Weigh-in-motion(WIM)**
- **Weather Station**



Sensors

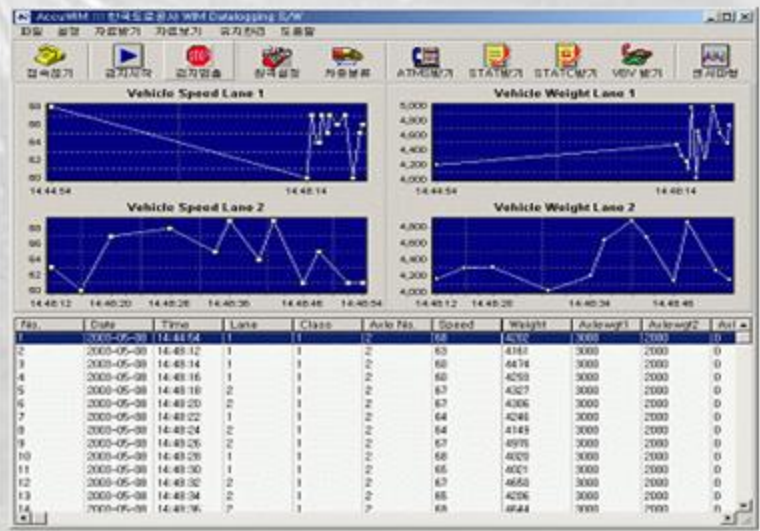
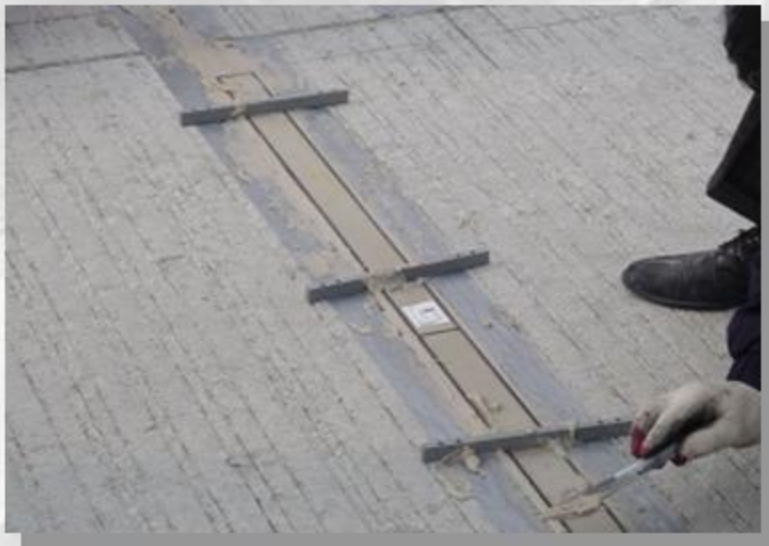
❖ 1897 Sensors of 11 Kinds to Measure

- Pavement Behavior
- Traffic and Environmental Loads

TYPE	Strain Gauge				Soil Pressure Gauge	MDD	Curling Displ. Gauge	Joint Displ. Gauge	Thermistor or Thermo-couple	Frost Depth	
	PCC	Steel	AC	Mold						Thermistor	Water Content Gauge
PCCP	636	48	36	132	34	4	51	120	140	30	30
ACP	-	-	374	-	66	6	-	-	112	39	39

Weigh-in-motion(WIM)

- ❖ Accumulative Vehicle Weight, Speed, Wandering
- ❖ Applicable up to 200km/hr
- ❖ High Accuracy (Error Rate < 3%)



Weather Station

- ❖ Weather Conditions in Test Road
- ❖ Ambient Temperature
- ❖ Solar Radiation
- ❖ Wind Speed and Direction
- ❖ Rainfall



MEASURING SYSTEM

- **Type of Measurement**
- **Type of Data**
- **Data Acquisition**

Type of Measurement

❖ Automatic(Continuous) Measurement

- Pavement Response to Climate Condition
- Temperature, Water Content
- Weather Data
- Accumulative Axle Load from WIM System

❖ Manual(Seasonal) Measurement

- Pavement Response to Traffic Load
- Strain, Soil Pressure, etc.

Type of Data

Measurement Type	Type of Data		Measurement Method
Automatic	Weather Condition, Pavement Temperature, Pavement Moisture		Every 30 Minutes
	Traffic Information		Continuous Collection
Manual	PCCP	Strain, Soil Pressure	Dynamic Load Test
			FWD Impact Load Test
		Joint Movement, Curling	72 Hours Observation
			FWD Impact Load Test
	ACP	Strain, Soil Pressure	Dynamic Load Test
			FWD Impact Load Test

Data Acquisition

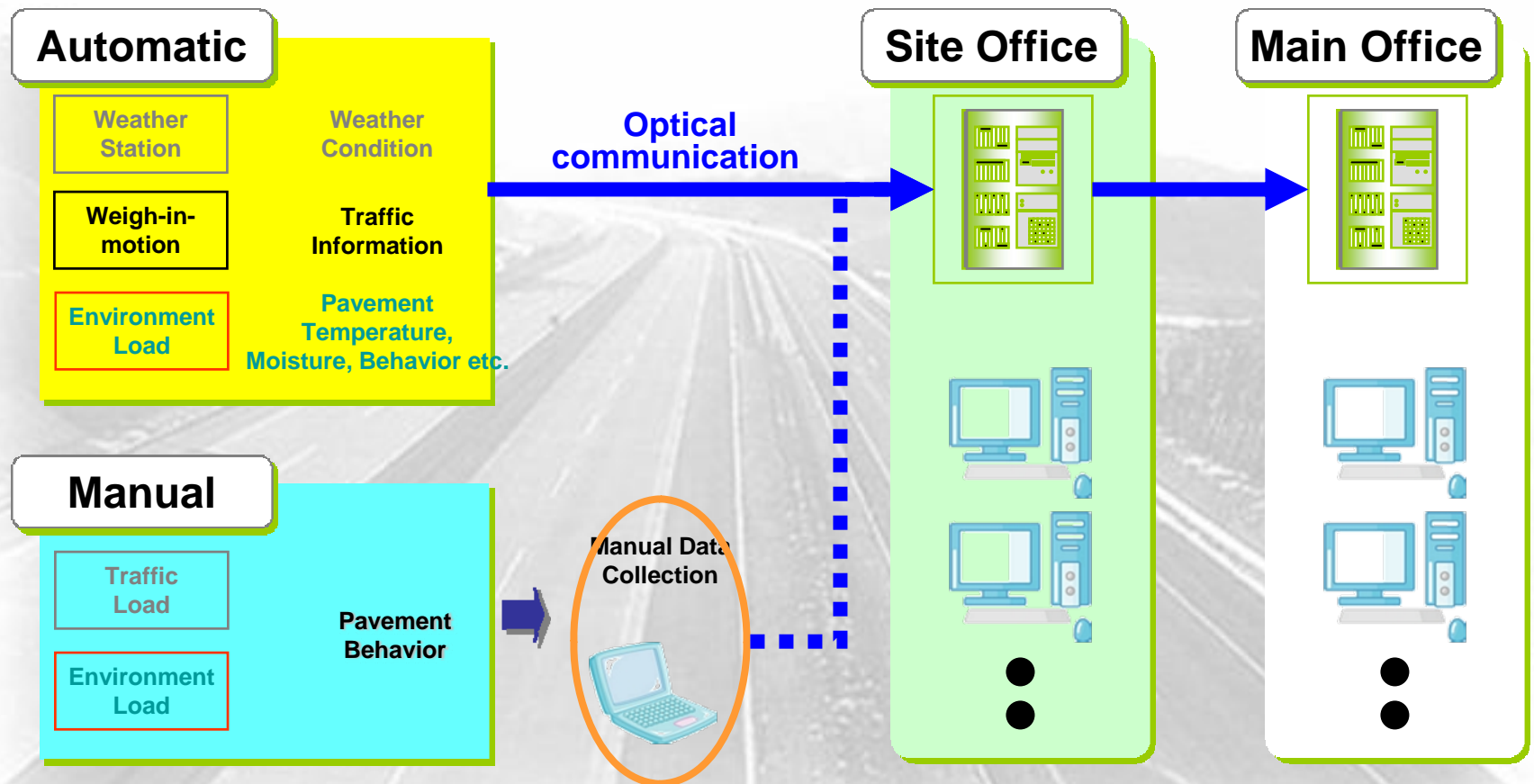
❖ Automatic Measurement (15 Main Sections)

- Install both Data Logger & Circuit Box at Each Section
- Data Transfer to Main Server through Fiber-optic Cable Network

❖ Manual Measurement (58 All Sections)

- Install only Circuit Box at Each Section
- Data Collection through Vehicle Mounted Data Logger(Data Acquisition System)
- Manual Data Transfer

❖ System Layout



PLAN OF RESEARCH

2002 ~ 2004

- To Set Up Research Infrastructure
- To Establish Test Road Operation Plan

2004 ~ 2010

- To Develop Korean Pavement Design Guide
- To Use the Data for Other Pavement Research Projects

DEVELOPMENT OF MATERIALS AND DESIGN-CONSTRUCTION TECHNOLOGIES FOR THE SUSTAINABLE AND MULTI-FUNCTIONAL PAVEMENT

SP²RC

Contents

- ✓ OUTLINE
- ✓ BACKGROUND
- ✓ OBJECTIVES
- ✓ SUBJECTS
- ✓ SCHEDULE

OUTLINE

● Organization



OUTLINE

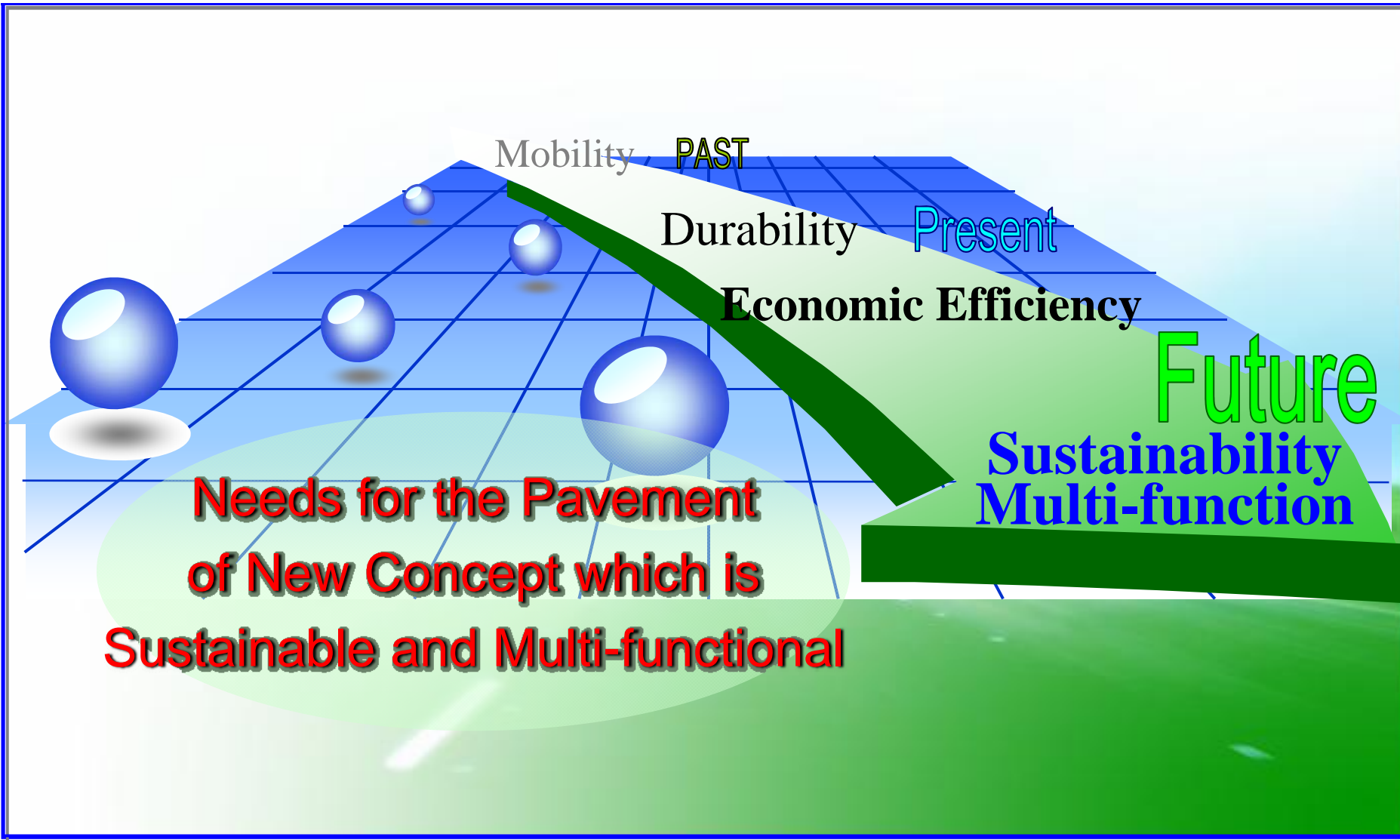
● Period

August 2006 ~ August 2011 (5 years)

● Budget

Total	US\$	17.9 mil.
<hr/>		
Government Fund		10.9
Matching Fund		7.0

BACKGROUND



OBJECTIVES

Realization of the Sustainable and Multi-functional Pavement

Four Key Objectives

**User-Oriented
Multi-functional
Pavement System**

**Durable new
Pavement Materials
And Application
Technologies**

**Advanced Construction
Technologies Using
Non-destructive and
IT Technologies**

**Advanced
Pavement Maintenance
Technologies**

SUBJECTS

DEVELOPMENT OF MATERIALS AND DESIGN-CONSTRUCTION TECHNOLOGIES FOR THE SUSTAINABLE AND MULTI-FUNCTIONAL PAVEMENT

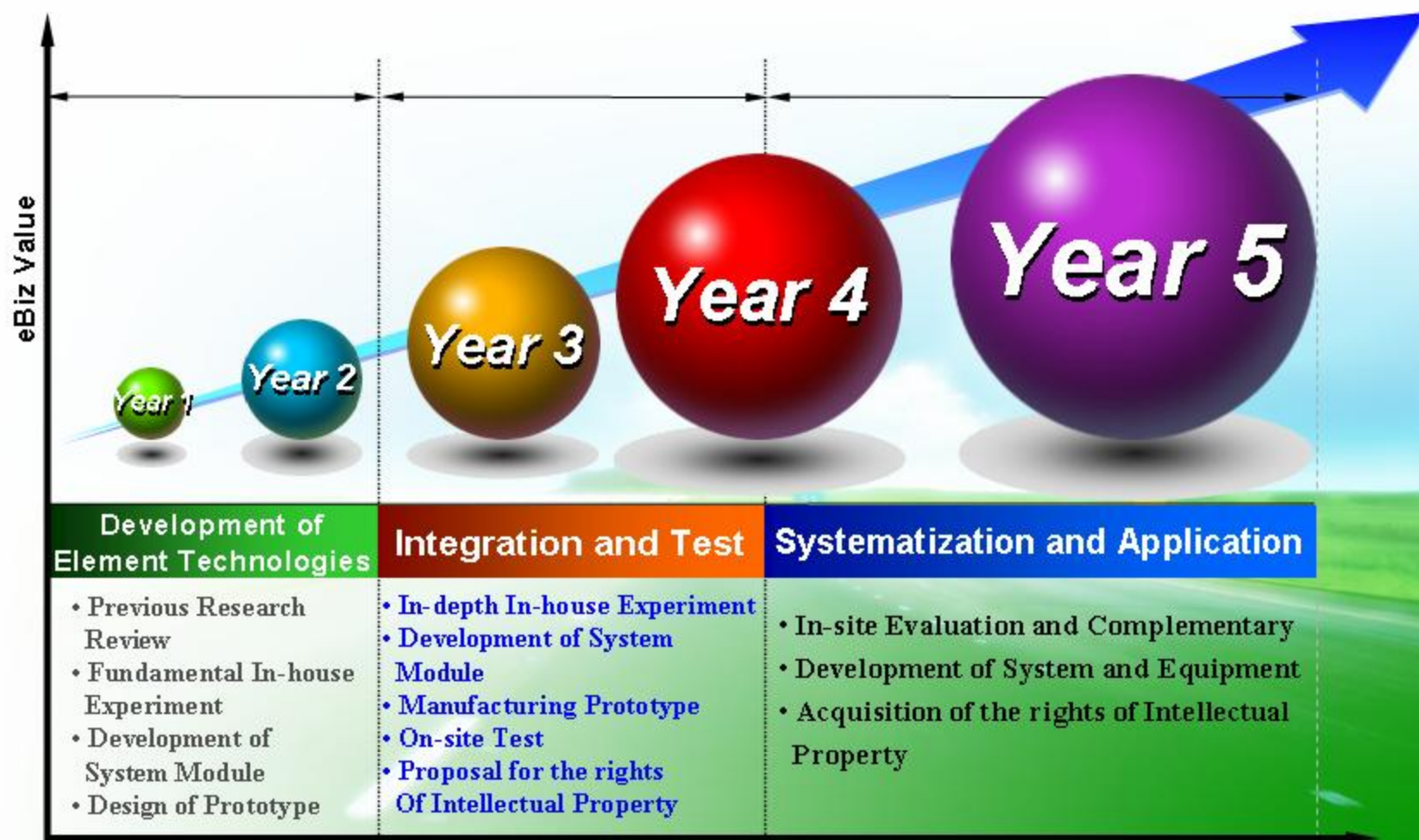
DEVELOPMENT OF SUSTAINABLE AND MULTI-FUNCTIONAL PAVEMENT SYSTEM

- ☐ Water-reserved Pavement to Mitigate Heat Island Effect
- ☐ Colored Pavement and Durable Block Pavement
- ☐ Surface Treatment Methods for Low Noise Pavement
- ☐ Durable Asphalt Pavement System and Bridge-deck Pavement System
- ☐ Snow Melting System Utilizing Alternative Energy
- ☐ Embedded Bridge Joint System

DEVELOPMENT OF ADVANCED CONSTRUCTION AND MAINTENANCE TECHNOLOGIES FOR PAVEMENT

- ☐ Quality Control Technologies Using Non-destructive and IT Technologies for Pavement Construction
- ☐ Advanced Quality Control System for Asphalt Concrete Mixture
- ☐ Quick Repair Technologies for Concrete Pavement
- ☐ Mid-Temperature Asphalt Pavement for Overlay
- ☐ Decision Making Aid System for Local Roads

SCHEDULE





MOCT



KICTEP

SMART Highway Project



Contents

I . OUTLINE

II . Background

III . RESEARCH & APPLICATION



OUTLINE

- **Research Period**
- **Budget**
- **Organization**

OUTLINE

- **Research Period** : 2007~2016 (10 years)
- **Budget** : US\$ 150mil. + Construction cost
- **Organization**



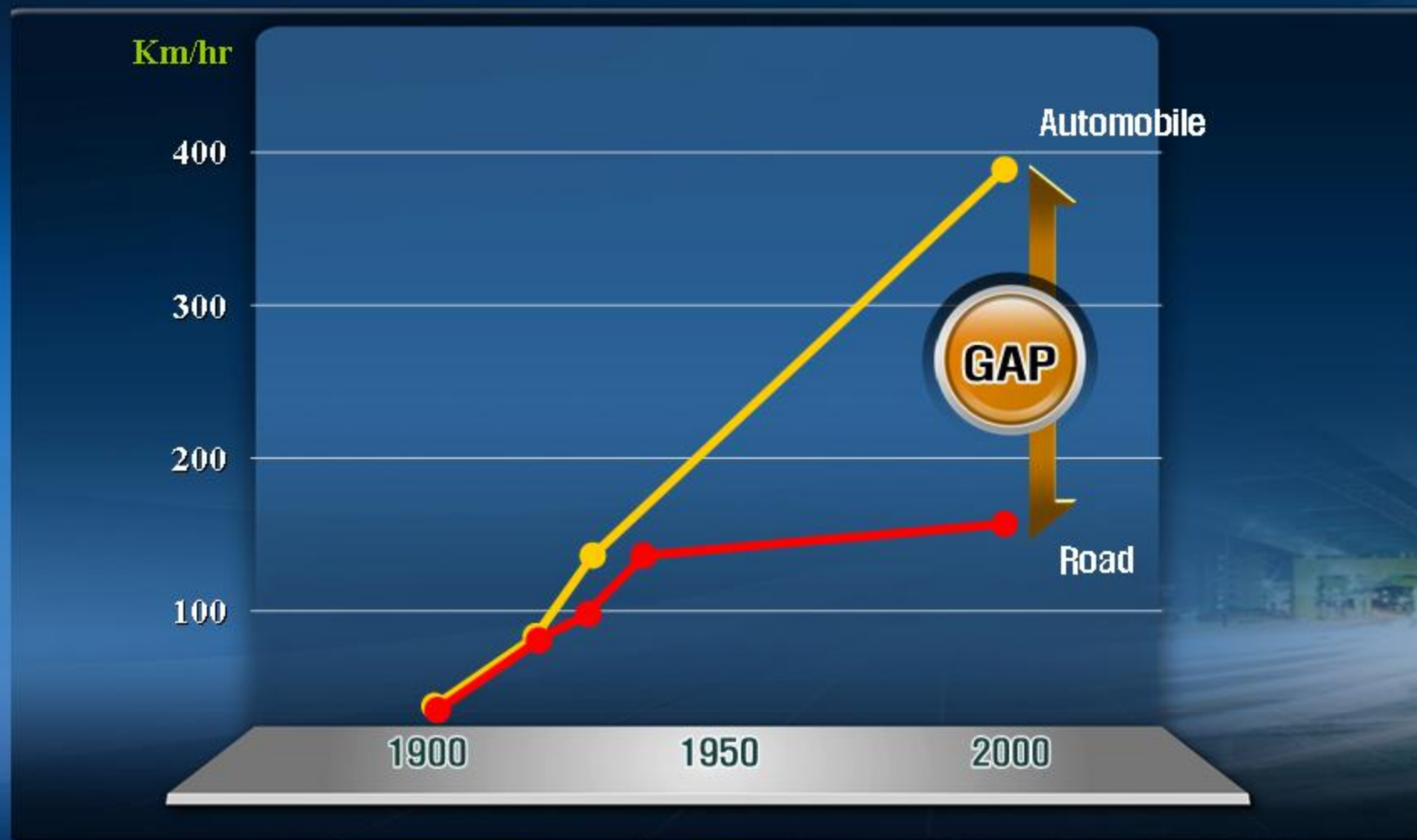


Background

- **Speed Change**
- **Evolution of Information Technology**
- **Automobile Technology**
- **Prospect of Future Technologies**

BACKGROUND

Speed Change

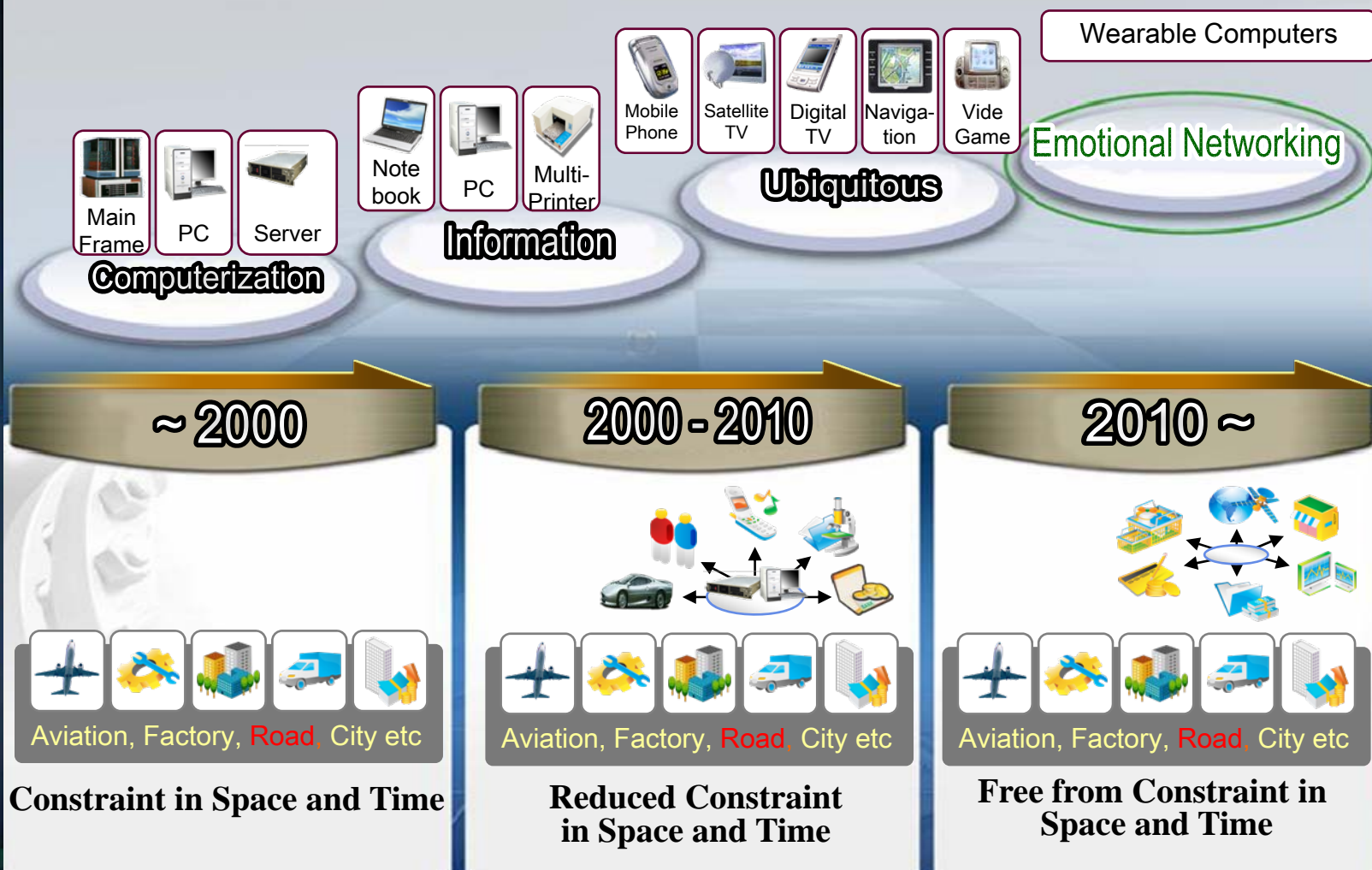


BACKGROUND

● Evolution of Information Technology

IT

Society



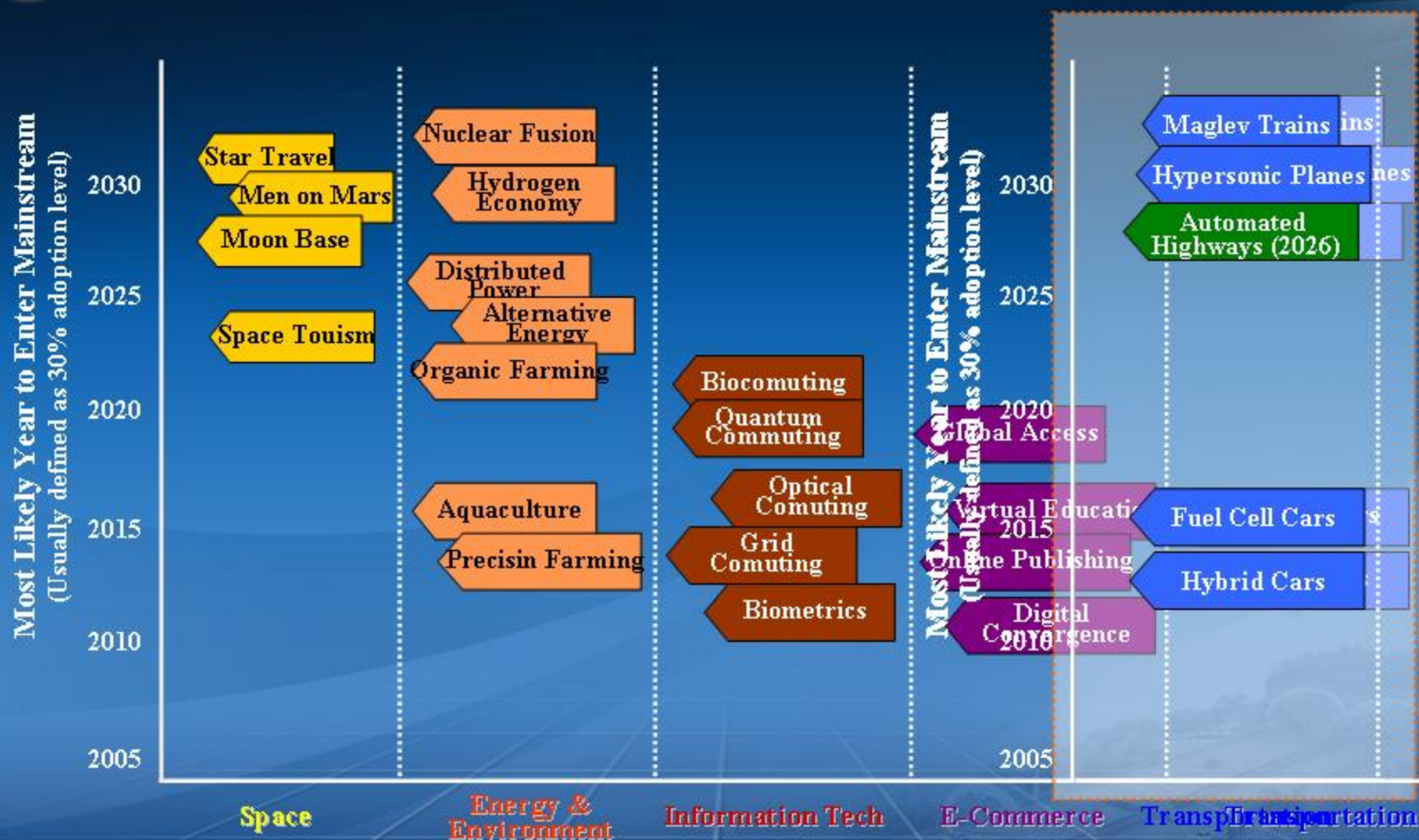
BACKGROUND

● Automobile Technology



BACKGROUND

Prospect of Future Technology





RESEARCH & APPLICATION

- **Concept**
- **Objectives**
- **Structure of Project**
- **Schedule**

RESEARCH & APPLICATION

● Concept

SMART Highway

Highway of New Concept

where road, Information and vehicle technologies are integrated

● **S**afety

● **S**ustainability

● for **T**omorrow

Core Values

S.M.A.R.T

Mobility ●

Advanced ●

Reliability ●

RESEARCH & APPLICATION

Objectives

Improve the quality of life through revolution of highway

Establishment of intelligent highway with design speed of 160km/h

Improvement of Safety

- Intelligent road facilities
- Geometric design for super-high speed
- Application of intelligent vehicle technologies

Improvement of Mobility

- Congestion free traffic
- Improvement in travel speed more than 30%
- Road-vehicle communication

Improvement of Convenience

- Application of human factor to road
- Gentrifying highway facilities for the disadvantages
- Diversification of information services

RESEARCH & APPLICATION

● Structure of Project

Blanket Subject

Establishment of Comprehensive strategy for Smart Highway

Core Subject 1

Core Technologies of Highway Infrastructure

Core Subject 2

Road Communication Based Traffic Management Technologies

Core Subject 3

Vehicle-Infrastructure Integration Technologies

Core Subject 4

Design and Construction of Test Bed and Monitoring

RESEARCH & APPLICATION

● Schedule



CONCLUSIONS

- Safety and Sustainability are key issues
- The policy of the Korean government :
willing to invest for future highways
- Chances for foreign experts to
take a part in SMART Highway Project