Key Issues in Life Cycle Planning of Chinese Transportation Asset Management

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Beijing University of Technology

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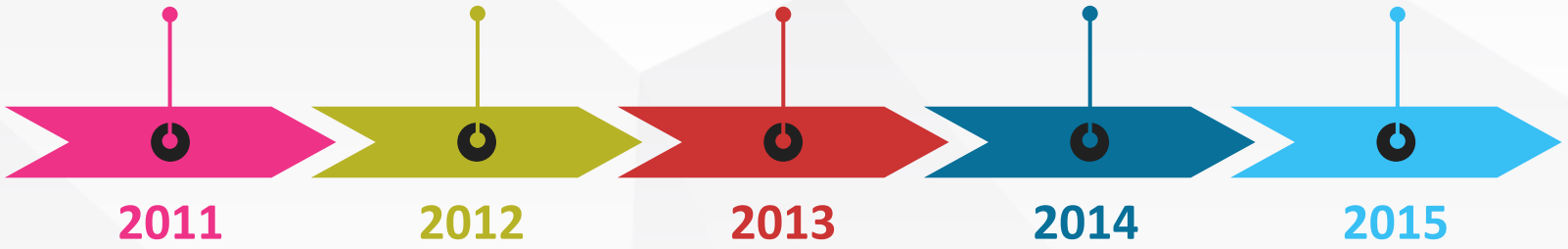


Transportation Fixed Asset Investment

More than 12.5 trillion;
The total transportation fixed asset investment in the **12th Five-Year** was **1.6 times** as the total investment in the **11th Five-Year**.

Railway

3500 billion;
The total mileage of railway operation was **774,565**.

Highway

The total traffic mileage was **2.84 million**; the expressway network "**7918**" has been basically built.

Water Transportation

Increased **500** ten-thousand-tons class berths in five years;
More than **2100** ten-thousand-tons class berths.

Air Transportation

Increased **39** civil airports in five years;
214 civil airports;

Traffic Infrastructure Construction Investment between January to April, 2016

Railway + Highway + Water Transportation

12.39 billion tons

▲ 2.5%

Highway Construction Investment

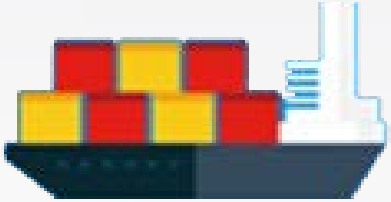
347.2 billion

▲ 8%

Water Transportation Construction Investment

30.4 billion

▲ 13.9%



Challenges

Many transportation asset classes: highway, railway, air transportation; infrastructures, vehicles, device, buildings……

Transportation assets are widely distributed; density of assets in southeast region is higher than in northwest region.

Transportation assets change frequently.

Funds allocation for different transportation projects.

U.S.A
China
Japan
Europe
……

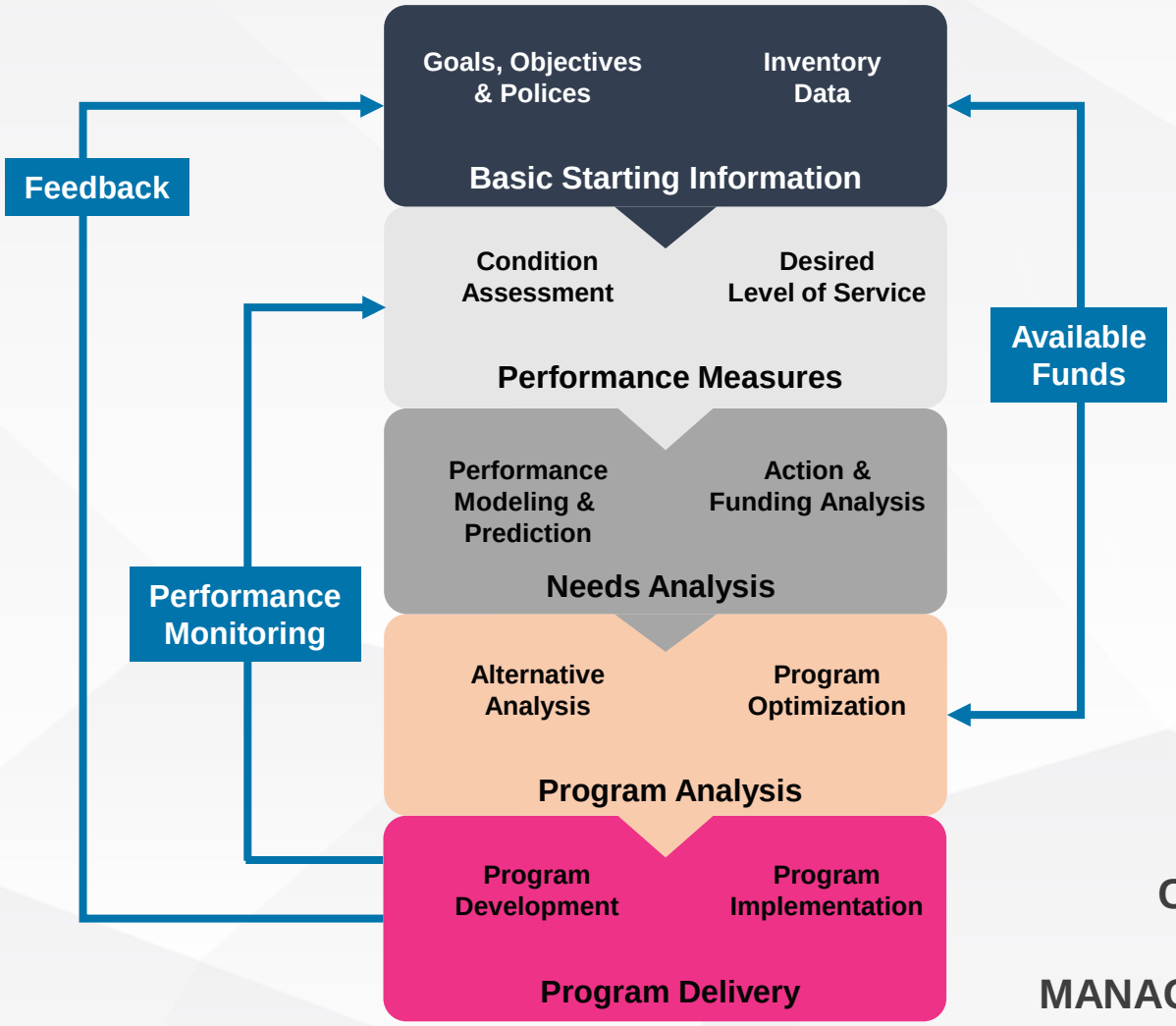
Pavement Management System

Bridge Management System

Railway Asset Management System

Integrated Infrastructure Asset Management

LIFE CYCLE COST OPTIMIZATION



COMPONENTS OF AN ASSET MANAGEMENT SYSTEM

Smith, R. "Asset Management—Texas Style: Asset Management Concepts." Presentation prepared for the Texas Department of Transportation, Texas Transportation Institute, The Texas A&M University System, College Station, Texas, 2005.

KEY TECHNOLOGIES

Storage technology of big data

Remote monitor technology of highway and transportation asset

High-tech detection of highway and transportation asset

Maintenance and reinforcement technology with high proficiency

Self-healing technology of infrastructure

RESEACH FOCUS

Allocation problem of asset management funds

- **Trade-off analysis, Pareto genetic algorithm**
- **Resource allocation, program decision based on risk analysis**

Data integration technologies

Influence of time-cost on the total costs of asset management

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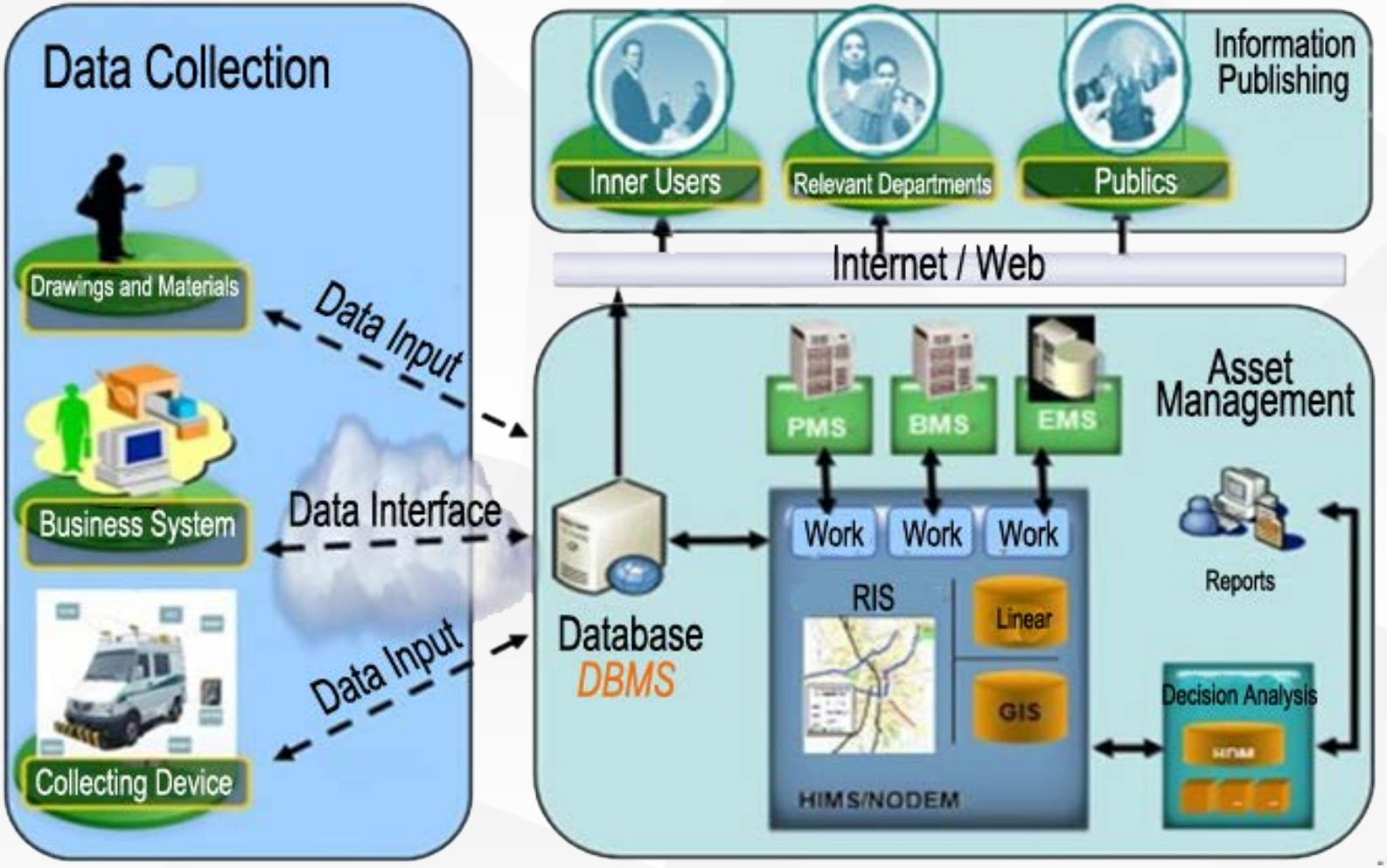
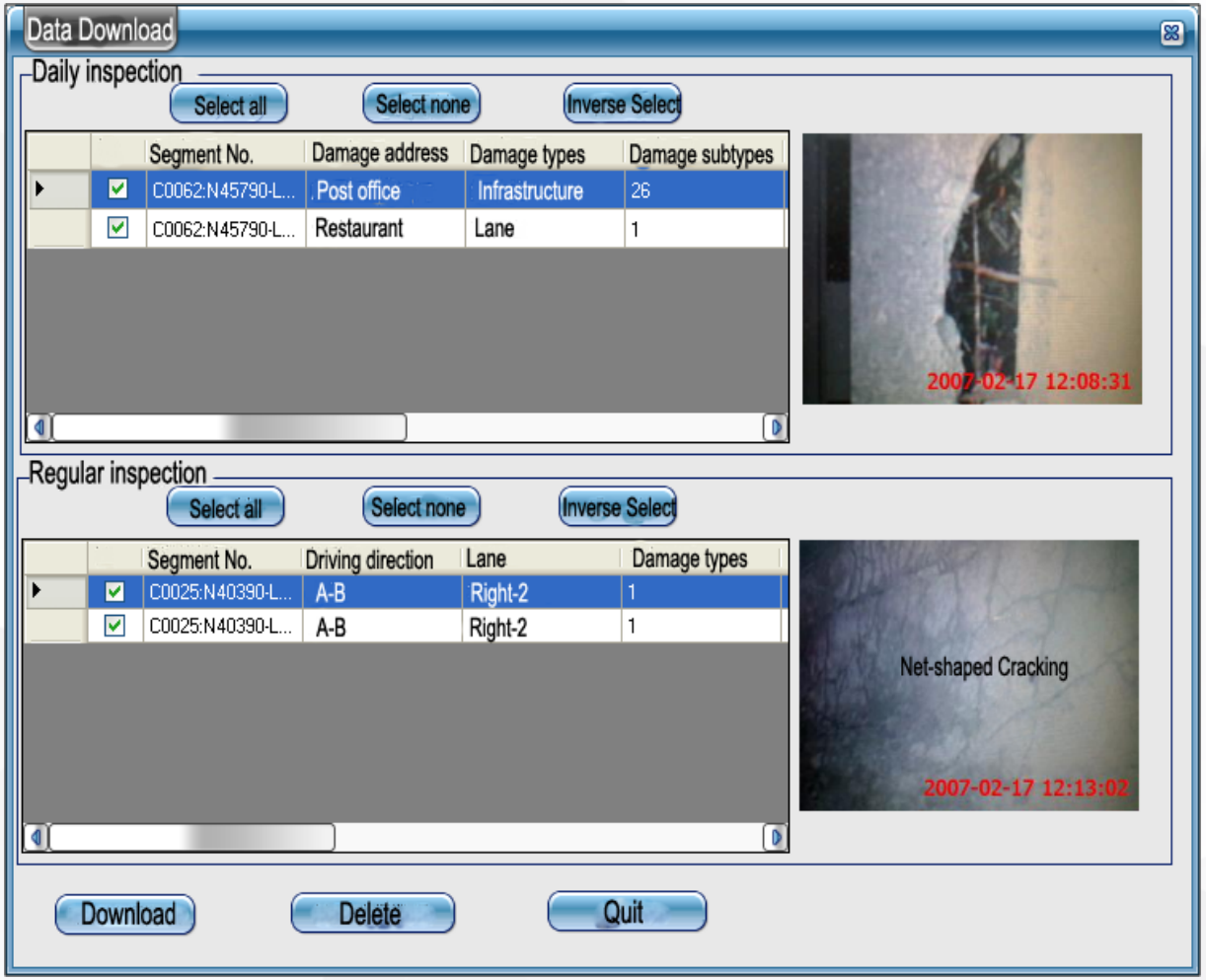
Highway Asset Management System



Asset Management System

- Database System
- Detection and Evaluation System
- Maintenance Decision Analysis System
- Bridge Asset Management System
- Statistical Analysis Management System



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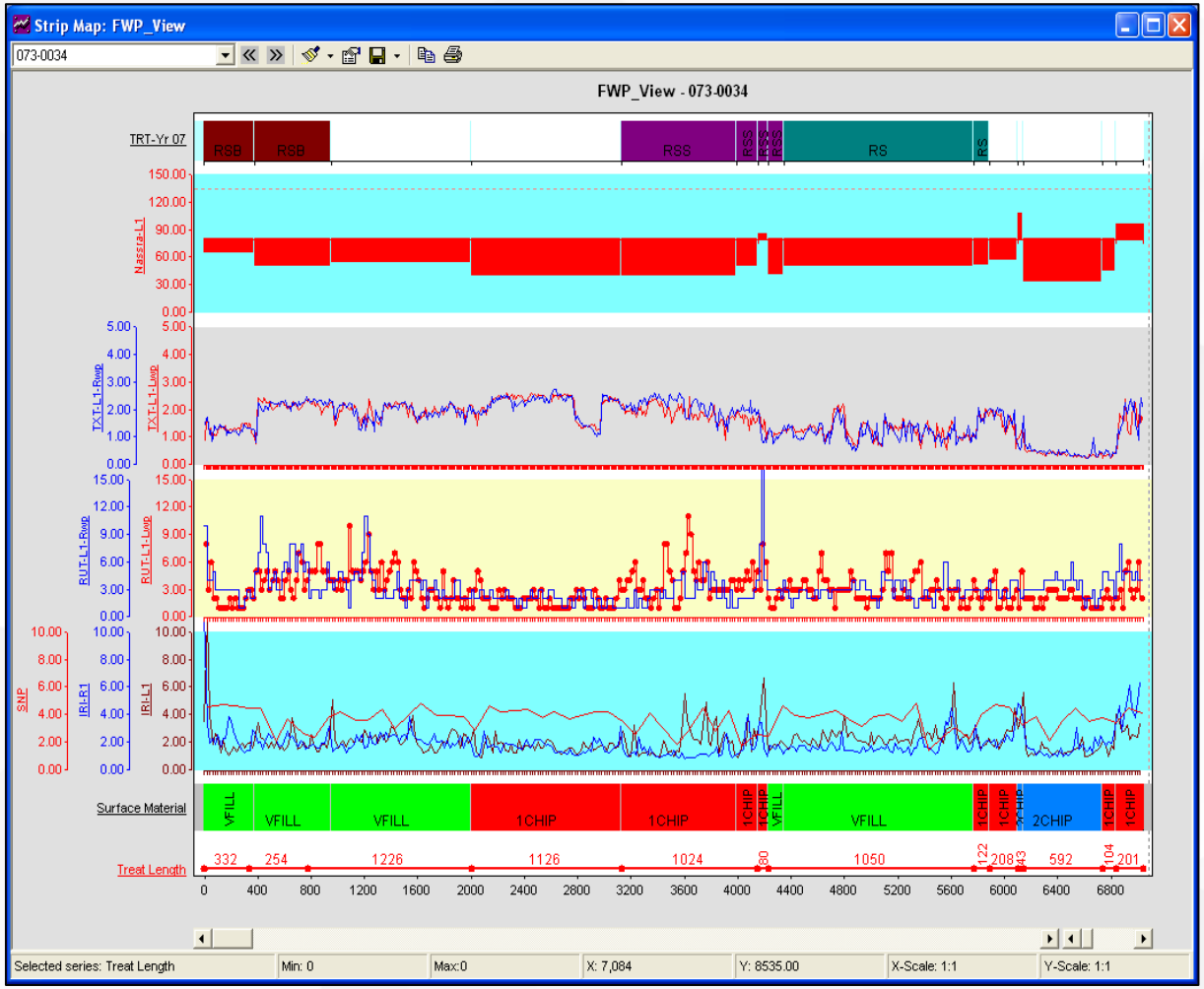

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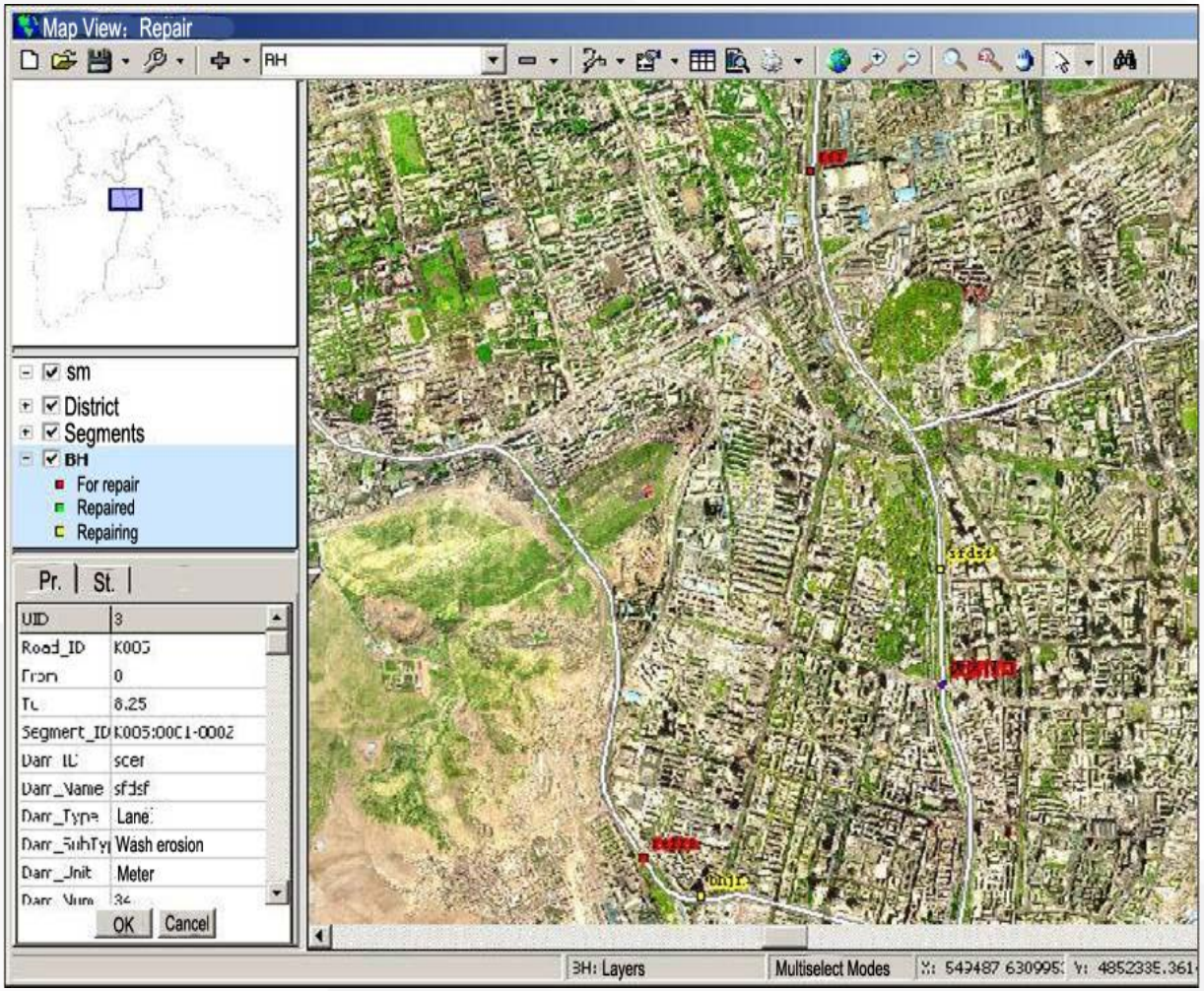

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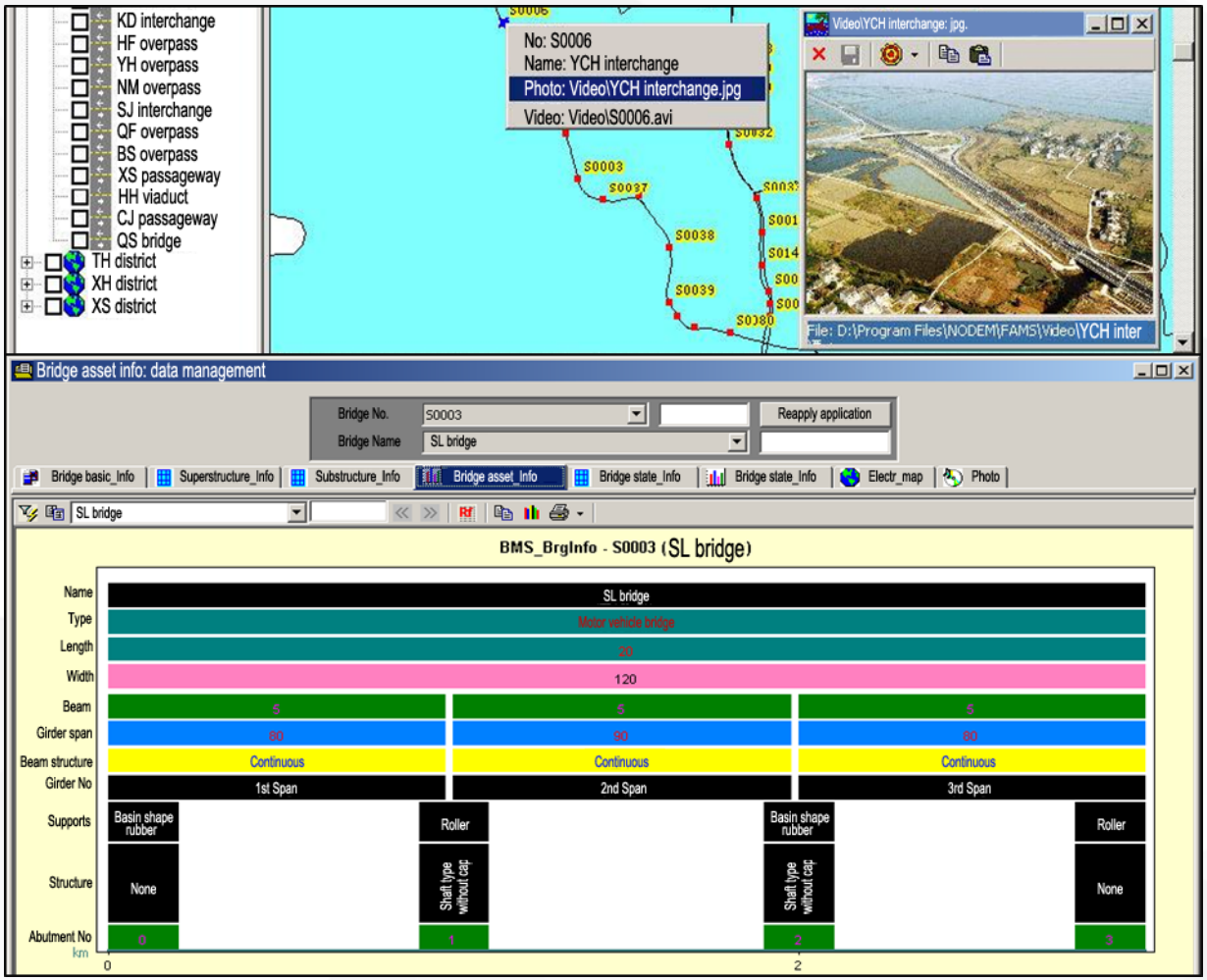

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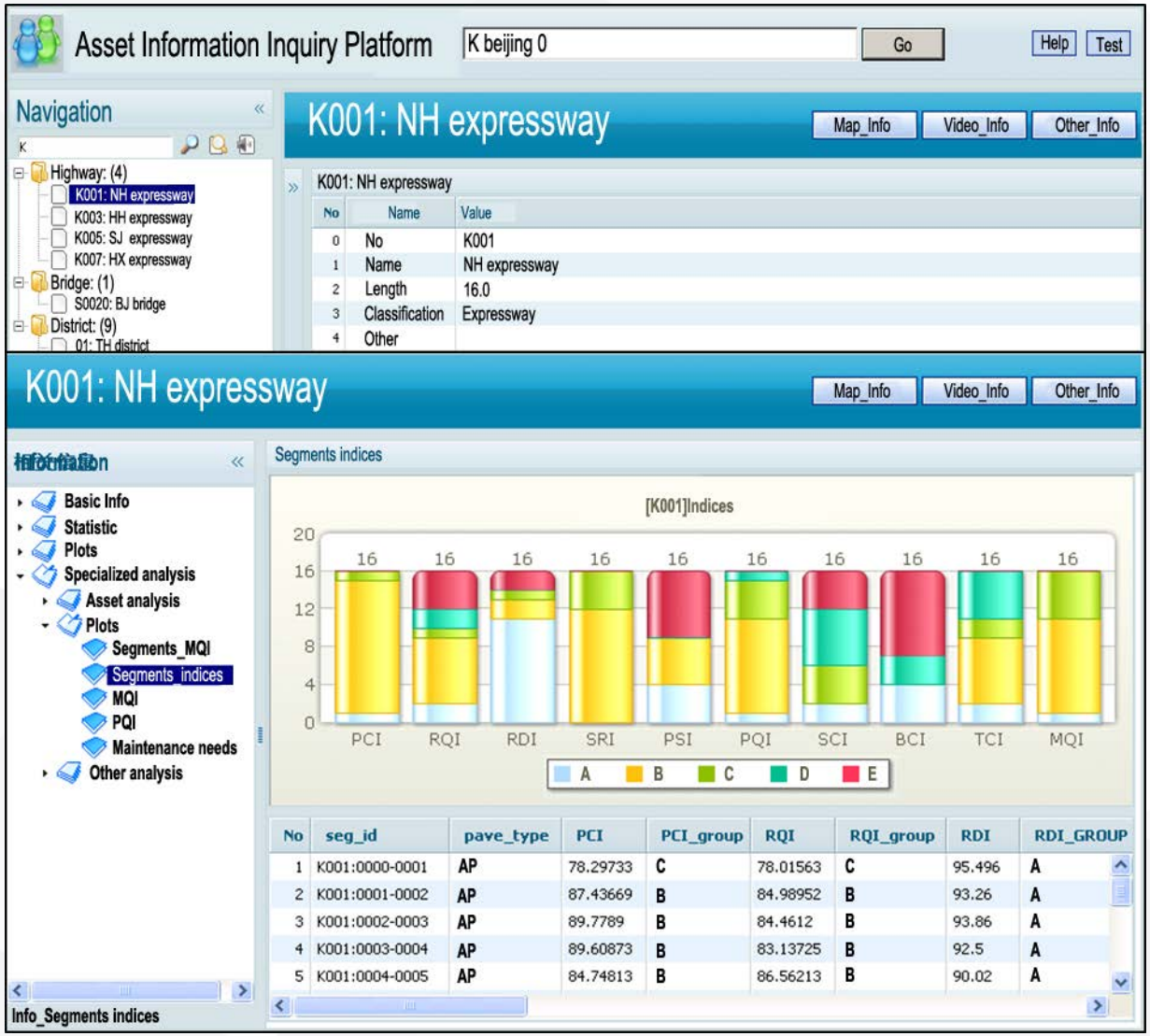

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Analysis - Work list（Unconditional budget）

	Segments	Length (km/h)	AADT	Work	Financial Cost
2010					
	C0025:N40390-N45860				
	C0025:N40390-N45860_1200	0.10	42000.00	Rebuild+20cm+surface10cm	0.147200
	C0025:N40390-N45860_200	0.10	42000.00	Thick overlay	0.140000
	C0025:N40390-N45860_300	0.32	42000.00	Thin overlay	0.404460
	C0025:N40390-N45860_621	0.10	42000.00	Thin overlay	0.129780
	C0025:N40390-N45860_724	0.08	42000.00	Thin overlay	0.095760
	C0025:N40390-N45860_800	0.15	42000.00	Rebuild+20cm+surface10cm	0.327040
	C0025:N40390-N45860_946	0.05	42000.00	Rebuild	0.069552
	C0025:N40390-N45860_1000	0.10	42000.00	Thick overlay	0.092000
	C0025:N40390-N45860_1100	0.10	42000.00	Rebuild+20cm+surface10cm	0.147200
	C0062:N45790-N45370				
	C0062:N45790-N45370_735	0.12	50000.00	Thin overlay	0.156600
	Z0022:N49650-N49560				
	Z0022:N49650-N49560_0	0.39	42300.00	Thin overlay	0.942840
2011					
	C0062:N45790-N45370				
	C0062:N45790-N45370_517	0.22	50000.00	Thin overlay	0.294300
	C0062:N45790-N45370_851	0.10	50000.00	Thin overlay	0.133650
	Z0020:N45820-N46120				
	Z0020:N45820-N46120_0	0.28	40000.00	Thin overlay	0.247500
2012					
	C0025:N40390-N45860				
	C0025:N40390-N45860_0	0.20	42000.00	Rebuild	0.392000
	C0025:N40390-N45860_1300	0.08	42000.00	Rebuild+20cm+surface10cm	0.114816
	C0025:N40390-N45860_1378	0.20	42000.00	Rebuild+20cm+surface10cm	0.292928

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PaveMaster

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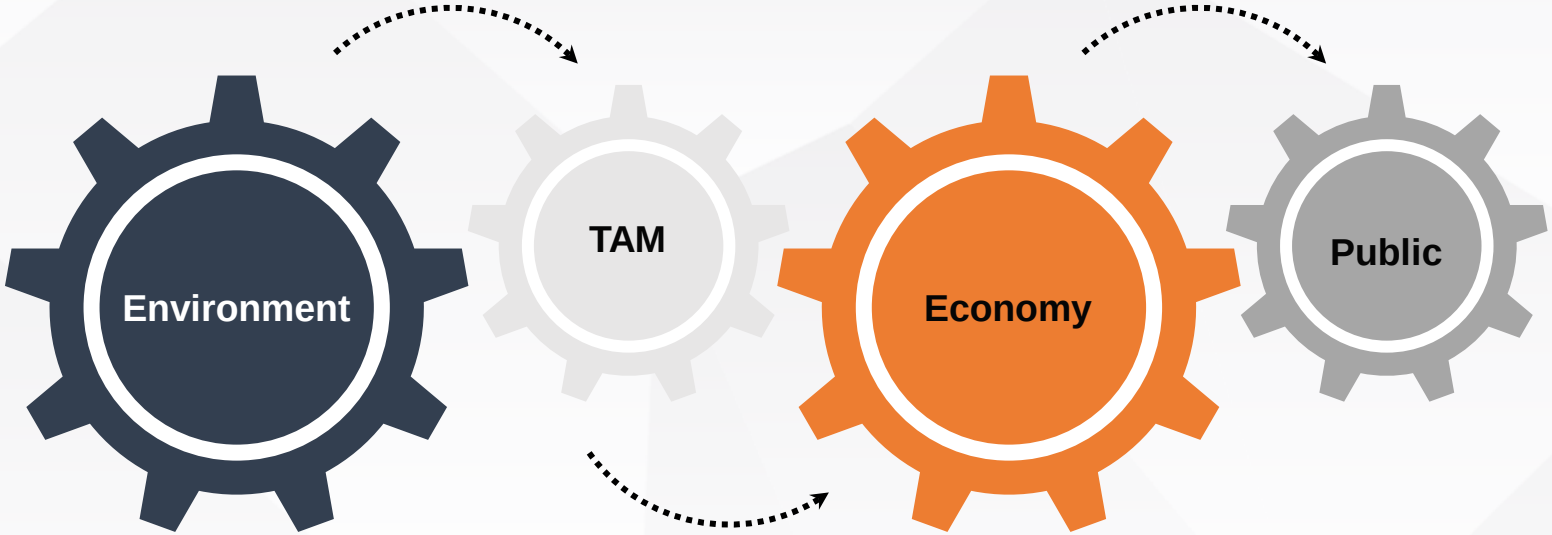
Integrated Design and Analysis Platform for Construction and Maintenance of Road Pavement

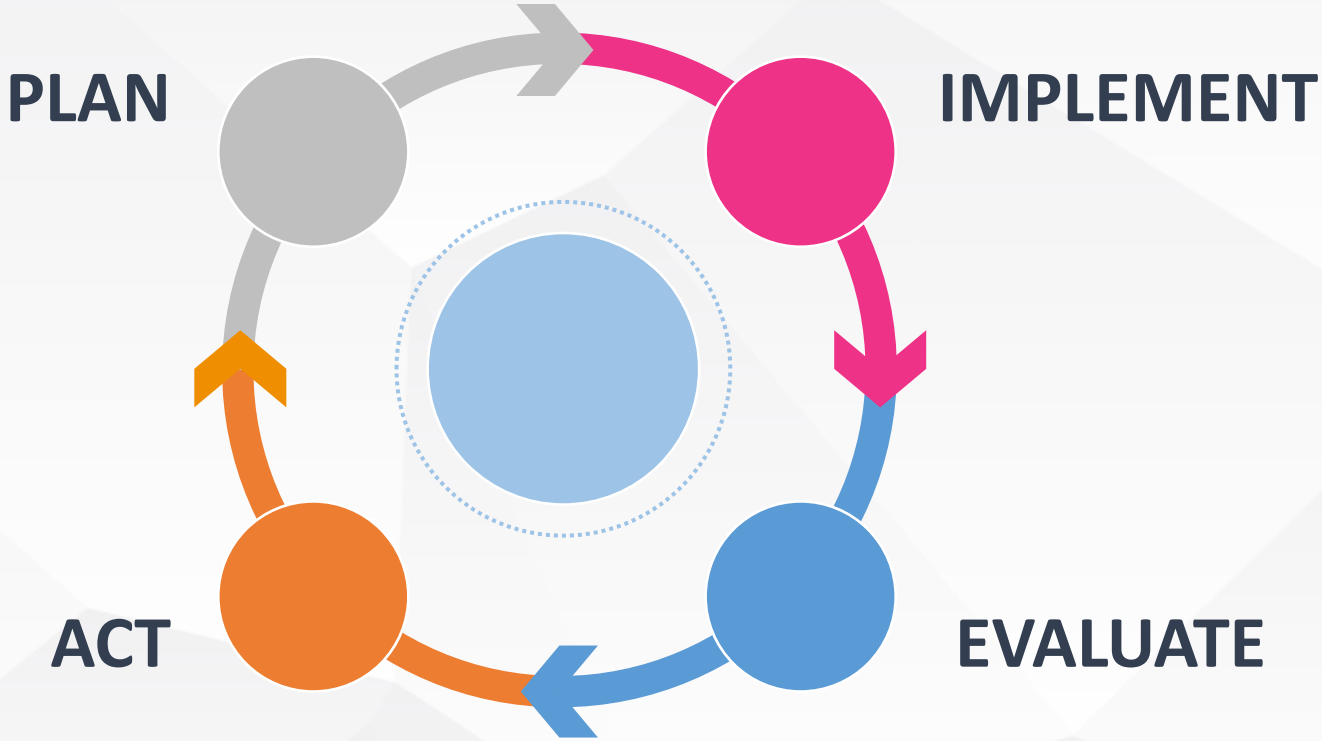
- Road Performance Prediction
- Maintenance Time Confirmation
- Maintenance Resource Allocation
- Investment Estimation and Benefit Analysis

- Build a sustainable asset management system
- Communicate
- Monitor
- Build effective database



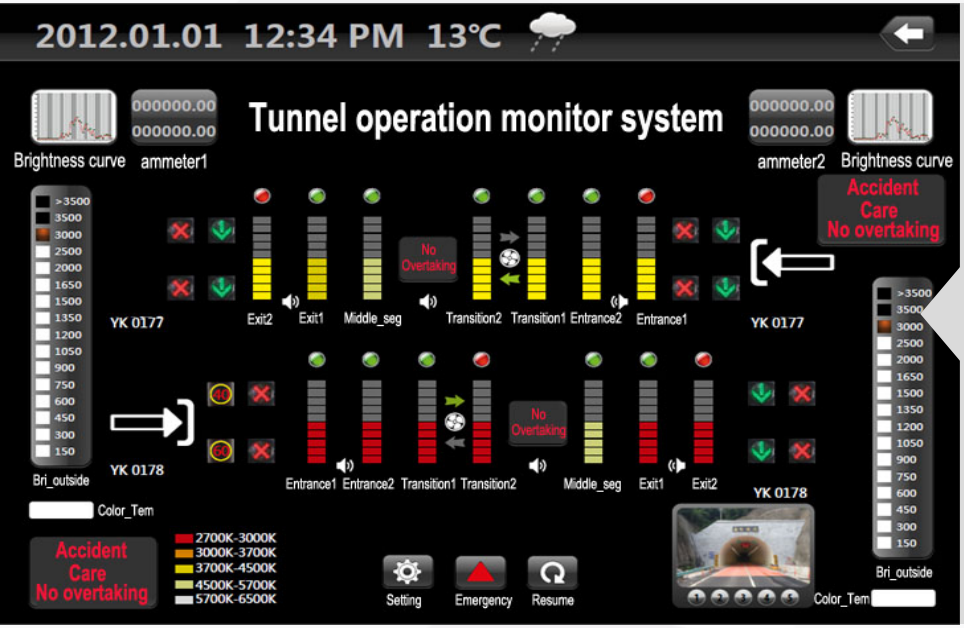
Sustainable transportation asset management system

- Activities relating to the assets, including operations, maintenance, asset renewals, new asset development work activities, performance monitoring, procurement and program delivered.
- Not focus on the asset management of a specific transportation program; for a long-term, transportation asset of highway network should be analyzed.
- Not only inner relation in this system, but also the relation of transportation asset with environment, economy……



Communicate

- Leadership, linking strategy and action in transportation asset
- Ministry of transport – Provincial department of transportation- specific agencies, about missions, goals, program initiatives, services and products.
- Engineering units, divisions and offices
- Governors, technicist, constructors



Video monitor(Zhongwei dianzi, Hangzhou)

Electronic monitor and control(Jinsui zidonghua, Chengdu)

Emergency broadcast and phone(Gongkefeida, Beijing)

Traffic event detection(Daotantan, Guizhou)

Tunnel lighting monitor and control(Shenghui lighting, Jiaxing)

Monitor & Build effective database

- Effective monitor devices
- Consistent and accurate data collection
- Lack of integration between many of the systems pertaining to core processes
- Large numbers of specific data throughout the life of transportation asset-BIG DATA

THANK YOU !

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