

# Case Study on the Implementation of Railway Facilities Information System (RAFIS)

2021. 10. 13



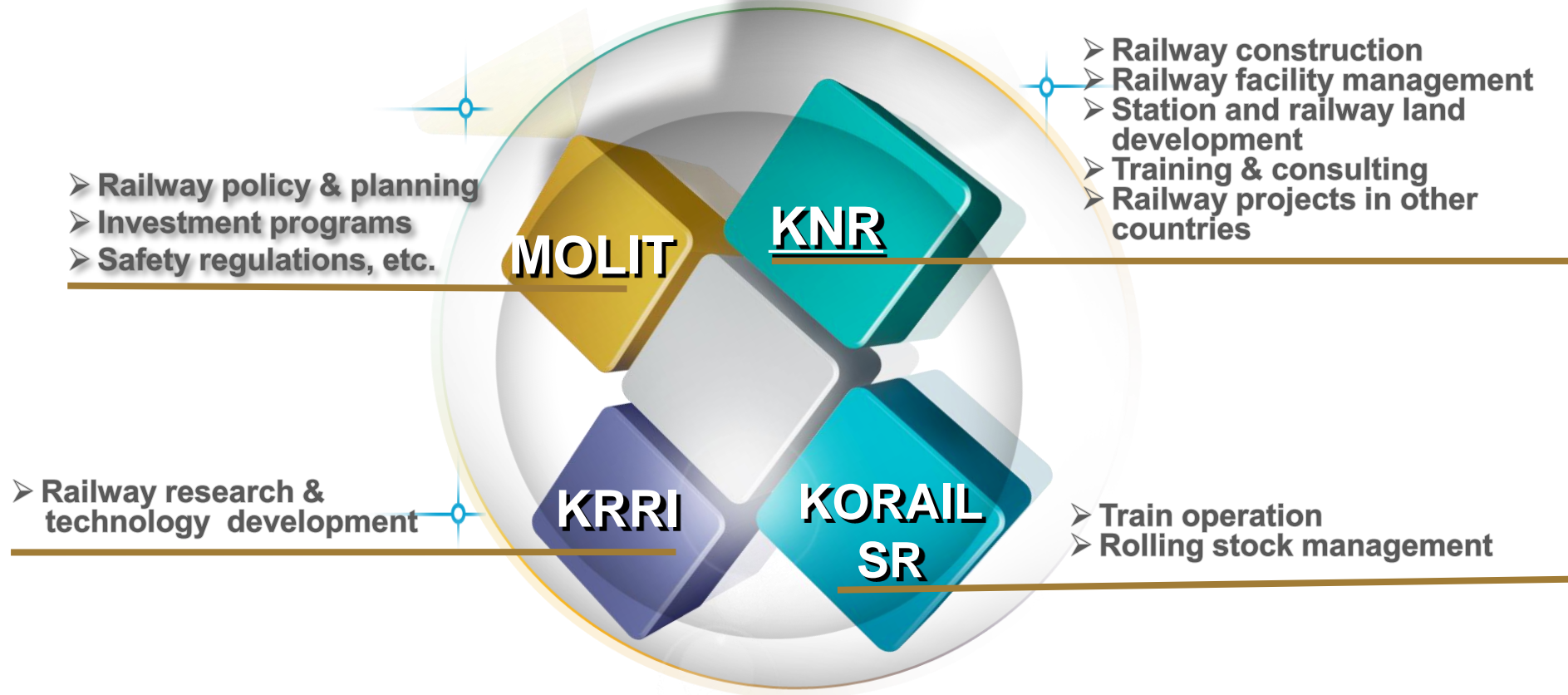


- 1. About KNR**
- 2. RAFIS Overview**
- 3. System Configuration**
- 4. System Development Aims**
- 5. Main Functions**
- 6. Benefits**
- 7. Future Plans**

# 1. About KNR



## 1-1 Railway organizations



# 1. About KNR



## 1-2 Railways in Korea today

<b>Total length</b>	<b>4,274 km</b>
<b>Electrified</b>	<b>2,965 km (74.4%)</b>
<b>HSR (over 300 km/h )</b>	<b>3 lines</b>
<b>Conventional railways &amp; commuter lines</b>	<b>34 main lines &amp; 55 branch lines</b>



	<b>Connection</b>	<b>Distance between stations</b>	<b>Finance</b>
HSR (300 km/h)	Major cities	About 40 km	Central govt. 50%, KNR 50% • 65 % of Gyeongbu HSR Phase 1 financed by KNR
Conventional	Major or midsized cities	About 20 km	Central govt. 100%
Regional	Downtown – suburbs	About 2 to 7 km	Central govt. 70%, local govts. 30%



# 1. About KNR



## 1-3 General information



Head Office in  
Daejeon, Republic of Korea

<b>Organization</b>	Korea National Railway
<b>Date founded</b>	1 January 2004
<b>Organization Type</b>	State-owned
<b>Annual Budget</b>	USD 9,900 million
<b>Total Asset</b>	USD 18,768 million
<b>Credit Rating</b>	Domestic AAA, Moody's Aa2, S&P AASTable
<b>Employees</b>	2,170

# 1. About KNR

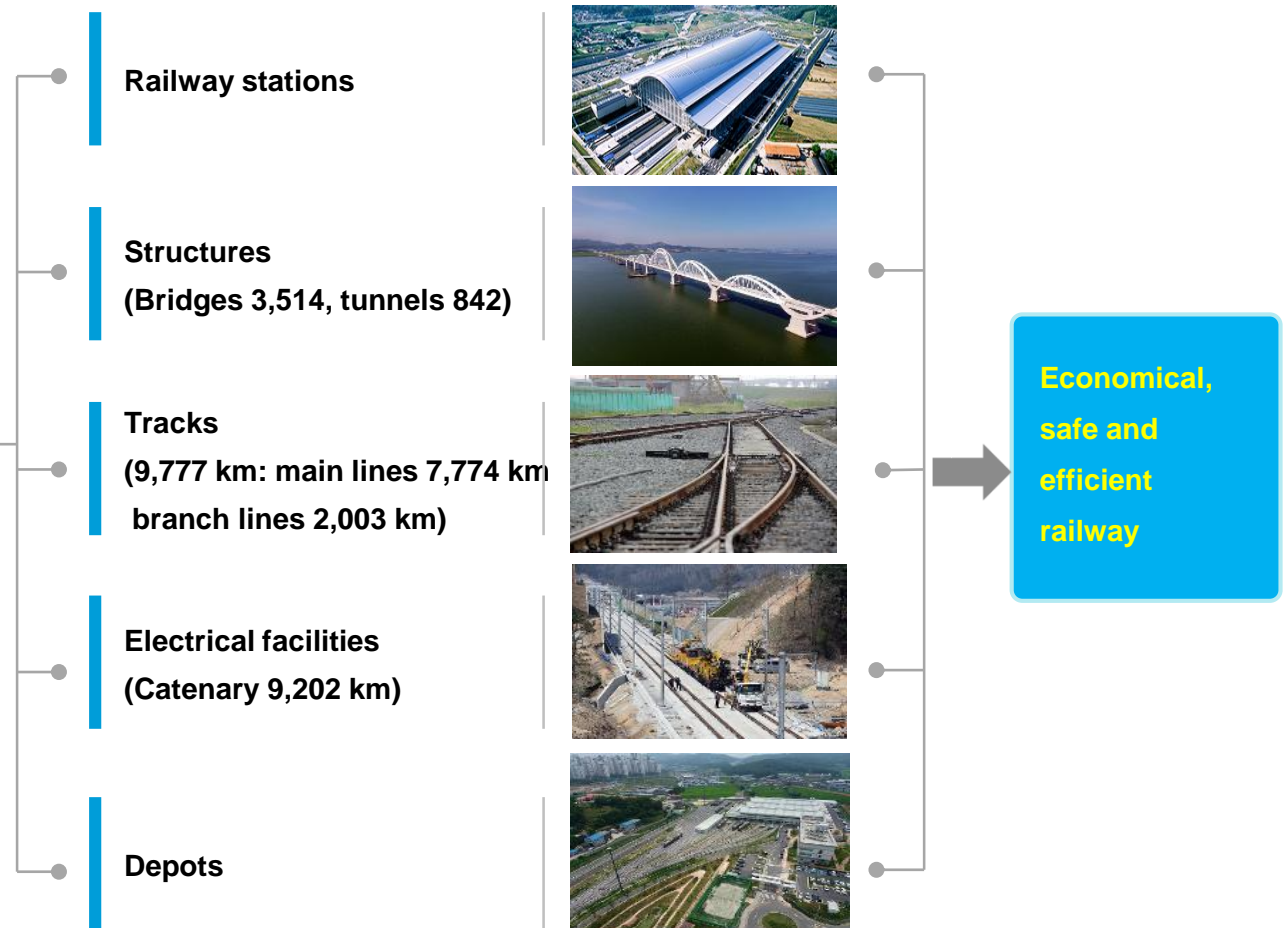


## 1-4 Business portfolio

### Business areas

- ① Railway network planning
- ② Project management
- ③ Railway construction
- ④ Railway facilities management
- ⑤ Training & consulting
- ⑥ Station area and railway land development
- ⑦ Overseas railway projects

### Infrastructure management capabilities



# 1. About KNR



## 1-5 Response to climate change

### Zero carbon in the rail sector, greening of railways (2021)

Areas of Application	Greening Method
1. Turning railway assets into energy	Expansion of electric vehicle charging facilities
2. Expanding the energy self-reliance rate of railway stations	Achieve 40% by 2025
3. Energy storage device expansion	Store late-night electricity for daytime use
4. Lighting in railway tunnels, stations, etc.	Automatic luminance adjustment
5. Substation insulation gas	Conversion to eco-friendly gases

## 2. RAFIS Overview – Development



### Name

RAilway Facilities Information System (RAFIS)

### Budget

USD 33 million

### Duration

18 April 2018 to 31 October 2021

### Host agencies

KNR, Korail, MOLIT (Ministry of Land, Infrastructure and Transport)

### Key contents

- Management of railway facility information for entire lifecycle
- Preventive maintenance decision-making based on facility information
- Location-based facility information system

# 3. System Configuration



Internal interface

**KR**  
(CPMS/ EPMS, HR, KRIC)

**KORAIL**  
(KOVIS PM, HR, MM, XROIS)

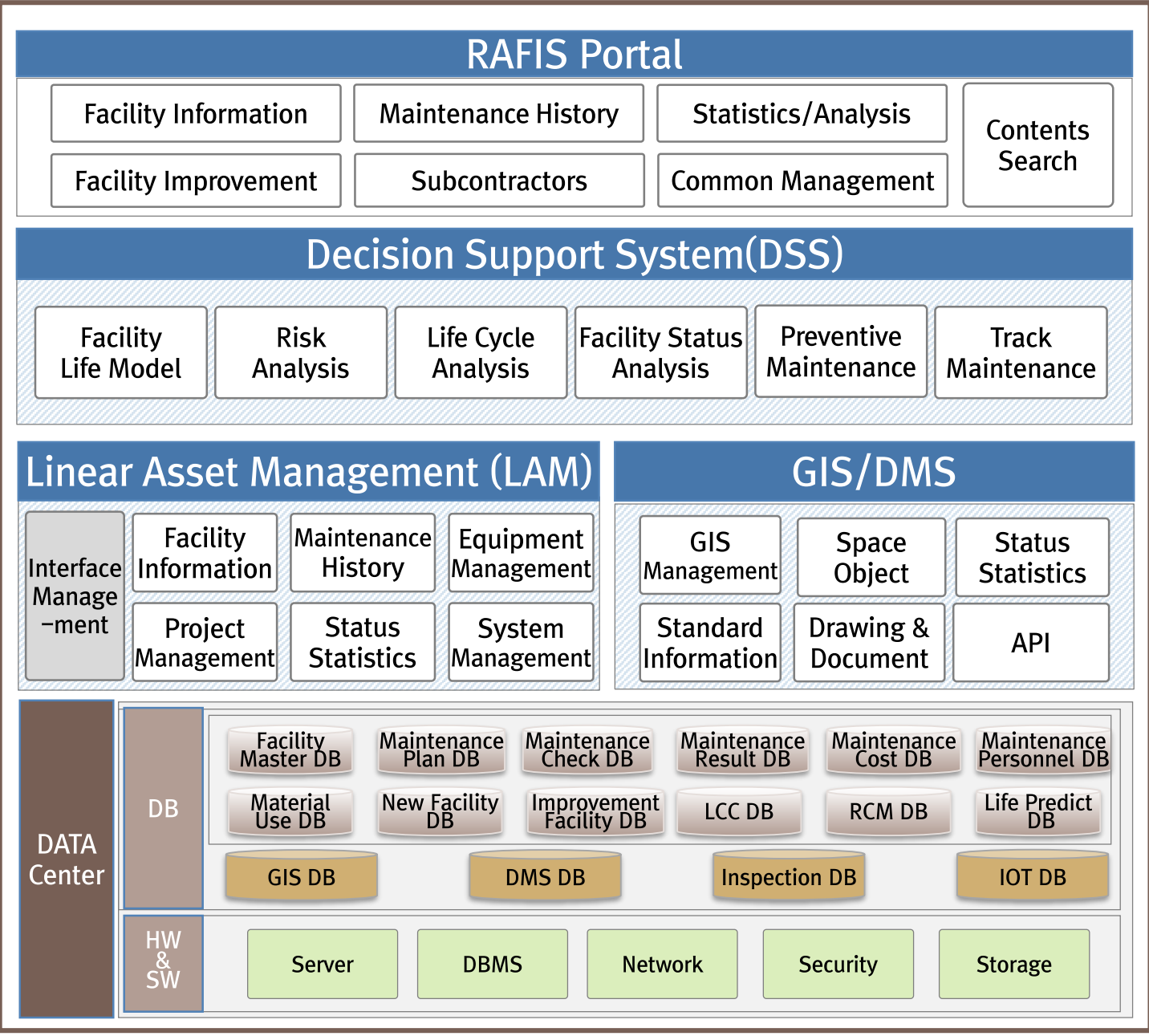
External interface

**Korea Authority of Land & Infrastructure Safety**

**Korea Meteorological Admin.**

**National Geographic Information Service**

Interface



Internal user

**Manager**

**Field User**

**IT Manager**

Private network

External user

**MOLIT**

**Partners**

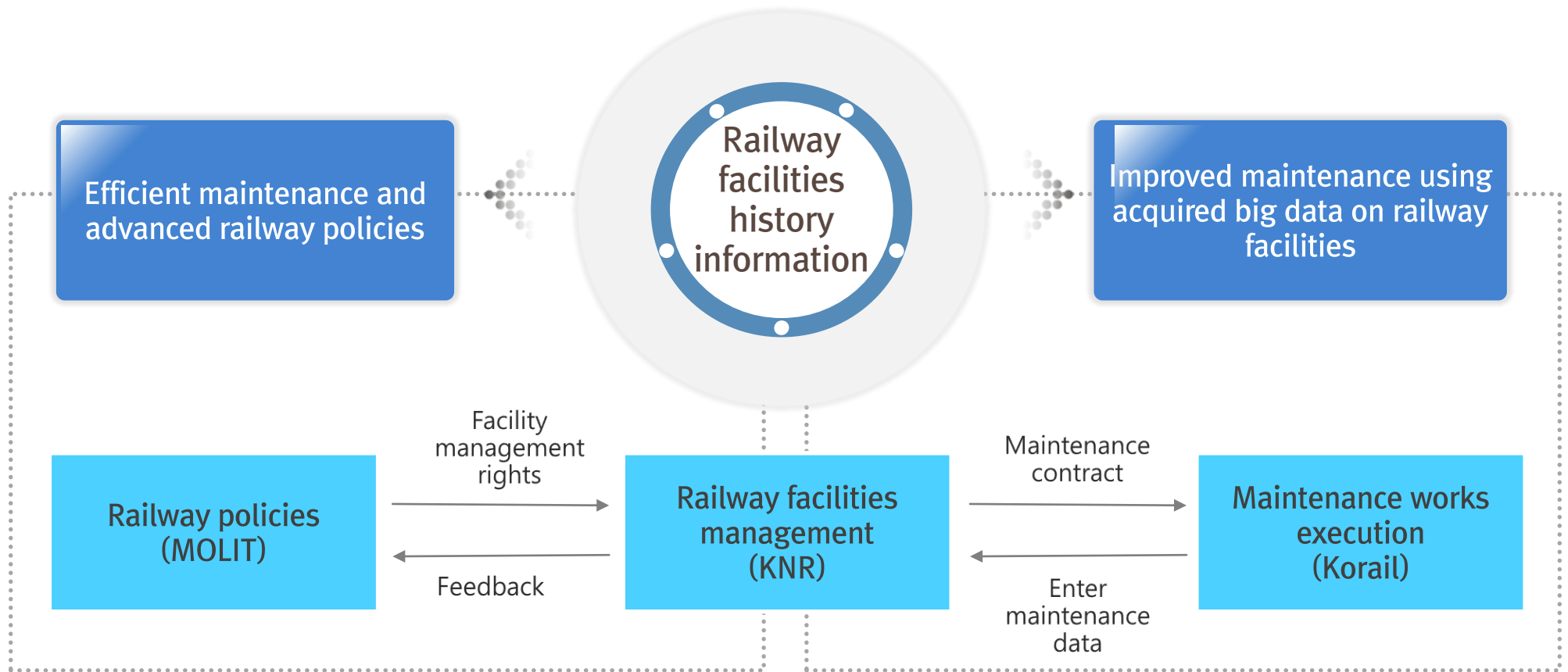
Public network (Internet)



# 4. System Development Aims



“Development of user-centered (MOLIT · KNR · Korail) railway facility information system to maximize asset value through budget allocation based on facility status information”





# 4. System Development Aims



## Key Success Factors

Railway facility lifecycle management

Preventive maintenance system

Enhanced user convenience

Facility status and statistics shared for policy/decision making and scientific maintenance

Standardized facility classification code

Introduction of GIS-based railway facility management system

Success factors

Scientific System with advanced work processing methods

Success Factor 01

Highly serviceable system offering easy utility in the field

Success Factor 02

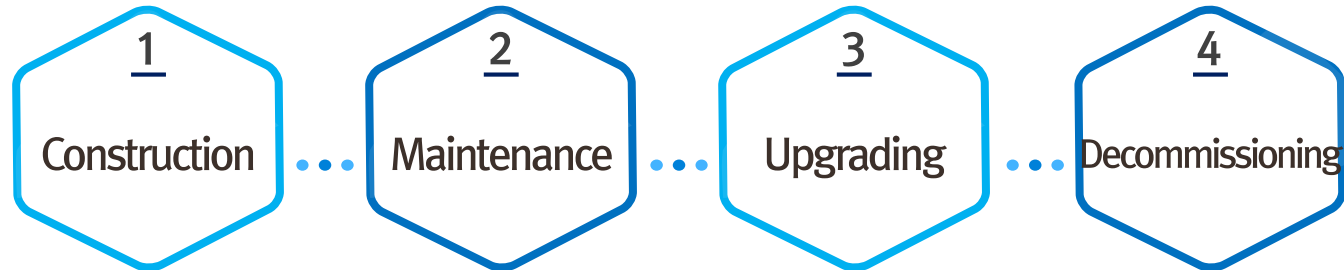
System using standardized codes and GIS for smart and safe railways

Success Factor 03

# 5. Main Functions



## Railway Facility Lifecycle Management



### AS-IS

- Insufficient lifecycle management due to disconnected information for different stages of facility' s lifecycle
  - After construction/upgrading of facility, hard copies of drawings and technical documents are handed over for facility management



### TO-BE

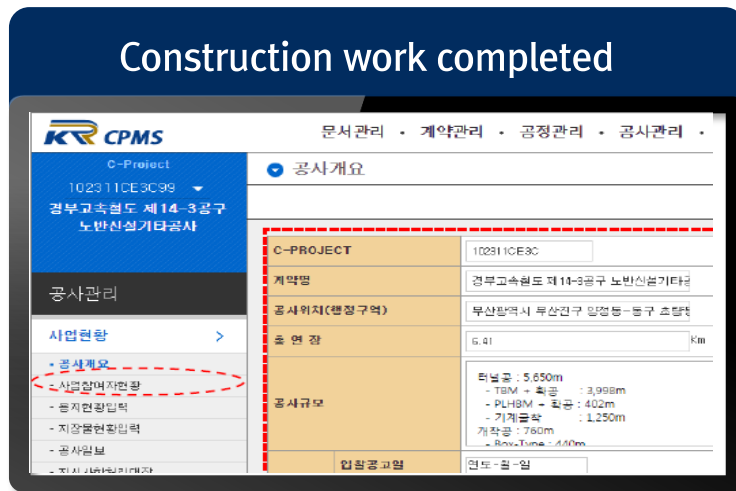
- Integrated management of facility information over entire lifecycle to support decision-making for maximized facility performance and lifespan
  - Integrate facility construction/upgrading data and maintenance history data formerly managed by separate systems
- Analyze accumulated information to compare facility types/construction methods/etc. to present optimum alternative

# 5. Main Functions

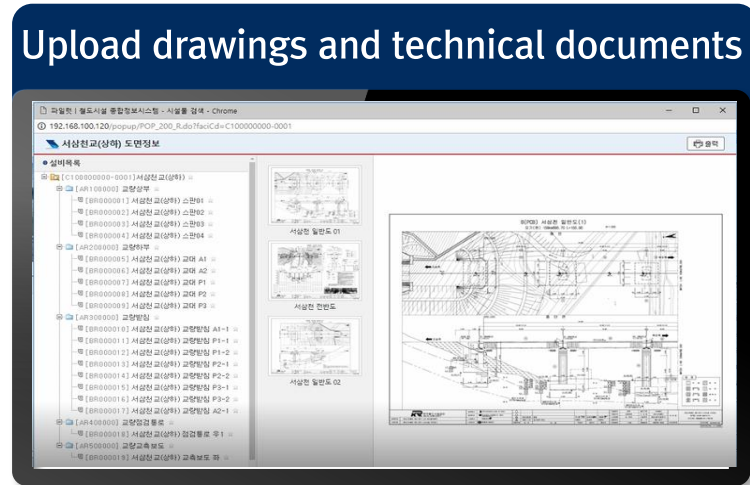
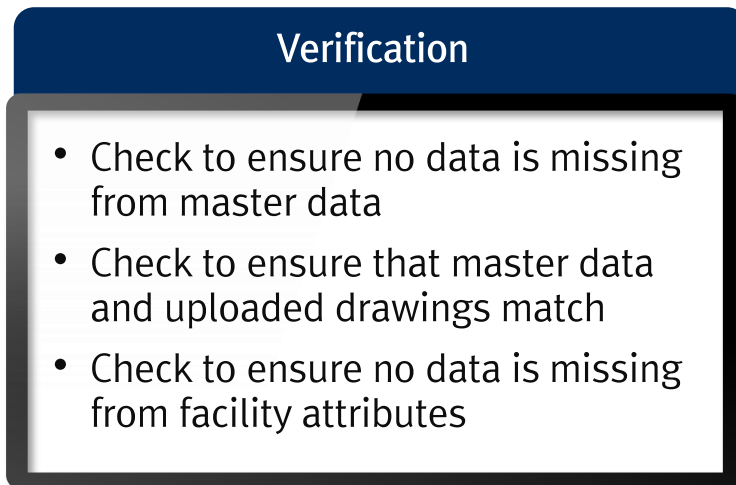


## Railway Facility Lifecycle Management

① Enter facility information: facility attributes, drawings, technical documents



(KNR: CPMS, Korail: KOVIS)



# 5. Main Functions



## Railway Facility Lifecycle Management

### ② Enter maintenance data: facility inspection and maintenance data

#### Confirm facility information

The screenshot displays a dashboard with a 'To-do list' on the left, listing various tasks with their respective dates and statuses. On the right, a 'GIS' map shows the geographical location of these facilities. The interface includes navigation menus and data visualization elements.

#### Search facilities information

The screenshot shows a search interface for facility information. It includes a search bar, filters, and a list of results. Two specific sections are highlighted: 'Facility attributes' which shows detailed data for a selected facility, and 'Facility maintenance history' which lists past maintenance activities.

Facility information search

To-do List

Enter work plan

#### Maintenance information created

The screenshot displays a detailed table of maintenance information. The table has multiple columns including facility ID, location, maintenance type, and dates. It provides a comprehensive overview of the maintenance schedule and execution status.

#### Work plan created

The screenshot shows a detailed view of a work plan. It includes a header with the plan name and dates, followed by a table detailing the specific tasks, locations, and assigned resources for the maintenance work.

Enter maintenance information



# 5. Main Functions



## Railway Facility Lifecycle Management

③ Select facilities for improvement and predict optimum improvement dates through LCC analysis based on accumulated facility information

시설물개량시기평가 결과

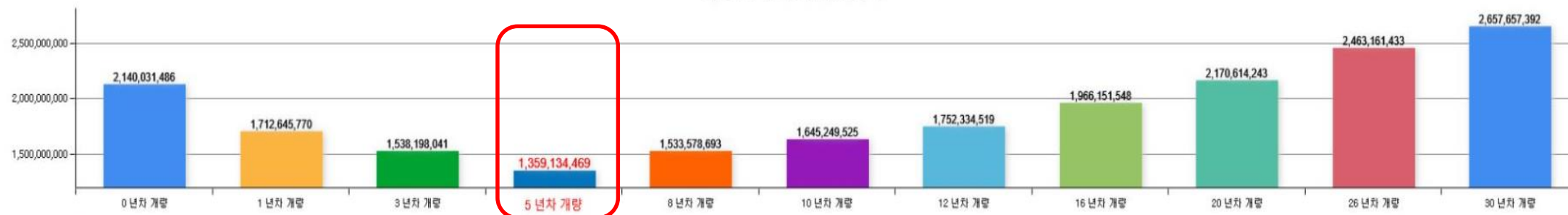
개량시기평가결과	유지보수비용상세	연차별투입자원	연차별투입자원상세	투입자원예산단가						최종선택대안 : 대안 5(대안순번: 32)	최종대안선택	평가시설물조회
분석번호	LFX202100015	분석명	2021 분석 테스트(복사 프로젝트)	분석년수(년)	30	할인율(%)	5.5	분석상태	분석중	첨부파일		

대안별 비용평가 결과 (총: 11건)

※ 총비용은 예병, 고장, 개량 비용 합산입니다.

선택	대안구분	대안순번	개량년차	대안명	대안설명	최종선택여부	현재가치총금액(원)	총비용금액(원)	내부수익률(%)	손익분기점년차수
<input checked="" type="checkbox"/>	대안	0	0	원안	개량없는 대안	아니오	2,140,031,486	2,162,744,083		
<input checked="" type="checkbox"/>	대안	1	1	1년차 개량 대안	1년차 개량이 진행되는 대안	아니오	1,712,645,770	2,131,744,139		
<input checked="" type="checkbox"/>	대안	3	3	3년차 개량 대안	3년차 개량이 진행되는 대안	아니오	1,538,198,041	2,257,400,001		
<input checked="" type="checkbox"/>	대안	32	5	대안 5	대안 5	예	1,359,134,469	1,378,568,153		
<input checked="" type="checkbox"/>	대안	8	8	8년차 개량 대안	8년차 개량이 진행되는 대안	아니오	1,533,578,693	1,553,588,817		
<input checked="" type="checkbox"/>	대안	31	10	대안 190	대안 10년차	아니오	1,645,249,525	1,665,781,551		
<input checked="" type="checkbox"/>	대안	12	12	12년차 개량 대안	12년차 개량이 진행되는 대안	아니오	1,752,334,519	1,773,486,575		
<input checked="" type="checkbox"/>	대안	16	16	16년차 개량 대안	16년차 개량이 진행되는 대안	아니오	1,966,151,548	1,988,896,623		

대안별 현재가치총금액



# 5. Main Functions



## Preventive maintenance system



### AS-IS

- Lack of preventive management system that takes facility conditions and age into consideration
  - Mostly corrective maintenance identified through periodic maintenance or after failure
  - Some condition-based preventive maintenance carried out on ballasted track sections of Gyeongbu HSR
- Increased risks due to difficulty in timely maintenance/reinforcement/upgrading of aging facilities posed by limited budget



### TO-BE

- Build reliability-centered preventive management system based on history and condition of facilities
  - Perform maintenance before failure and propose appropriate maintenance intervals
  - Carry out condition-based maintenance on all sections of conventional lines and high speed lines
- Build preemptive maintenance decision-making support system based on priorities and performance evaluations of aged facilities

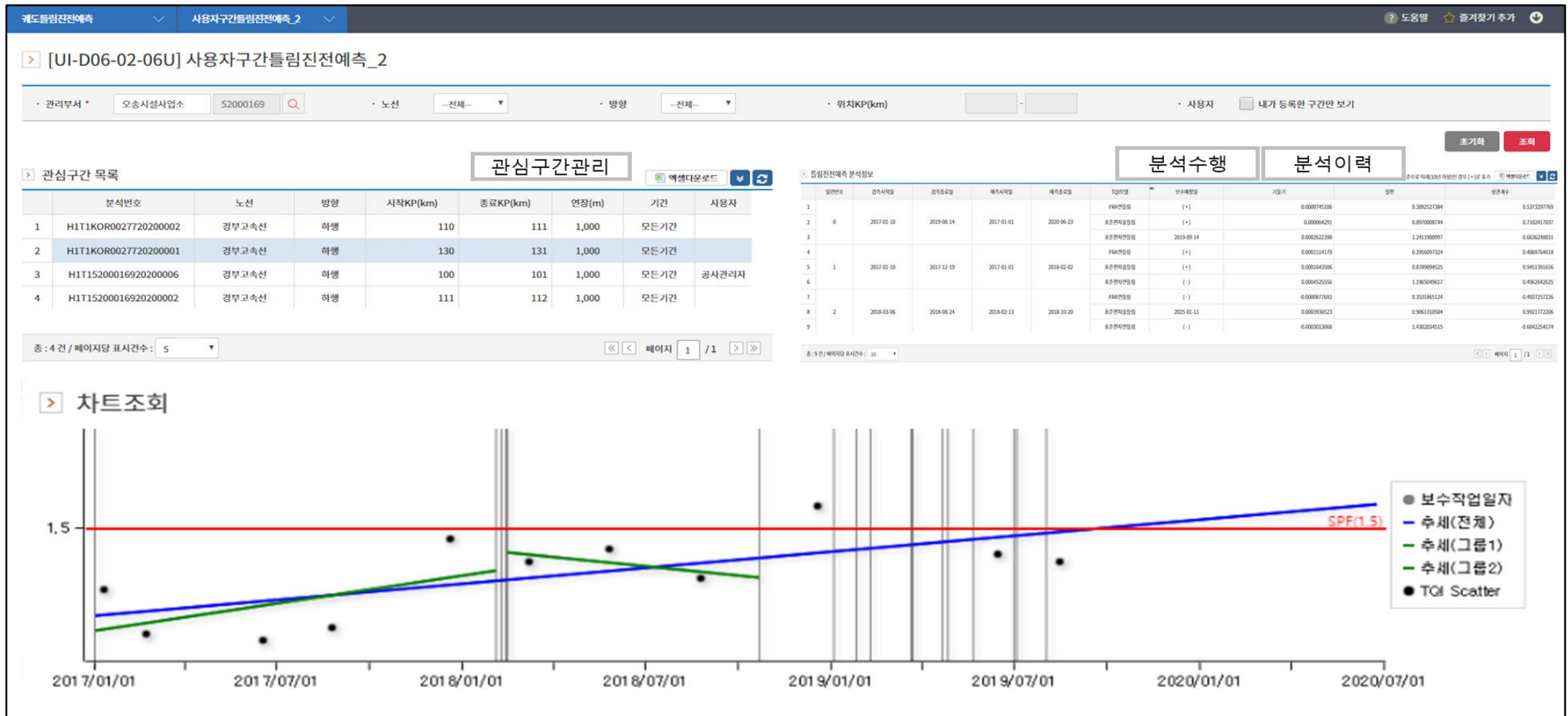


# 5. Main Functions



## Preventive maintenance system

- Predict track irregularities using track condition analysis to estimate optimal track alignment maintenance intervals and manage preventive maintenance schedules



# 5. Main Functions



## Preventive maintenance system

- Propose optimal maintenance intervals based on analyses of facility failures and costs of maintenance and repairs

### > 점검주기 분석대상 목록

번호	시설물통합번호	분석대상 시설물명	분석기본데이터(LCC 분석결과)		
			총 예방정비비용(원)	총 고장정비비용(원)	확률분포함수종류 *
1	E0000000020	가스절연개폐장치( F3) (연산SS)	29,000	1,112,499	와이블분포함수
2	E0000000021	가스절연개폐장치( F4) (연산SS)		1,112,499	와이블분포함수
3	E0000000020	가스절연개폐장치( F3) (연산SS)	365,000	21,439,611	와이블분포함수
4	E0000000021	가스절연개폐장치( F4) (연산SS)		21,439,611	와이블분포함수
5	E0000000020	가스절연개폐장치( F3) (연산SS)	270,040	1,112,499	와이블분포함수
6	E0000000021	가스절연개폐장치( F4) (연산SS)		1,112,499	와이블분포함수

총 : 9 건 / 페이지당 표시건수 : 20

최적점검주기평가

현행주기 및 유사시설물주기

### > 최적점검주기 입력조건

예방정비비용(원) *	29000	고장정비비용(원) *	1112499
확률분포함수종류 *	와이블분포함수	모수1	97
탐색시작점 *	10	모수2	1.3
		탐색종료점 *	6000
			10000

※ 예방정비비용(원)은 고장정비비용(원)보다 작아야 합니다.

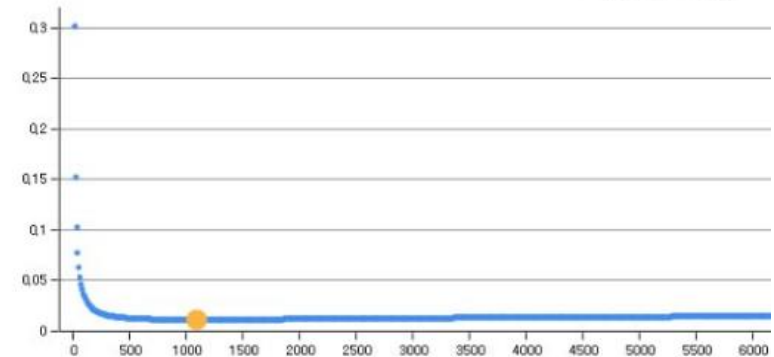
분석

### > 최적점검주기 결과

최적점검주기	45.415085019687496 일	최적점검비용(원)	0.012209503
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Analysis of gas insulated switchgear found 45 days to be the optimal maintenance interval

시간별 비용



# 5. Main Functions



## Enhanced User Convenience



### AS-IS

- Existing system, SAP, has complicated access path and input system
  - Efficient response to frequently changing railway related regulations and policies hindered by limited packages
- Duplicated input of facility attributes and maintenance data on separate external systems (FMS, NDMS, etc.) lowers work efficiency
- Increased work load due to having to enter maintenance data after returning to office and having to keep separate hard-copy record of the same data



### TO-BE

- Simplified access and intuitive UI with user-friendly web based screen
  - Domestically developed system means expandable and flexible system
- Duplicated inputting of facility attributes and maintenance data no longer necessary with interlinked systems
- Supports searches for facility information and maintenance history on the field with a mobile system

# 5. Main Functions



## Enhanced User Convenience

- Improved convenience by integrating planning and performance input, data which were processed in multiple steps, on one screen

> [UI-TEST-001] #유지보수관리

초기화 조회

· 시설분류  · 관리(자산)소속    · 유지보수소속

> 유지보수목록

엑셀다운로드

	유지보수소속	작업분류	유지보수번호	유지보수명	기간		위치					진행상태					
					시작일	종료일	노선	시점역	종점역	시점(KP)	종점(KP)	연장(Km)	계획 생성	계획 확정	계획 승인요청	계획 승인완료	부분 완료
1	오송고속 오송전...	재해복구	202104230000000035	경부선 서울-용산간 재해복구(20...	2021-04-01	2021-04-22	경부선	서울	용산	123.100	125.100	2	0	0	0	0	0
2	오송고속 오송전...	감독입회	202104230000000034	경부선 남영-노량진간 감독입회(...	2021-04-01	2021-04-22	경부선	남영	노량진	123.100	125.100	2	0	0	0	0	0
3	오송고속 오송전...	동일레벨추가...	202104230000000033	경부선 서울-용산간 동일레벨추...	2021-04-01	2021-04-14	경부선	서울	용산	123.100	125.100	2	0	0	0	0	0



계획생성
  계획확정
  계획승인요청
  계획승인완료
  부분완료
  실적승인요청
  작업완료

유지보수번호	<input type="text" value="202104230000000034"/>	KOVIS오더번호	<input type="text"/>	유지보수소속 *	<input type="text" value="오송고속 오송전기 전력외주"/> <input type="button" value="X"/> <input type="button" value="Q"/>
유지보수명 *	<input type="text" value="경부선 남영-노량진간 감독입회(20"/> <input type="button" value="자동생성"/>	작업분류 *	<input type="text" value="감독입회"/> <input type="button" value="X"/> <input type="button" value="Q"/>	유지보수기간 *	<input type="text" value="2021-04-01"/> - <input type="text" value="2021-04-22"/> <input type="button" value="calendar"/>
노선 *	<input type="text" value="경부선"/> <input type="button" value="X"/> <input type="button" value="Q"/>	역구간	<input type="text" value="남영"/> ~ <input type="text" value="노량진"/>	KP *	<input type="text" value="123.100"/> ~ <input type="text" value="125.100"/>
주야간구분 *	<input type="text" value="주간"/>	차단/단진계획	<input type="checkbox"/> 차단일정확인		

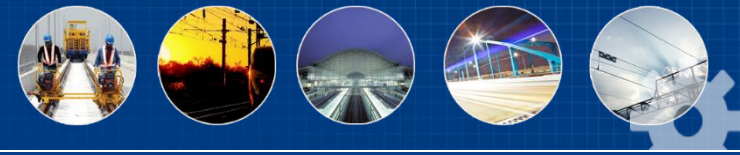
> 투입인력 (총 : 1건)

+ 투입인력추가 - 투입인력삭제

번호	작업자명	기술자구분 *	작업시작일 *	시작시간	작업종료일 *	종료시간
1	[유지]송변전	책임기술자	2021-04-01		2021-04-22	

안전작업계획서생성 임시저장 부분완료 실적승인요청 목록

# 5. Main Functions



Provide status statistics to support policy decision-making



## AS-IS

- Preparation of facility status and statistics is time consuming and data lacks accuracy
  - Data for reporting to umbrella organizations prepared and managed separately in other formats (Excel, Word, etc.)
- Security policy of the existing system restricts access by external organizations
  - MOLIT and KNR have to rely on limited information provided by Korail



## TO-BE

- Provides fast and reliable statistical data by using analysis data based on information system data
- Creates external portal for information sharing system between railway organizations
  - Provides various statistics such as budget execution performance by sectors, failure statistics by facilities, and condition-based facility grades



# 5. Main Functions

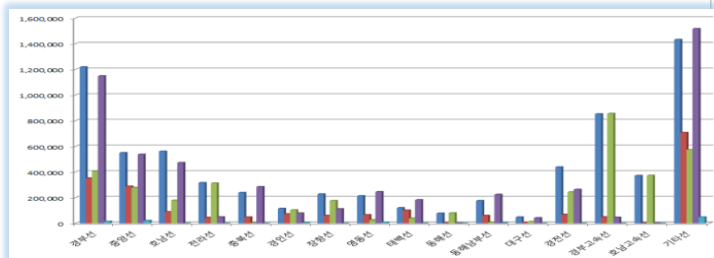


Provide status & statistics to support policy decision-making

- Provide railway facilities and maintenance statistics in diverse formats
- Provide GIS information linked to facility condition, failures and maintenance data

## Facility Status

### Line/Organization/Section

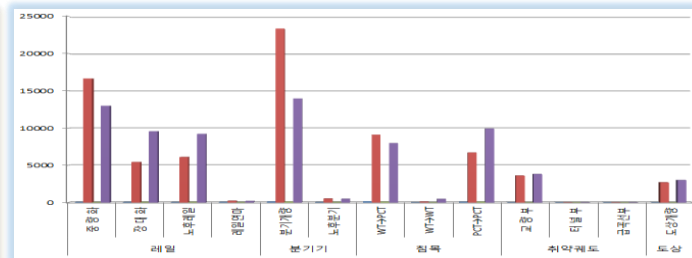


(단위 : m)

노선	본·측선			중량별			
	계	본선	측선	계	60Kg	50Kg	기타
계	9,000,684	6,969,561	2,031,123	9,000,684	3,681,213	5,215,652	103,819
경부선	1,571,795	1,219,184	352,611	1,571,795	407,124	1,149,380	15,291
중앙선	838,561	550,158	288,403	838,561	279,358	537,746	21,457
호남선	652,176	561,789	90,387	652,176	179,362	472,814	0

## Maintenance History

### Line/Organization/Section



사업별	2015년 실적		2016년 계획		
	수량	금액	수량	금액	
레일	중량화	37.6	16,649	20.1	12,992
	장대화	26	5,428	24	9,558
	노후레일	22.1	6,100	36.1	9,208
	레일연마	36.5	200	15	160
분기기	분기개량	83	23,349	71	13,981
	노후분기	12	505	28	464

## Facility Condition Analysis

### Track Inspection/Track Quality Index

Track inspection

Predicted track irregularity

Sequence	Distance	Obliq	Horizon
1	55700		
2	55750		
3	55800	0.0	-0.8
4	55850	-1.0	-0.7
5	55900	-0.9	-1.0
6	55950	-1.2	-0.7
7	56000	-1.0	-0.7
8	56050	-0.7	-0.7
9	56100	-1.2	-0.8
10	56150	-1.3	-1.0
11	56200	-1.1	-0.8
12	56250	-1.1	-0.8

Track quality index

## Facility Condition Based on GIS

- 노선/조직/구간별 현황
- 재해우려개소현황
- 노후시설물 현황
- 중점관리개소 현황

## Maintenance Status Based on GIS

- 노선/조직/구간별 현황
- 중복지적개소 현황
- 사고/장애 발생 현황
- 유지보수 계획대상 현황

## Facility malfunctions/failures

- 사고/장애 발생 현황
- 원인별 사고/장애 발생현황
- 재해 발생/증감/피해 현황
- 구간별 선로등급 현황



# 5. Main Functions



Provide status & statistics to support policy decision-making

- Provide various statistics such as the condition of facilities and maintenance status to railway-related organizations via Internet portal

**RAFIS**

Navigation: LAM, DSS, GIS, PTL, 개발지원

Menu: 열차운행선로안전관리, 현황통계, 전기공통, DSS정보, 현황통계, 궤도틀림진전분석

**October 2020**

Su	Mo	Tu	We	Th	Fr	Sa
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

**전체 (7) 오늘 (3)**

- 철도 레일 유지 보수 공사
- 철도 레일 유지 보수 공사
- 철도 레일 유지 보수 공사
- 철도 레일 유지 보수 공사
- 철도 레일 유지 보수 공사
- 철도 레일 유지 보수 공사
- 철도 레일 유지 보수 공사

**공지사항**

- 철도 레일 유지 보수 공사 2019.04.19
- 철도 레일 유지 보수 공사 2019.04.19
- 철도 레일 유지 보수 공사 2019.04.19
- 철도 레일 유지 보수 공사 2019.04.19
- 철도 레일 유지 보수 공사 2019.04.19

**시설물 작업현황**

시설물	진행률
교량	100%
터널	75%
옹벽	50%
하수	25%
하수	100%
송강장	75%
인접공사	50%
중점관리소	25%
인접공사	50%
중점관리소	25%

**노후 시설물 정보**

시설물	비율
Mushrooms	37.5%
Onions	12.5%
Olives	12.5%
Zucchini	12.5%
Pepperoni	25%

**Service Link 01**

**Service Link 02**

**Service Link 03**

# 5. Main Functions



## Standardization of railway facility classification code



### AS-IS

- All facilities are functional location dependent and non-movable
  - Difficult to track history of facility attributes when location is deleted or components are changed
- There is no linkage between railway facilities, drawings and technical documents
- Boundaries dividing equipment and material that compose railway facilities are different for different sectors
- Lack of linkage with the facility classification code because only the main task of maintenance are coded
- Seasonal specific inspections are not reflected in the work code



### TO-BE

- National railway facility code is standardized to lay the foundation for application to all operating organizations
- Apply to all fields by clearly specifying the boundaries between equipment and materials composing railway facilities
- Secure linkage between facility classification code, drawings and technical documents
- Support history management for major components by assigning management numbers to equipment and modules
- Reinforcement of linkage with facility classification code by expressing all maintenance work as a standard type of work

# 5. Main Functions

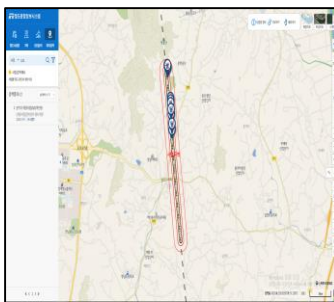


## GIS-based railway facilities management pilot project

- Pilot deployment on 4 lines (Gyeongbu HSR, Honam HSR, etc. – total 732 km)
- Integrated management of facility location and maintenance history, providing various information (building ledger, land use plan, etc.) to support GIS-based decision-making


### GIS-based Maintenance

#### Maintenance Information




- Facility KP Information
- Line/Organization/Section
- Project Plan (Improvement, Maintenance)
- Project List(Location)

- Linear Section
- Terrain Elevation
- Field KP Information
- Longitudinal Section



### Facility Drawings

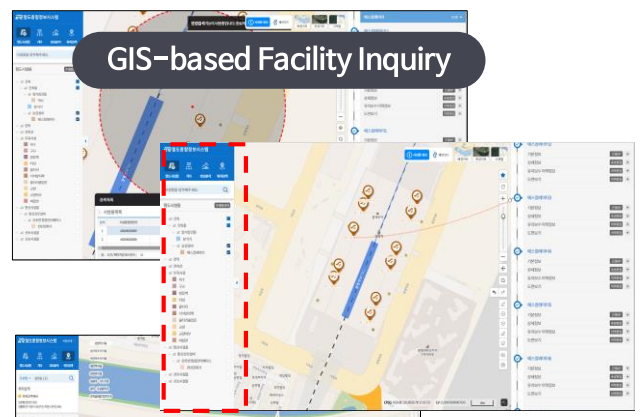


- Drawings
- Technical Documents
- Related Projects
- Facility List

### GIS-based Facility Status

#### Facility Information

#### GIS-based Facility Inquiry



- Road name/Lot number


### GIS Link Information



- Building Ledger
- Land Use Plan
- Weather
- Continuous Cadastral Map

### GIS-based Decision-making

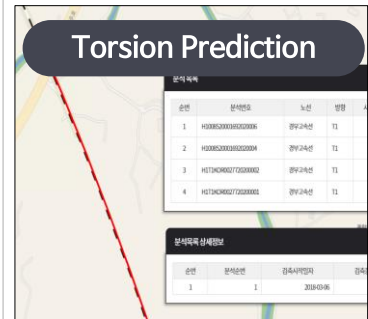
#### DSS Analysis Visualization



#### Track Deterioration Prediction

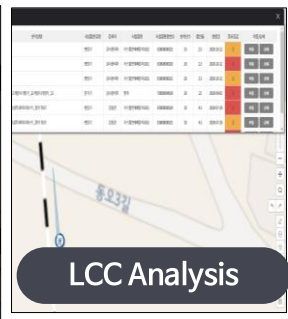
번호	구분	구분명	구분코드	구분명	구분코드	구분명	구분코드
1	구분	구분명	구분코드	구분명	구분코드	구분명	구분코드
2	구분	구분명	구분코드	구분명	구분코드	구분명	구분코드
3	구분	구분명	구분코드	구분명	구분코드	구분명	구분코드
4	구분	구분명	구분코드	구분명	구분코드	구분명	구분코드
5	구분	구분명	구분코드	구분명	구분코드	구분명	구분코드
6	구분	구분명	구분코드	구분명	구분코드	구분명	구분코드

#### Torsion Prediction




구분	구분명	구분코드	구분명	구분코드
1	구분명	구분코드	구분명	구분코드
2	구분명	구분코드	구분명	구분코드
3	구분명	구분코드	구분명	구분코드
4	구분명	구분코드	구분명	구분코드

#### LCC Analysis



구분	구분명	구분코드	구분명	구분코드
1	구분명	구분코드	구분명	구분코드
2	구분명	구분코드	구분명	구분코드
3	구분명	구분코드	구분명	구분코드
4	구분명	구분코드	구분명	구분코드

#### Facility aging Analysis

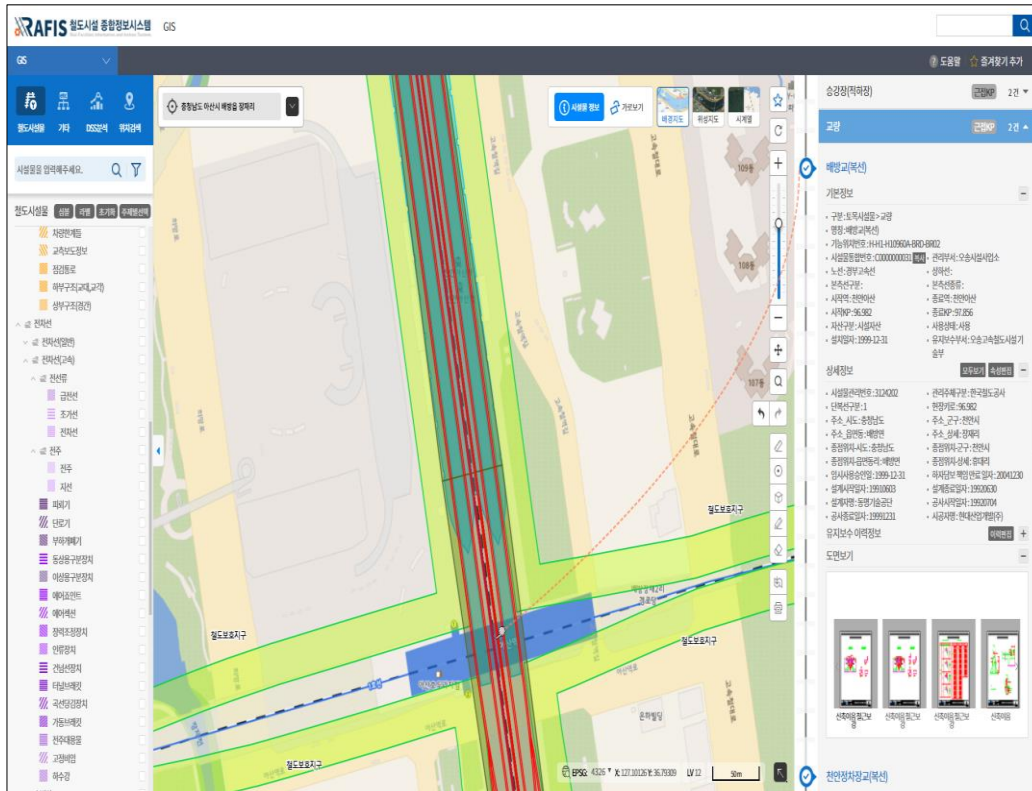




# 5. Main Functions

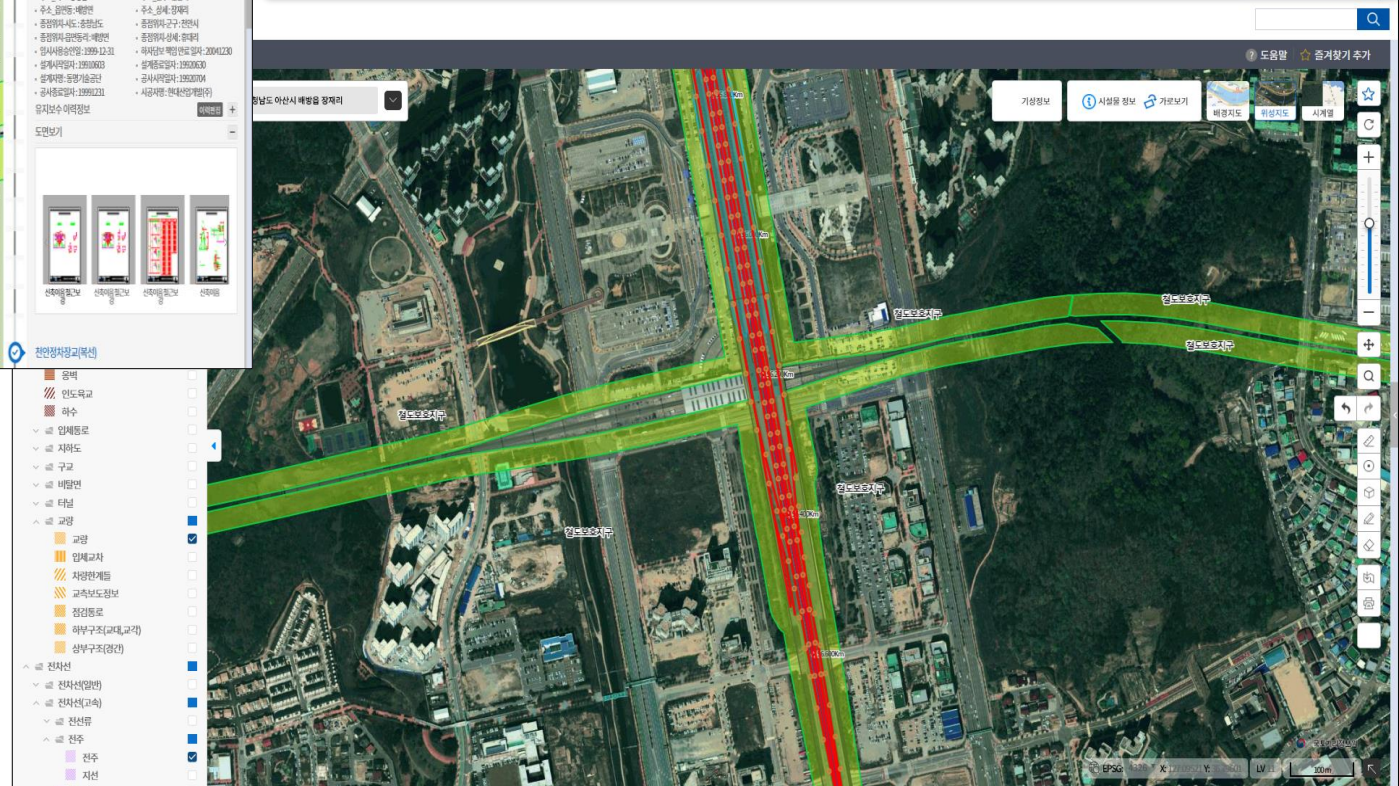


## GIS-based railway facilities management pilot project



- Provide location information for each discipline (track, civil engineering, architecture, power, signaling, telecom) on the GIS map as 150 layers
- Supporting decision-making by facility attributes, adjacent area information, building ledger, land use plan, address, cadastral, weather information, etc.

• It is possible to process realistic information such as checking facility location information using precisely captured orthographic images

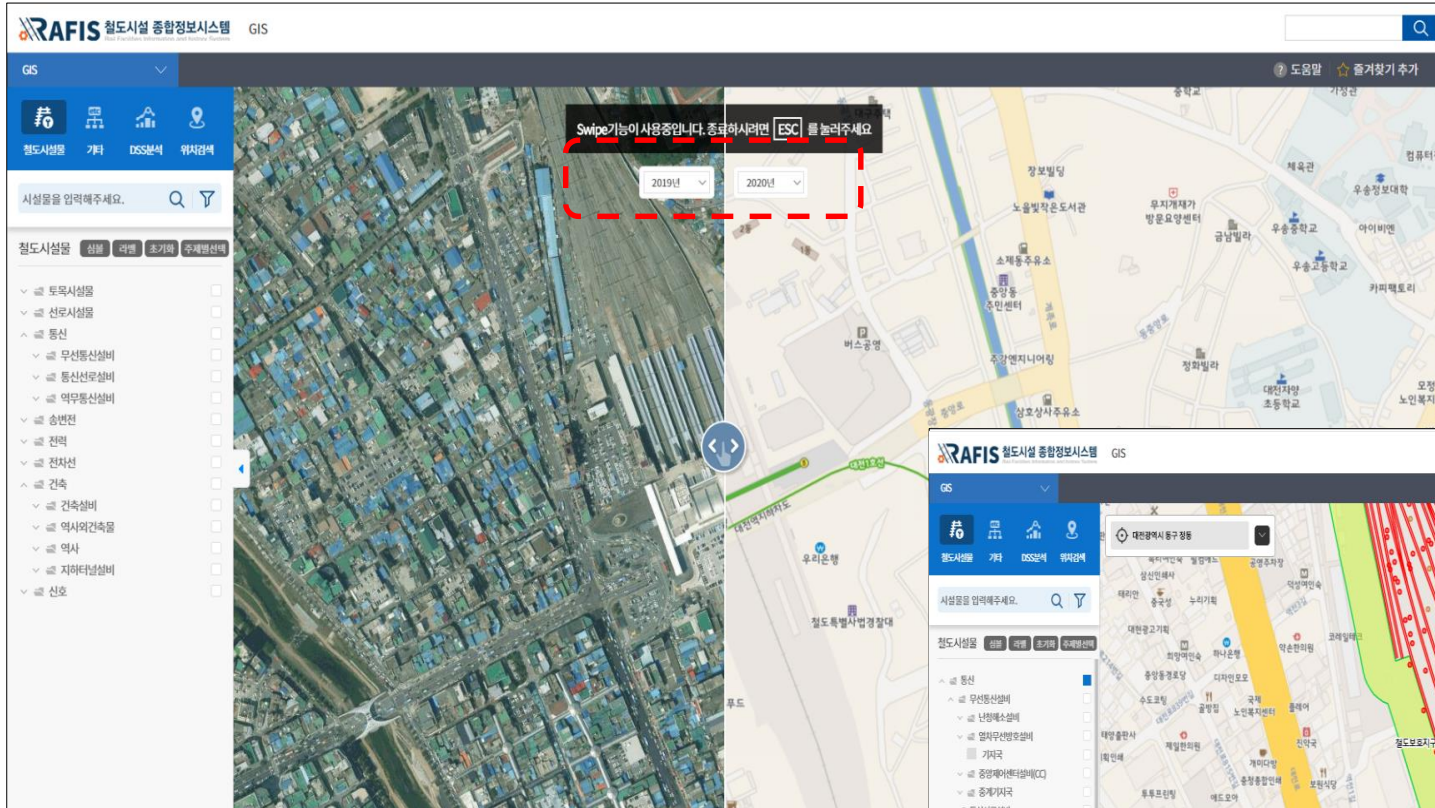




# 5. Main Functions



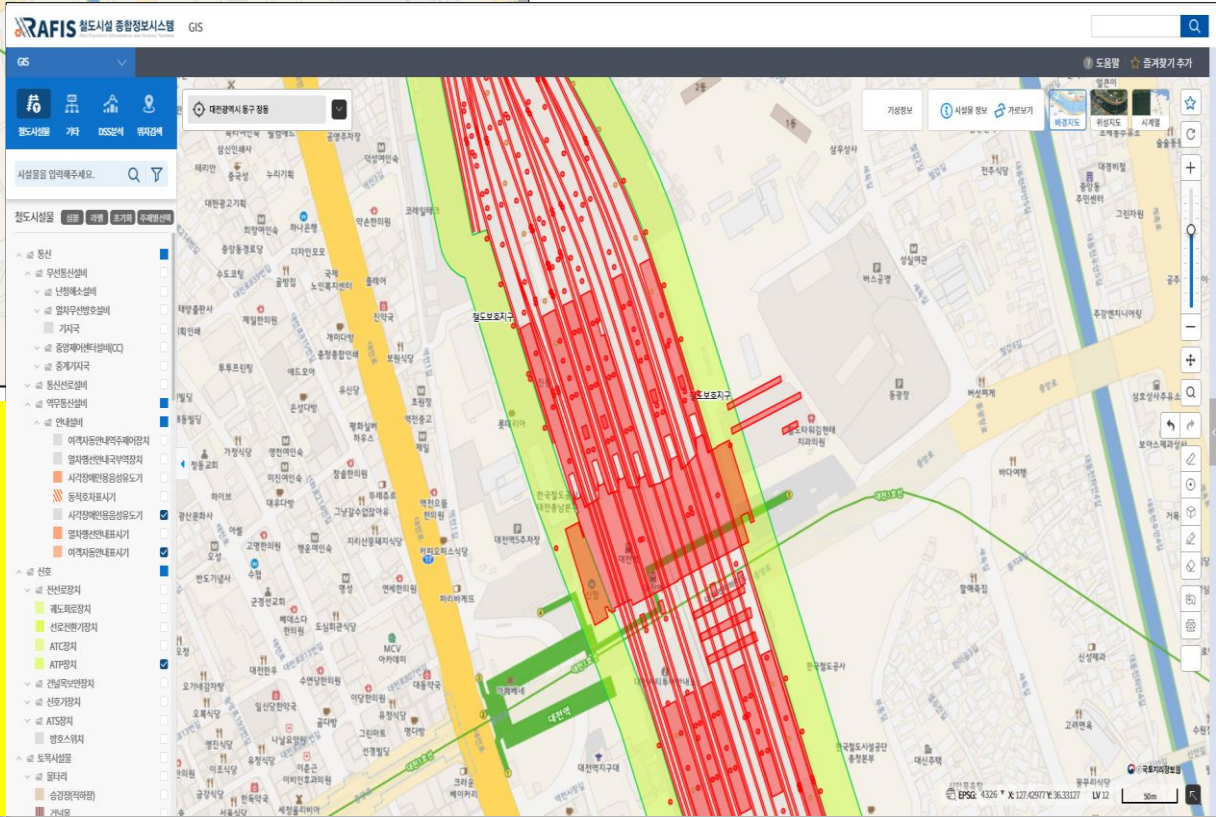
## GIS-based railway facilities management pilot project



• Provides a swipe function for decision-making, such as comparing orthogonal images and background map by year to analyze changes in the surrounding conditions of railway facility

• Supports decision-making by providing location and attribute information, maintenance history of railway facility

• It is possible to check location information and input real time history when mobile is introduced in 2023



# 5. Main Functions



## GIS-based railway facilities management pilot project

- Drawings and technical documents owned by KNR data management office and Korail maintenance site are integrated into DB (3.1 million items)

Drawing can be checked anywhere in the system



### Implementation Function

- Drawings and Document inquiry
- Drawings and Document Input/revision
- Browse/Print/Download
- Status and Statistics
- DMS Configuration

### Implementation Target



순번	공사공단구분	사업번호	준공일	사업
1	한국철도시설공단	102311C22C	2001-09-30	경부고속철도 제2-2공구 노반신설 기타
2	한국철도시설공단	102311C30C	2001-09-30	경부고속철도 제3공구 노반신설 기타
3	한국철도시설공단	102311C14C	2002-12-31	경부고속철도 제1-2공구 노반신설 기타
4	한국철도시설공단	102311C21C	2002-12-31	경부고속철도 제2-1공구 노반신설 기타
5	한국철도시설공단	102311C13C	2004-03-31	경부고속철도 제1-1공구 노반신설 기타
6	한국철도시설공단	141414C01C	2007-12-28	경원선 복선전철 주내외 8개역사 전역
7	한국철도시설공단	102114D03C	2008-12-31	경부고속철도 2단계구간 태구-경주간
8	한국철도시설공단	106422C01C	2009-01-29	장항선 천안-온양온천간 복명외 1개역
9	한국철도시설공단	145331C01C	2012-03-31	오라-수원 복선전철 신길외 1개역사 신
10	한국철도시설공단	225813R16C	2012-12-31	경부고속선 지리교외 7개교량 허무 일
11	한국철도시설공단	225813R23C	2016-04-29	경부고속철도 반월교외 외 4개 교량 내
12	한국철도시설공단	193116D10C	2016-06-30	대구선 복선전철 및 경복선 예산-이등



# 6. Benefits



## 6-1 Quantitative Effect

- Economic Value : USD 23.83 million / year”
  - Train Punctuality Value : USD 1.25 million / year
  - Increase Work Productivity : USD 22.58 million / year

## 6-2 Qualitative Effect

MOLIT (Ministry of Land, Infrastructure and Transport)	<ul style="list-style-type: none"><li>• Databased policy decision-making system to secure railway stability</li><li>• Securing an immediate field application for policy and law revision and scalability and flexibility to handle private investment and urban railroads</li></ul>
KNR (Korea National Railway)	<ul style="list-style-type: none"><li>• Establishment of railroad credibility through tracking management throughout the life cycle of railroad facilities</li><li>• Reinforce the role of facility managers through transparent budget execution</li></ul>
Korail (Korea Railroad Corporation)	<ul style="list-style-type: none"><li>• Establishment of databased reliability-based preventive maintenance system</li><li>• Increase work efficiency by securing a simple and easy-to-use system</li></ul>

# 7. Future Plans



## RAFIS Roadmap

### 1 Phase Build the Foundation

- ❖ Developing RAFIS
  - Linear Asset Management
  - Decision Support System [DSS(TBM, Track)]
  - Portal System
  - GIS Pilot Development [GIS(2D, 703Km)]
  - Drawing Management System

2018

### 2 Phase Expansion

- ❖ Expanding RAFIS
  - Mobile System
  - DSS Advancement
  - GIS(Expansion of all routes)
- ❖ IoT Big Data Connection
- ❖ BIM(ISP 및 Pilot)
- ❖ Performance Evaluation System

2022

### 3 Phase Advancement

- ❖ RAFIS Advancement
  - AR(Added Reality)
  - AI(Artificial Intelligence)
- ❖ BIM Advancement
- ❖ Performance Evaluation System

2026

2030

중국횡단철도

모공철도

블라디보스토크

시베리아철도

Thank You!!!

Q & A