

Overview of O&M and Tunnel Facilities in NEXCO-Central

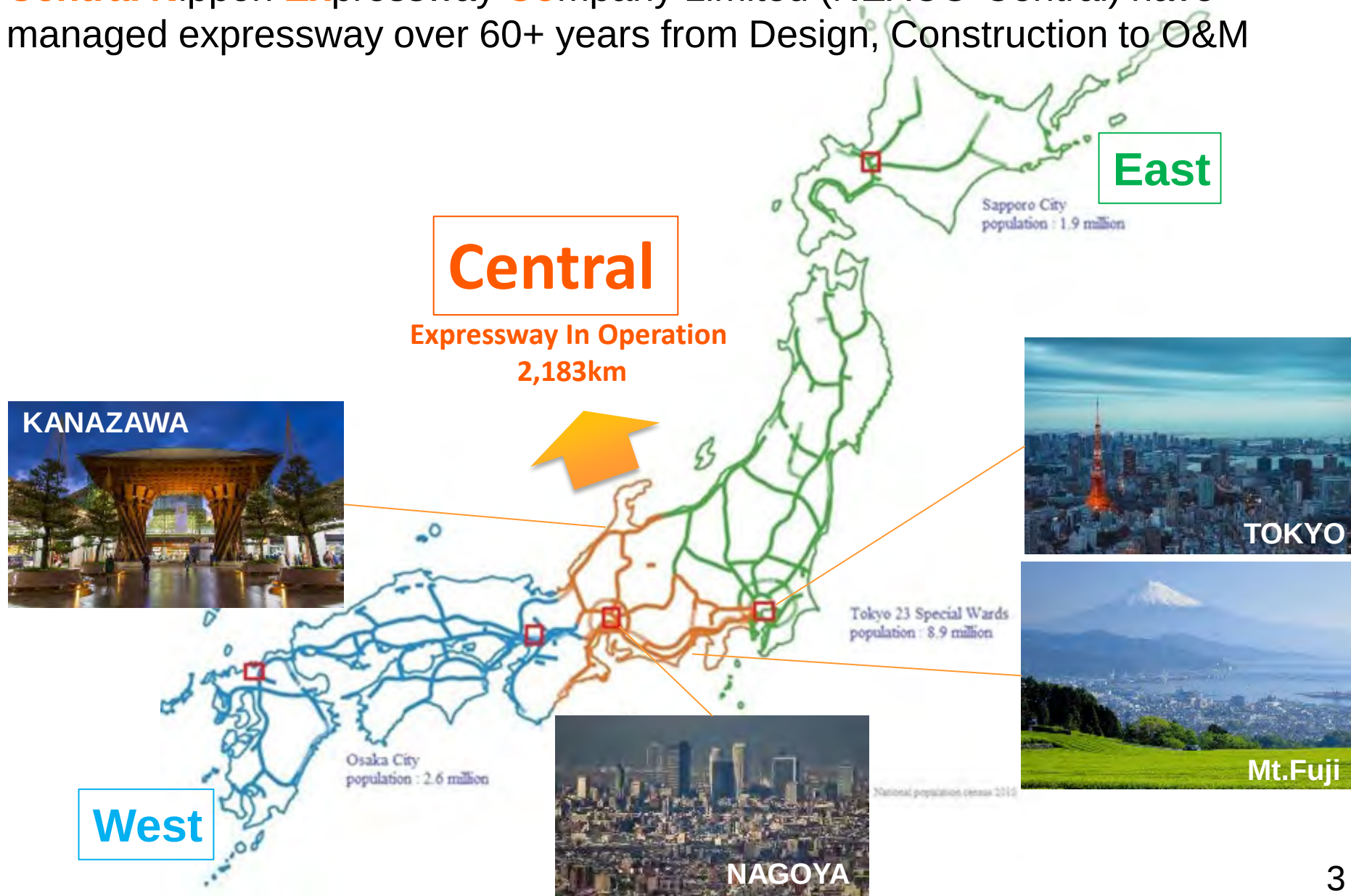
Contents

1. Expressway Overview in Japan
2. Business Operation
3. NEXCO-Central's O&M
4. Tunnel Emergency facilities

1. Expressway Overview in Japan

1. Expressway Overview in Japan

Central Nippon **Ex**pressway **Co**mpany Limited (NEXCO-Central) have managed expressway over 60+ years from Design, Construction to O&M



1. Expressway Overview in Japan

More than 60 years of experience in expressway operation in Japan

1956 Japan Highway Public Corporation (JH) established

1963 Japan's 1st expressway opened

1969 All 347 kilometers of the Tomei Expressway(between Tokyo and Nagoya) opened

2005 JH split into three companies under privatization. NEXCO-Central established

As of March 31 2024,

NEXCO Central operates 2,183km expressways and 205 rest areas.

Also we are constructing 90km expressways in Central Japan.

Based on our experience, we are implementing a diverse range of expressway management.

Toll Collection



Traffic Control



Construction



Maintenance & Repair



Rehabilitation



1. Expressway Overview in Japan

● Privatization of Japan Highway Public Corporation

◆ Reorganization Plan for Special Purpose Public Institutions (Cabin Approval in Dec. 2001)

Privatization Principles

- To ensure the redemption (40 trillion yen) within 45 years
- To utilize private companies' know-how and initiatives so that the government can build required expressways efficiently with a minimum staffing burden
- To provide diversified and flexible tollage setting
- Reimbursement period is 45 years.

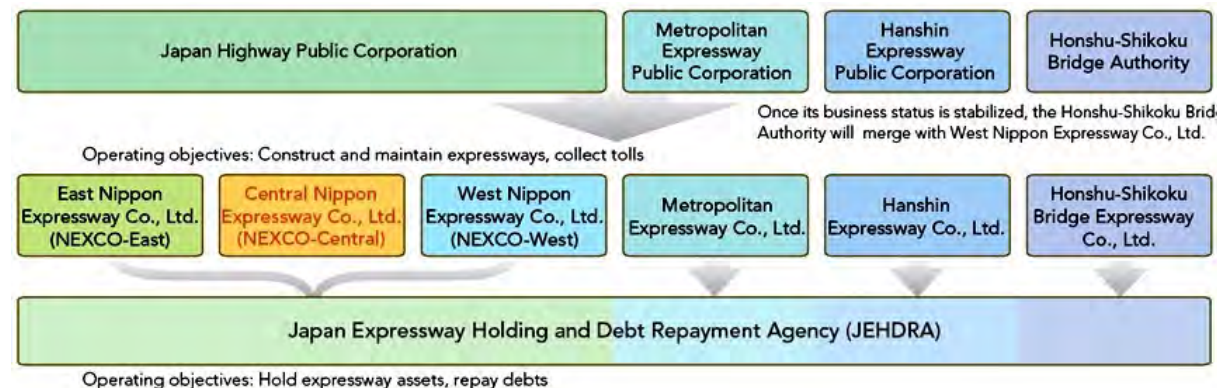


Promotion committee for the privatization

◆ Organizational Restructuring

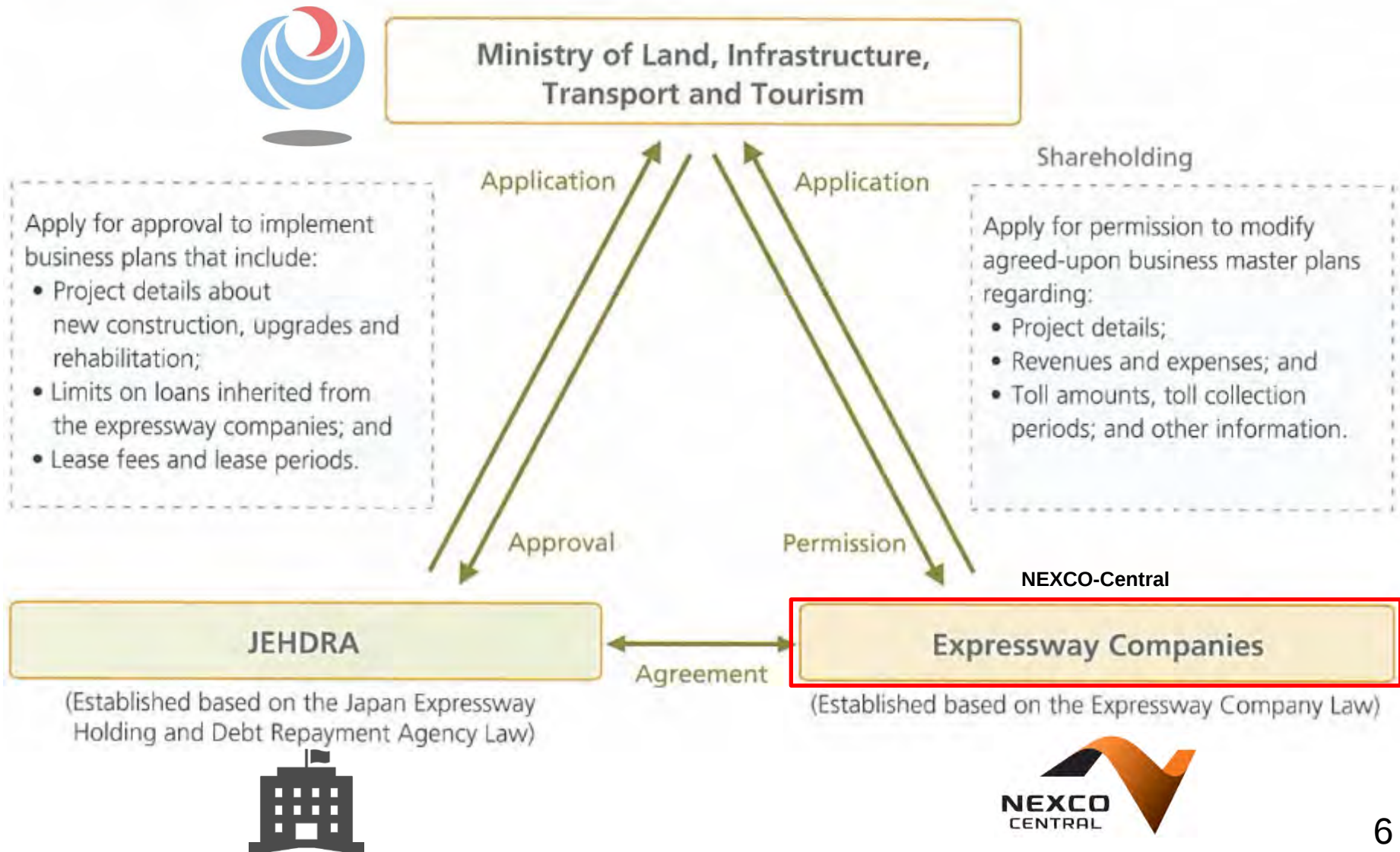
Territorial & Vertical Division

- Japan Highway was divided into three companies.
- JEHDRA was founded to manage the assets and liabilities of all expressways.



1. Expressway Overview in Japan

Relationship Among the Organizations



1. Expressway Overview in Japan

● Start Point of Japan's Expressway Development

◆ Road situation of the post-World War II period

Serious Delay of Road Development in Japan

- Since carriage traffic did not progress in Japan, unlike Western countries, road development was remarkably behind.
- Road development was insufficient to support the motorization coming along with the growth of the postwar economy.

Watkins' Report (in 1956) - Investigator for Meishin Expressway

- "The roads of Japan are Incredibly bad. "
"No other industrial nation has so completely neglected its highway system."

Car ownership	140 (in 1945) ⇒ 920 (in 1955) thousand vehicle
Road Condition	Only 8% of all roads were paved; Improved roads* were 24% (in 1956) *Width over 5.5m
Situations in other countries	2000km-autobahn was in operation (Germany) Nationwide road network was completed (USA)



1. Expressway Overview in Japan

● Framework of Japan's Expressway Development

◆ Governmental Corporation

- The organizations perform construction, maintenance, and repair of toll roads comprehensively and efficiently on behalf of the ministry of construction.
- **Japan Highway Public Corporation** was established in 1956 to operate inter-city expressways and other toll roads.
- **Metropolitan Expressway Public Corporation** and **Hanshin Expressway Public Corporation** were established in 1959



First Opening Ceremony in 1963

◆ Relevant Bills

Start of Road Development

- New "Road Act" in 1952

Start of Toll Road System

- "Act on Special Measures concerning Road Construction and Improvement" in 1956

Start of Expressway Construction

- "National Express-Motorways Act" in 1957
- "National Development Longitudinal Expressway Construction Law" in 1957

1. Expressway Overview in Japan

● Master Plan of Japan's Expressway Development

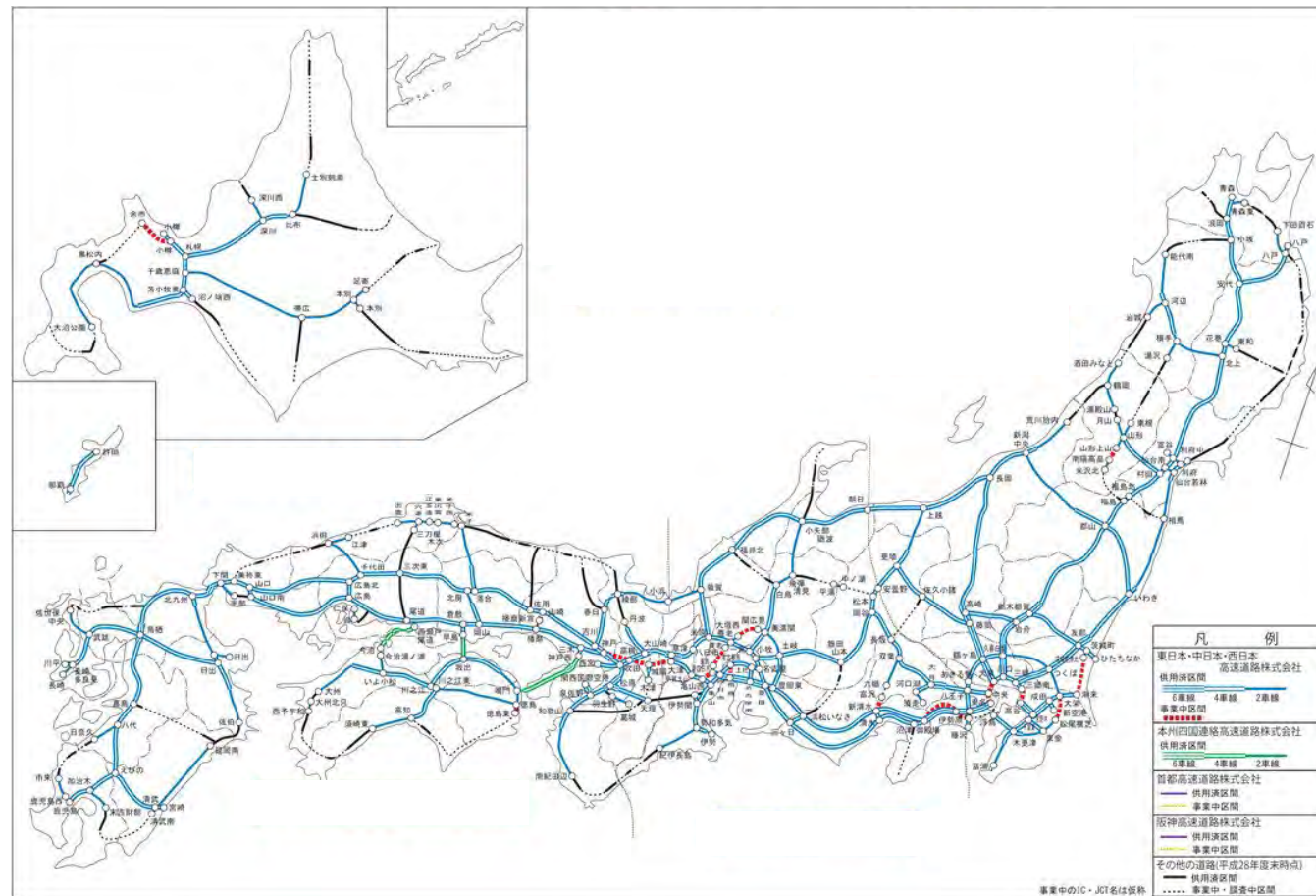
◆ The Fourth Comprehensive National Development Plan (1987)

- A plan to establish the expressway network that can be accessed in **less than 1 hour from every region** in Japan

Arterial high-standard highway
Planned Length:
14,000km

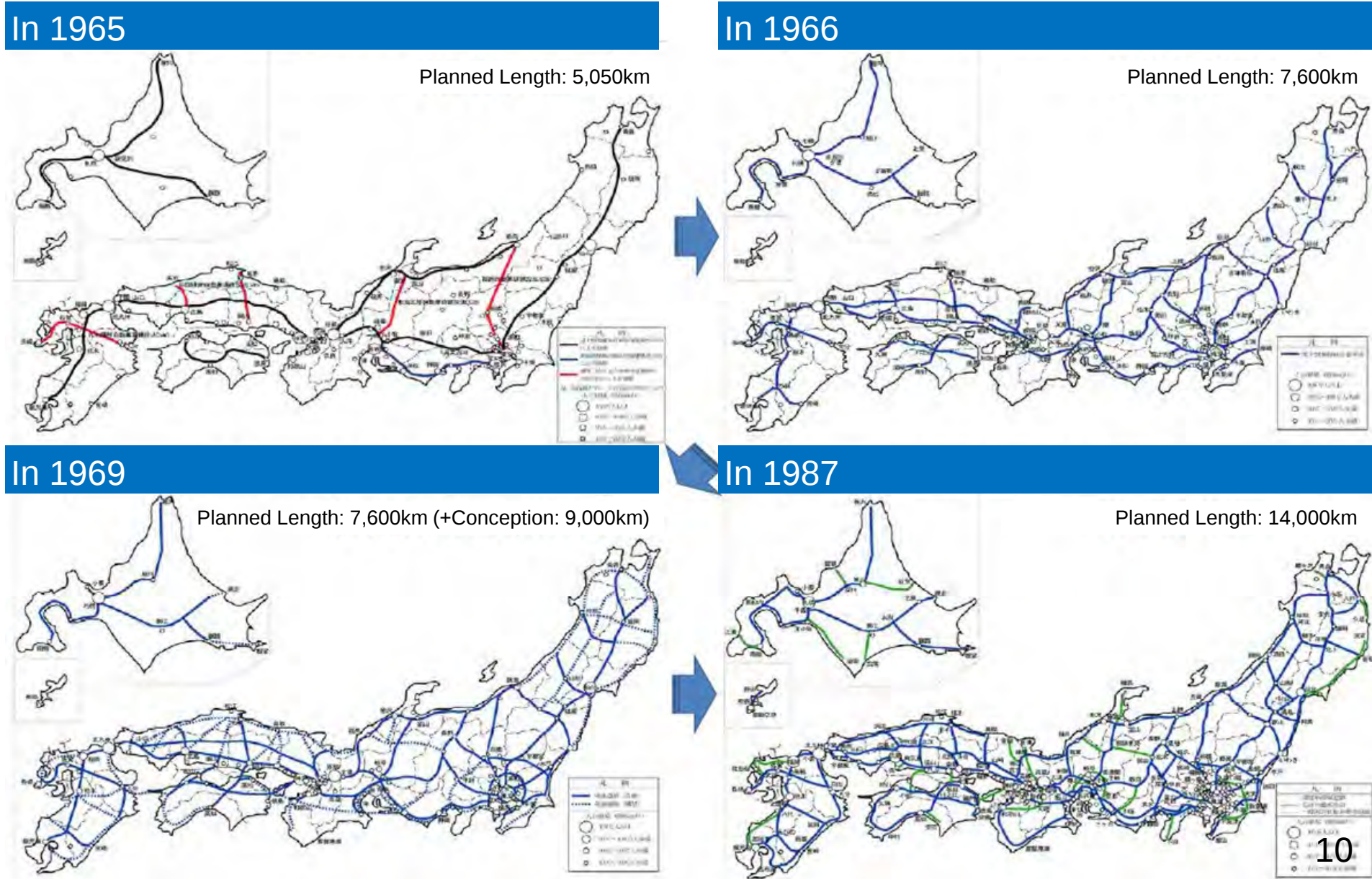
National expressway
Planned Length:
11,520km

National limited
Highway
Planned Length:
2,480km



1. Expressway Overview in Japan

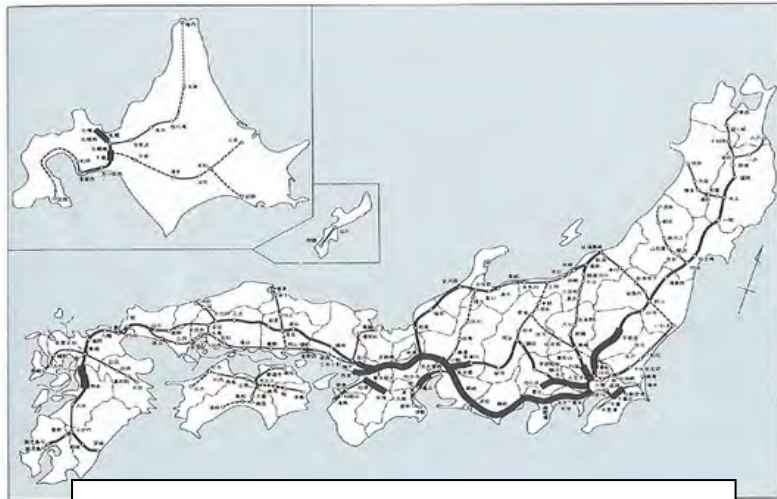
● Transition of Master Plan of Japan's Expressway Development



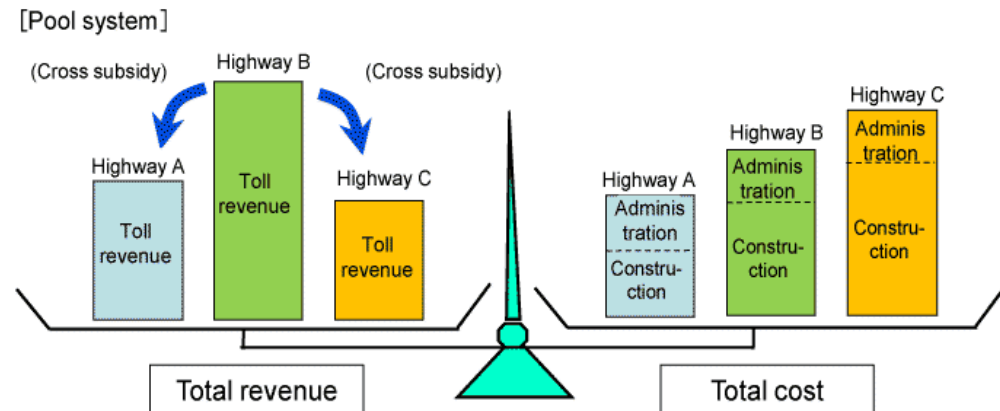
1. Expressway Overview in Japan

● Revenue pool system

- First Comprehensive Expressway Network Plan of 7,600 km became law in 1966.
- Under this plan, not only profitable trunk routes but also less profitable branch routes should be constructed.
- **Revenue pool system was introduced**, in which toll rate and toll collection period are calculated based on network as a whole.
- At this stage, **network formation becomes first priority**.
- Expressway development progressed smoothly at the speed of 200 km / year.



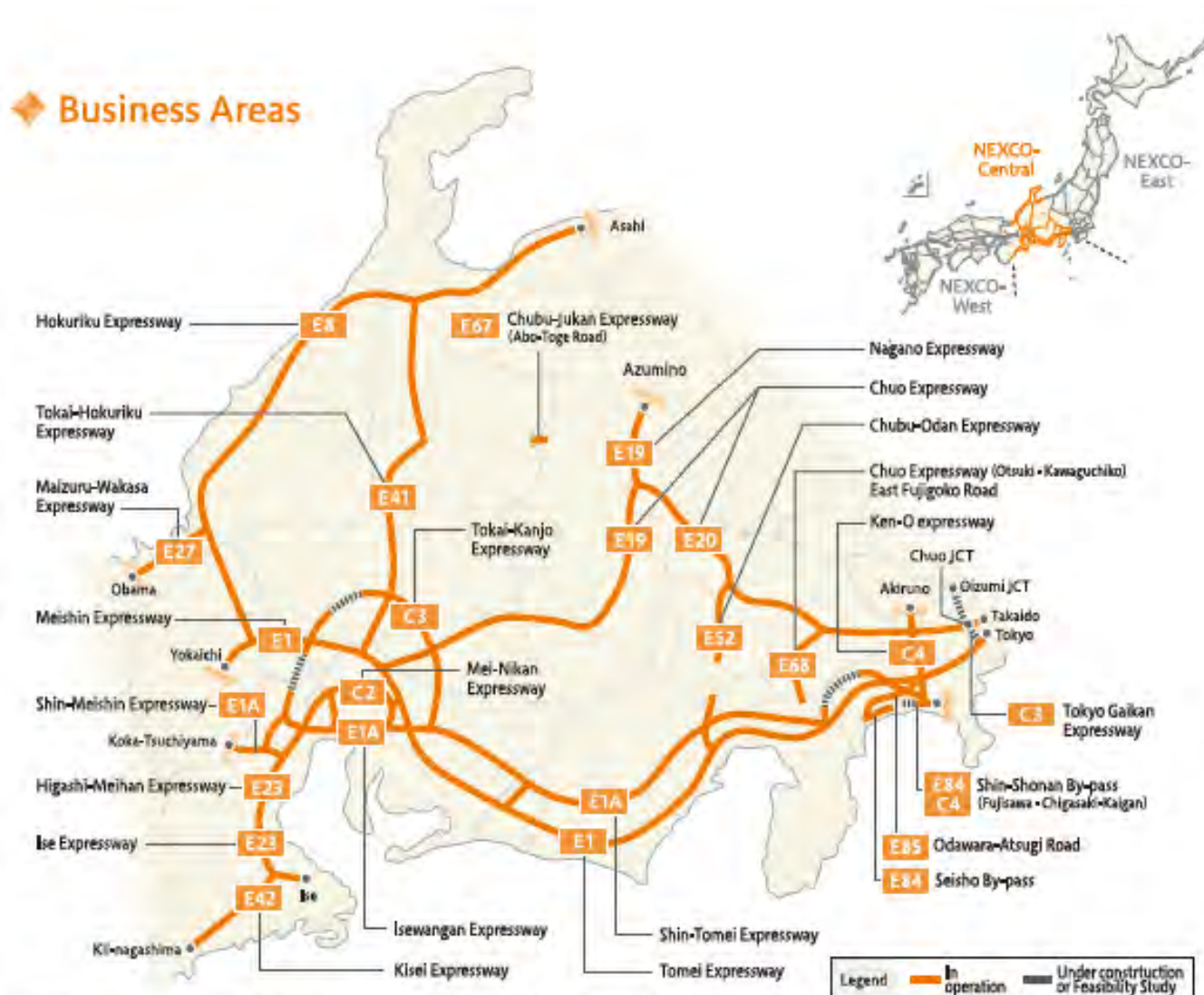
Expressway Network Plan of 7,600 km



2. Business Operation

2. Business Operation

Business Areas

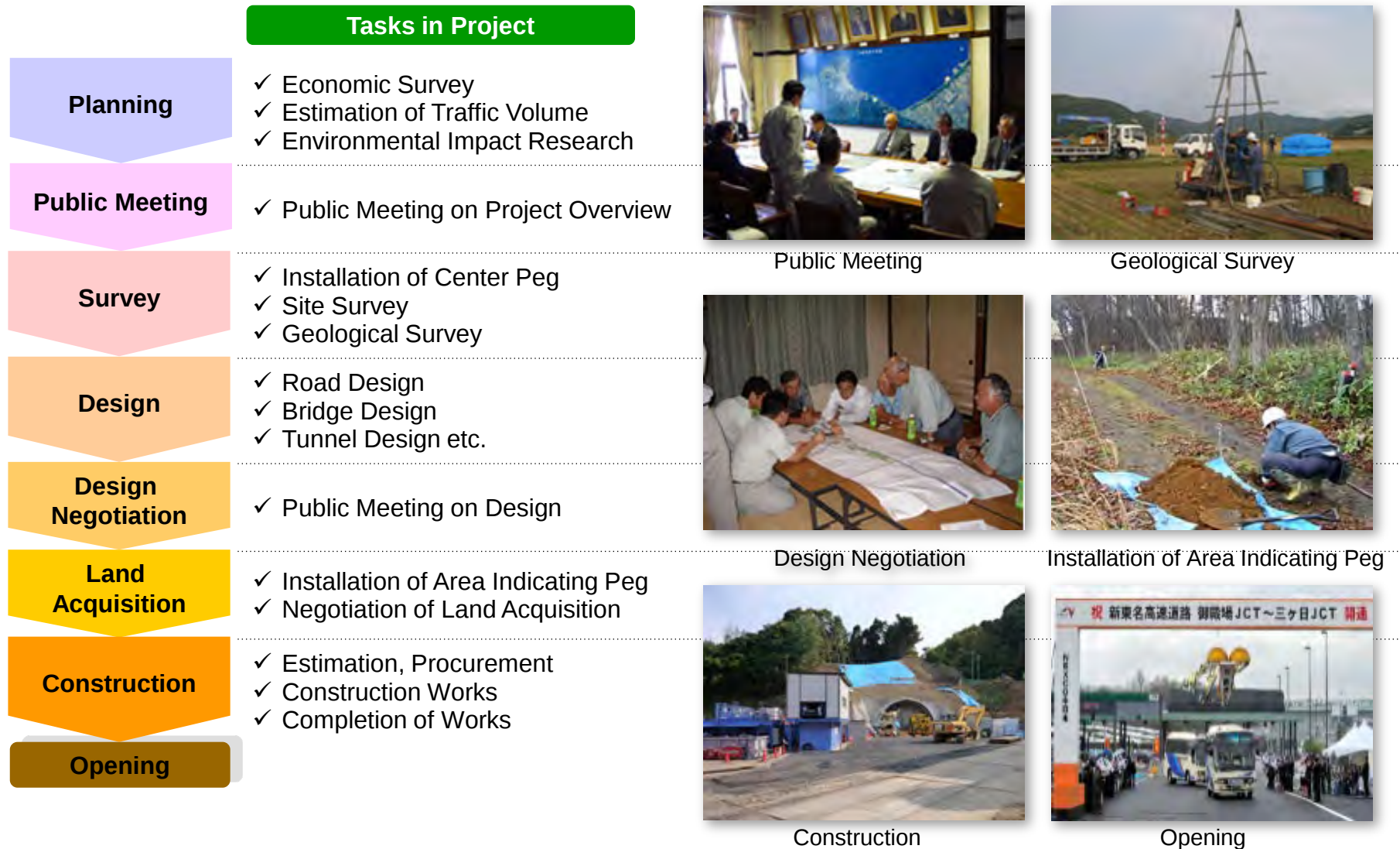


* NEXCO-Central runs business of Tokyo Gaikan Expressway (between Olzumi JCT and Chuo JCT) since MLIT and NEXCO-East delegated the business to us.

As of April 2024

2. Business Operation - Construction

➤ Total management works in entire construction, from basic planning to site works



Construction

Opening

2. Business Operation

- Operation, Maintenance & Rehabilitation

Toll Collection

- ETC services
- Manual toll collection



Non-ETC lane



ETC lane

Traffic Control

- Traffic Information
- Expressway Patrol



Traffic Control Center



Checking overloaded truck



Road patrol

Engineering

- Inspection
- Engineering work



Slope inspection



Bridge inspection



Maintenance & Rehabilitation

- Repair & Renewal
- Cleaning
- Planting



Road surface cleaning



Trimming grass



Pavement maintenance

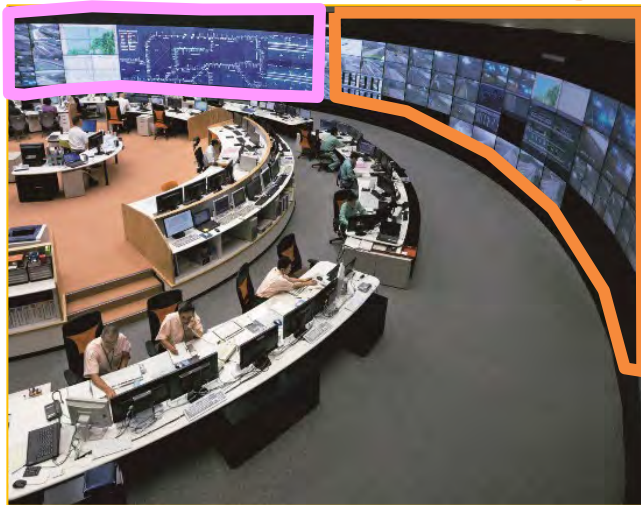


Bridge deck slab rehabilitation

Traffic Management Center(TMC)



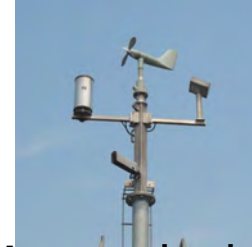
Traffic Control Facility Control



Monitor and Gather Information



CCTV



Meteorological
Observation System



Patrol

Monitor Traffic Info

Traffic
Accident

Highway
Radio

Tunnel
Facilities

Traffic Info
Board

**Traffic
Management
Center (TMC)**

Traffic Control
Facility Control



Traffic Info Board

Traffic Info
Board

Traffic Info
Board

Traffic Management Center(TMC)

Incident response

Incident: Fire in Tunnel



Traffic Management
Center(TMC)



Call for
Emergency
Vehicles



Firefighters



Traffic Control
Vehicle

Provide Traffic
Info



Fire detector



CCTV

Sense & Monitor Flame
Condition

Activate automatically



Water Spray



Ventilation fan

Rest Area Business

- Making more comfortable, convenient, and enjoyable rest areas with attractive shops, restaurants, and facilities.
- Revitalizing society by selling locally produced products, providing opportunities for business for locally-based companies, and improving access to local highways



New type of rest areas

Rest areas with whole new concepts have been introduced on our expressways.

- **EXPASA** is a new type of rest area that has been created to turn a mere rest spot into a shopping mall on an expressway.
- **NEOPASA** is only on the Shin Tomei Expressway, becomes a final destination, not a spot before going to a destination.
- We offer an array of new products and services that would meet a broad range of needs.



Locally-based product shop



Locally-based company booth



Rest Area Concierge

Overseas Business Activities



- **Filipino Subsidiary (NCP)**
- Manage the construction of road tunnel facilities, traffic management center, and toll facilities in the Davao Bypass Construction Project.



- **US Subsidiary (NHSA)**
- Offer American road operators and engineering companies innovative roadway management solutions.
- Smart Pavement Management (SPM) provides a pavement condition rating with a map display, verified by in-house engineers, that allows for timely, cost-effective analysis.

Overseas Business Activities

JICA Consulting Activity in NEXCO-Central (FS, Technical cooperation, etc.)



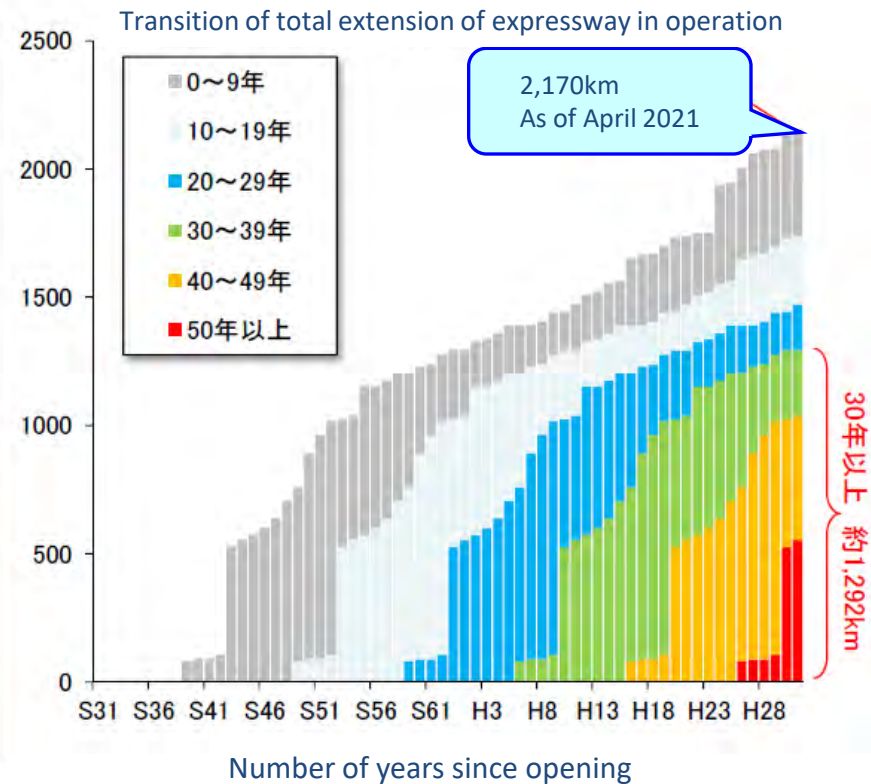
3. NEXCO-Central's O&M

Why Asset Management (AM) is applied?

□ Providing higher quality infrastructures to the society with the lowest possible costs is an eternal task

■ Aging Expressways

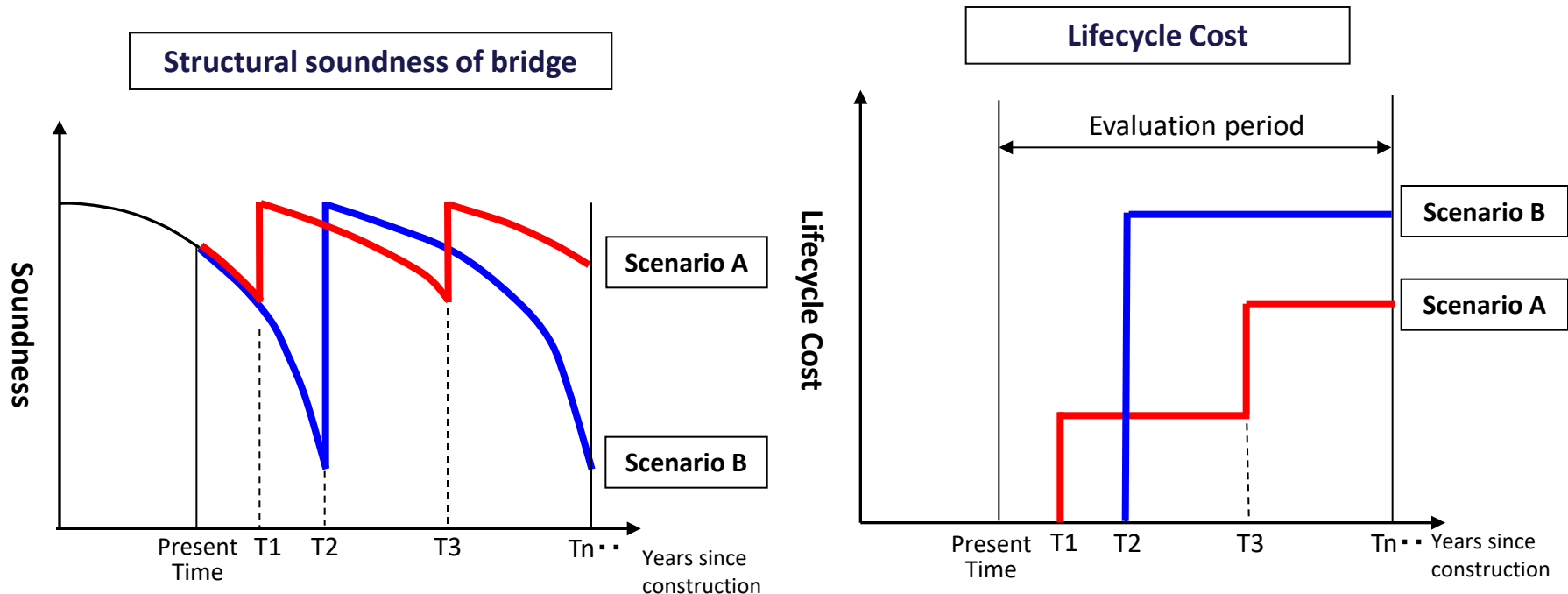
- 60% have been in use for 30 years or more
- 25% have been in use for 50 years or more.



Bridge maintenance

【Scenario A】 Proactive Maintenance ⇒ Protect structures from deteriorating severely and maintain them in sound conditions.

【Scenario B】 Reactive Maintenance ⇒ Invest on maintenance only after damage becomes severe



Long-term strategies are required in the maintenance of road structures to predict the cost of future repair and reconstruction, and efficiently maintain the soundness of the structures

Outline of Our Pavement management System (PMS)

Supporting tool for building optimized maintenance strategy within budget

NEXCO (HQ・Branch・Project Office)

Road surface property data

- Rutting
- Cracks
- IRI



Road profiler

Structure evaluation data

- Damage evaluation of pavement structure by FWD
- Physical test by core sample collection

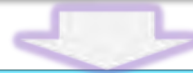
Road information data

Maintenance history data



Road maintenance

Integrated PMS Database

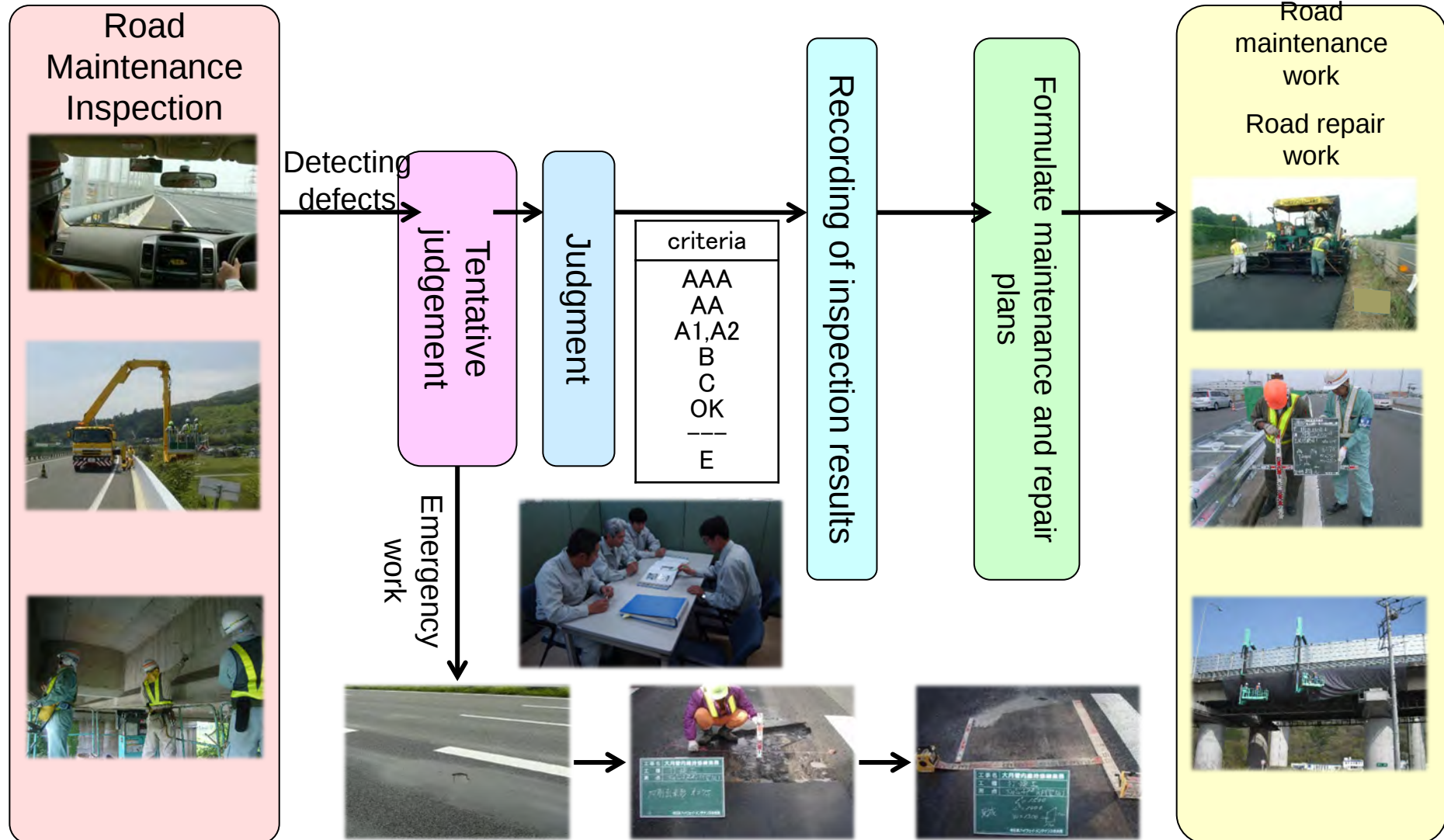


Support Mid-term/Long-term pavement maintenance strategy

<Past & Present> Evaluate pavement maintenance & Inspection data

<Future> Predict deterioration of pavement

Workflow from Inspection to Repair



Inspection Methods and Frequency

classification	Inspection details	Inspection frequency
Initial Inspection	Inspections to determine initial post-construction condition (Inspection by proximity visual inspection and hammering test etc.)	Once after construction
Daily Inspection	Inspections to routinely check the occurrence of structural deformities, etc. (Visual inspection from the vehicle)	4 to 7 days/2 weeks
Basic Inspection	Inspections to determine the condition of structures throughout the managed area (Visual inspection on foot)	1 time / 1 year
Detailed Inspection	Inspections to determine the condition of individual structures in detail and on a regular basis (Inspection by proximity visual inspection and hammering test etc.)	1 time / 5 years



Initial inspection



Daily Inspection



Detailed inspection



Road Surface Profiling Vehicle



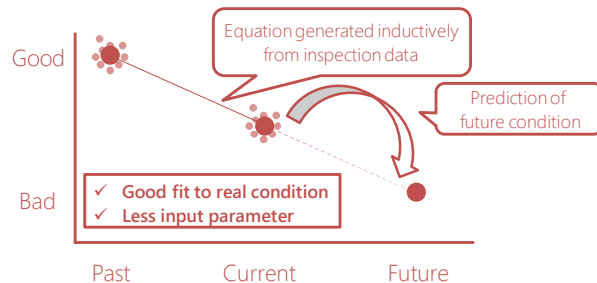
Rutting Depth



Cracking Ratio

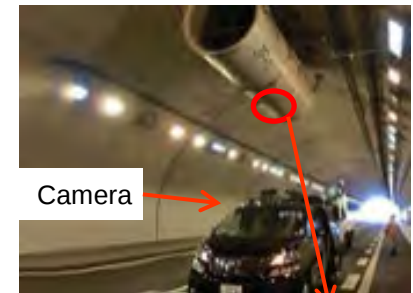


IRI(International Roughness Index)

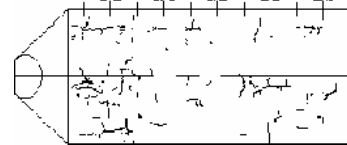


Markov hazard model for predicting pavement deterioration

We predict future road surface conditions with road surface profiling data and the Markov hazard model. It provides useful decision support tools such as pavement inventory, distress condition reports, and projected preservation costs.



Camera



High-Speed Tunnel Concrete-crack Measurement Vehicle

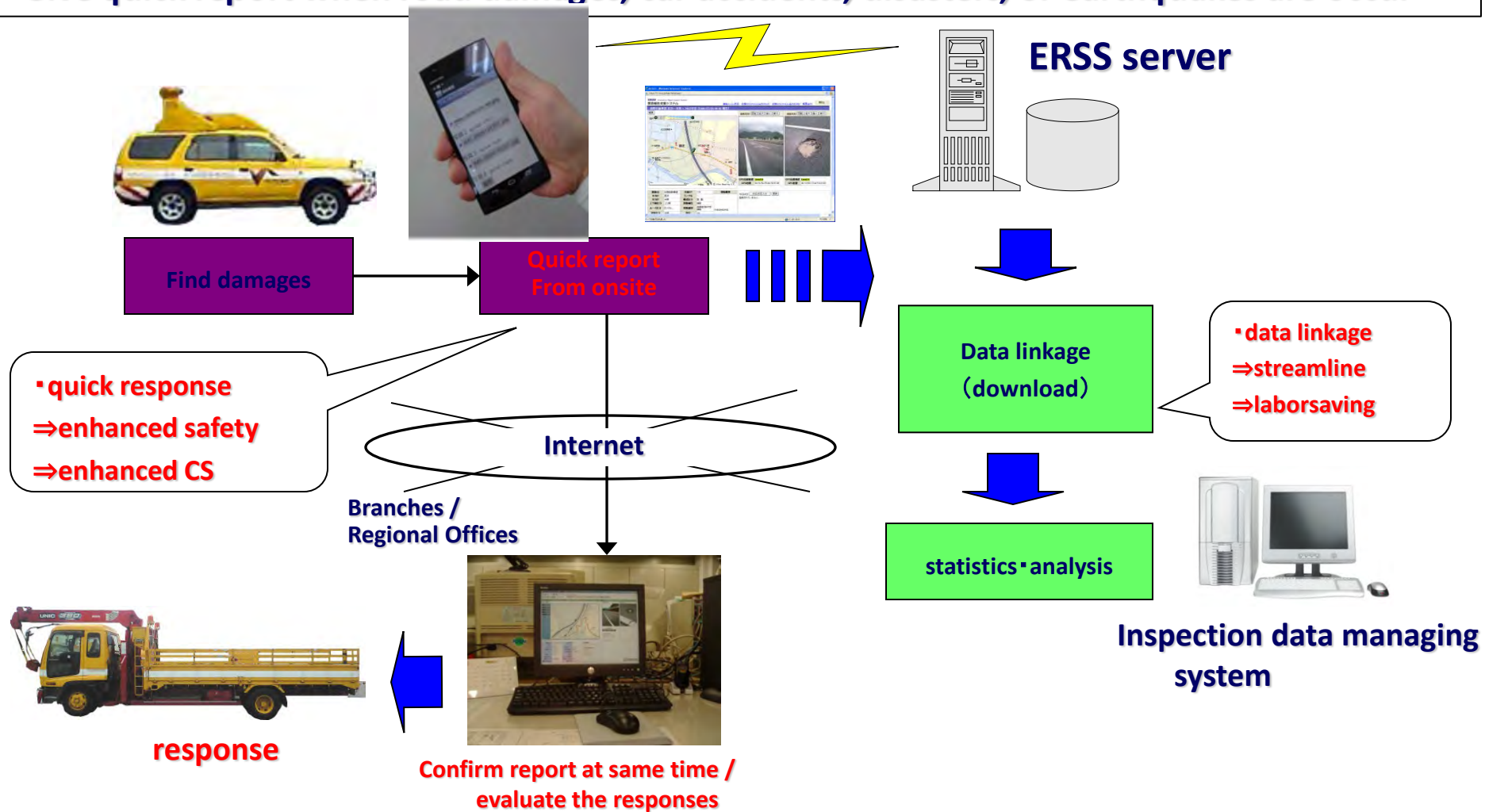


Rope Access Technique for close visual inspection



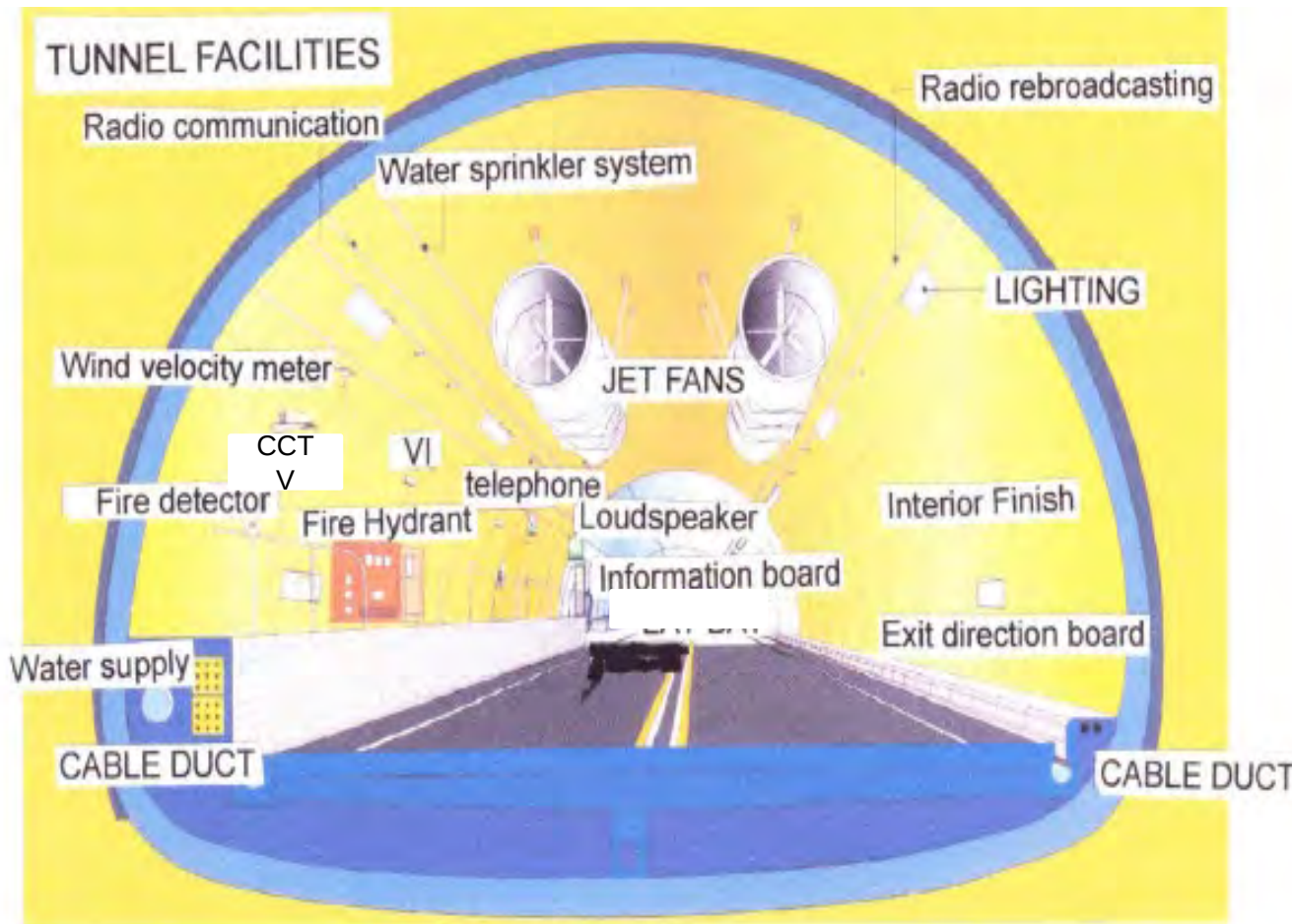
●ERSS (Emergency Report Support System)

- Help to share local information within groups
- Give quick report when road damages, car accidents, disasters, or earthquakes are occur



4. Tunnel Emergency facilities

4. Tunnel Emergency Facilities



Ventilation



Evacuation Tunnel



Information Board



Provide Information with
Projection Mapping

- ❑ High Risk of secondary disaster
 - Evacuate safely road users
 - Identify irregularities quickly
 - Alarm road users, and prevent spread of fire

4. Tunnel Emergency Facilities

(i) Information and Alarm

(e.g. Fire Detector, Emergency Telephone)

(ii) Fire Extinguishing

(e.g. Fire Hydrant, Fire Extinguisher)

(iii) Escape and Guidance

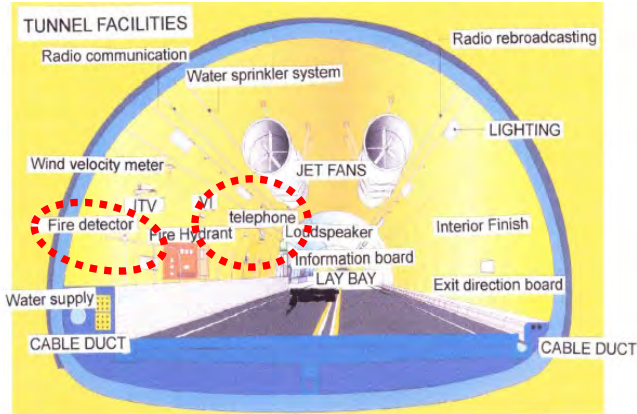
(e.g. Evacuation Tunnel, Ventilation)

(iv) Others

(e.g. Water Sprinkler, CCTV)

4. Tunnel Emergency Facilities

(i) Information and Alarm



Fire Detector

- Automatically notify fire location

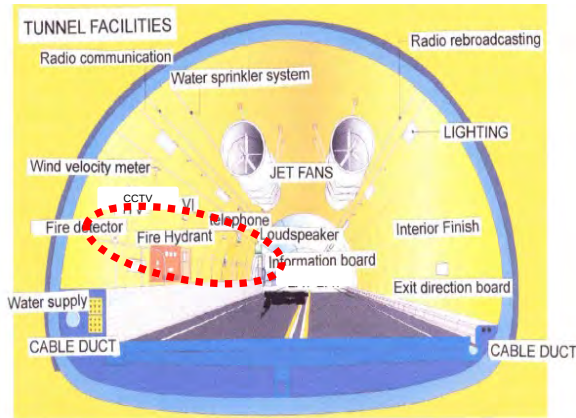


Emergency Telephone

- Manually inform occurrence of fire etc.

4. Tunnel Emergency Facilities

(ii) Fire Extinguishing



Emergency Response Drill

2015Nihonzaka Tunnel

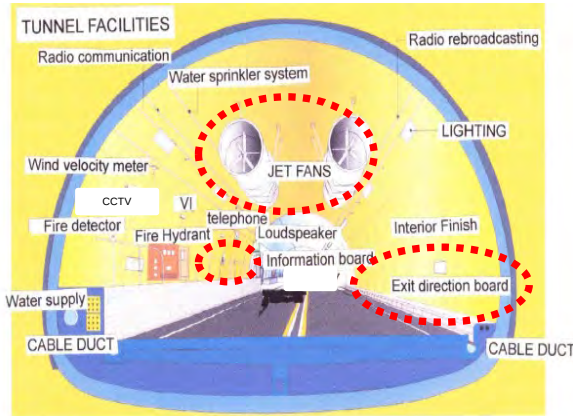
Fire
Extinguisher

Fire
Hydrant

- Supply water for fire fighting activities

4. Tunnel Emergency Facilities

(iii) Escape and Guidance Equipment



Ventilation(JET FAN)



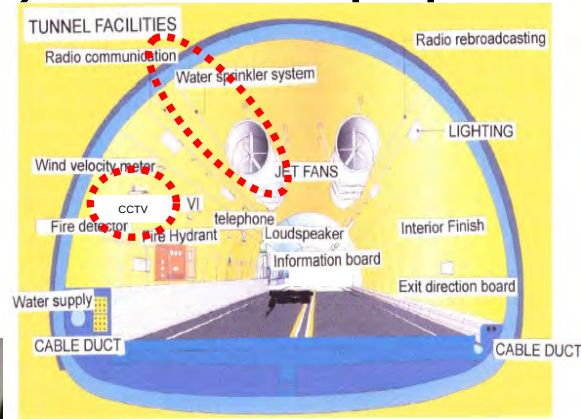
Evacuation Guidance



Evacuation Tunnel

4. Tunnel Emergency Facilities

(iv) Other Equipment



CCTV

Automatic Sprinkler: Prevent fire from spreading
Support fire-fighting

Thank you for your attention !

