

Traffic Technology

تكنولوجيا حركة المرور

Drive Assisting Delineators (DADs)



DADs contribute to traffic congestion mitigation

- DADs provide the lighting flows along the road
- Drivers instinctively maintain steady speeds or restore their speeds with the DADs flows

Unique Features

- ✓ Minimize or restraint congestion occurrences when traffic is busy
- ✓ Facilitate restoring traveling speed when traffic is congested
- ✓ Automatic control on best suitable lighting patterns based on (real-time) traffic conditions
- ✓ Applicable to congestion multiple bottlenecks

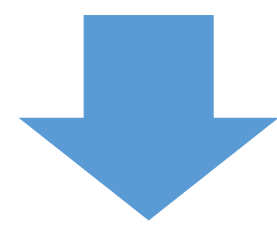


Snow Deicing

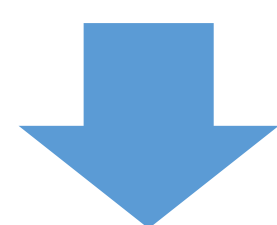
إذابة الثلوج

Salt Alternatives

Sodium chloride has been used for deicing.



However, it could shorten the service life of road structures.



Alternatives!
“Sodium Propionate”

Unique Features

- ✓ A 1:9 ratio of sodium propionate to sodium chloride
- ✓ As effective as sodium chloride
- ✓ Causes as little damage to road structures as rainwater may cause
- ✓ Can be used for any road structures, including bridges, with existing wet-salt spreaders or brine spreaders



A joint study by Toyama Prefectural University and the Civil Engineering Research Institute for Cold Region



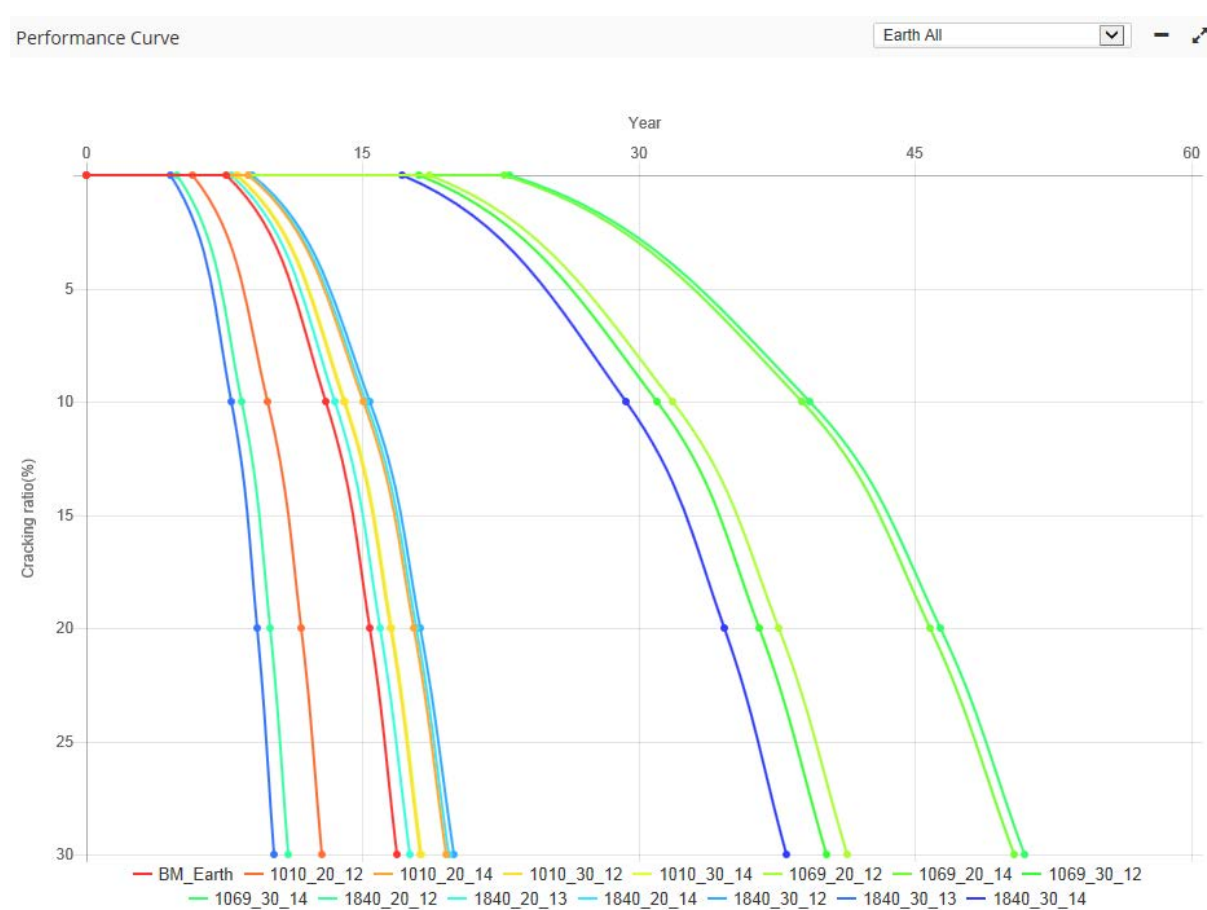
Pavement Inspection and data analysis

فحص الطرق المعيدة وتحليل البيانات

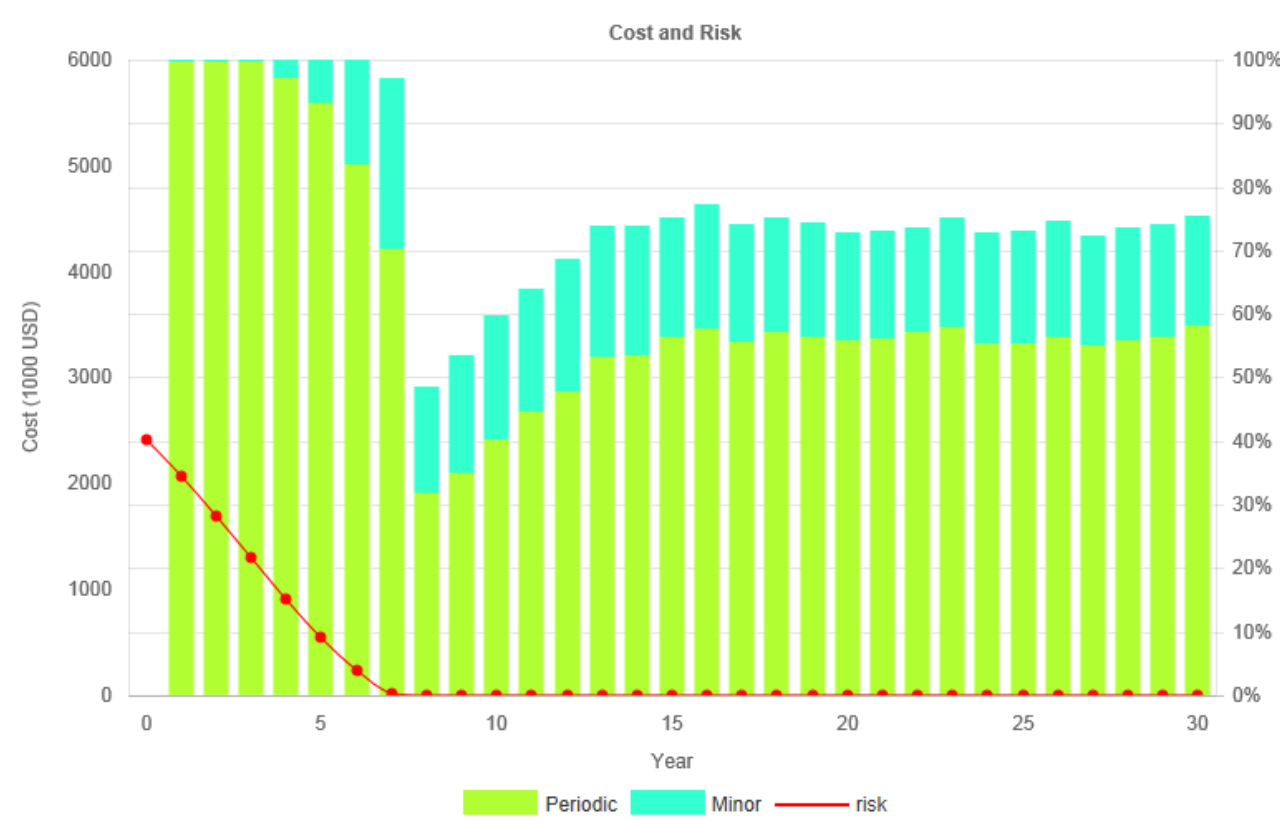
PDAS (Pavement Data Analysis Service)

Unique Features

- ✓ Helps road operators make data-driven decisions based on pavement condition data
- ✓ Estimates the average pavement performance deterioration rate and remaining lifetime
- ✓ Compares pavement performances by pavement type, section, traffic and climate



Deterioration Evaluation



Budget Simulation



Visualization

APDIS (Automated Pavement Distress Identification Service)

Unique Features

- ✓ Helps road operators & engineering companies grasp overview of pavement distress conditions of their highway networks using image recognition technology
- ✓ Reduces pavement condition survey time and cost definitely



Powered by a leading tech

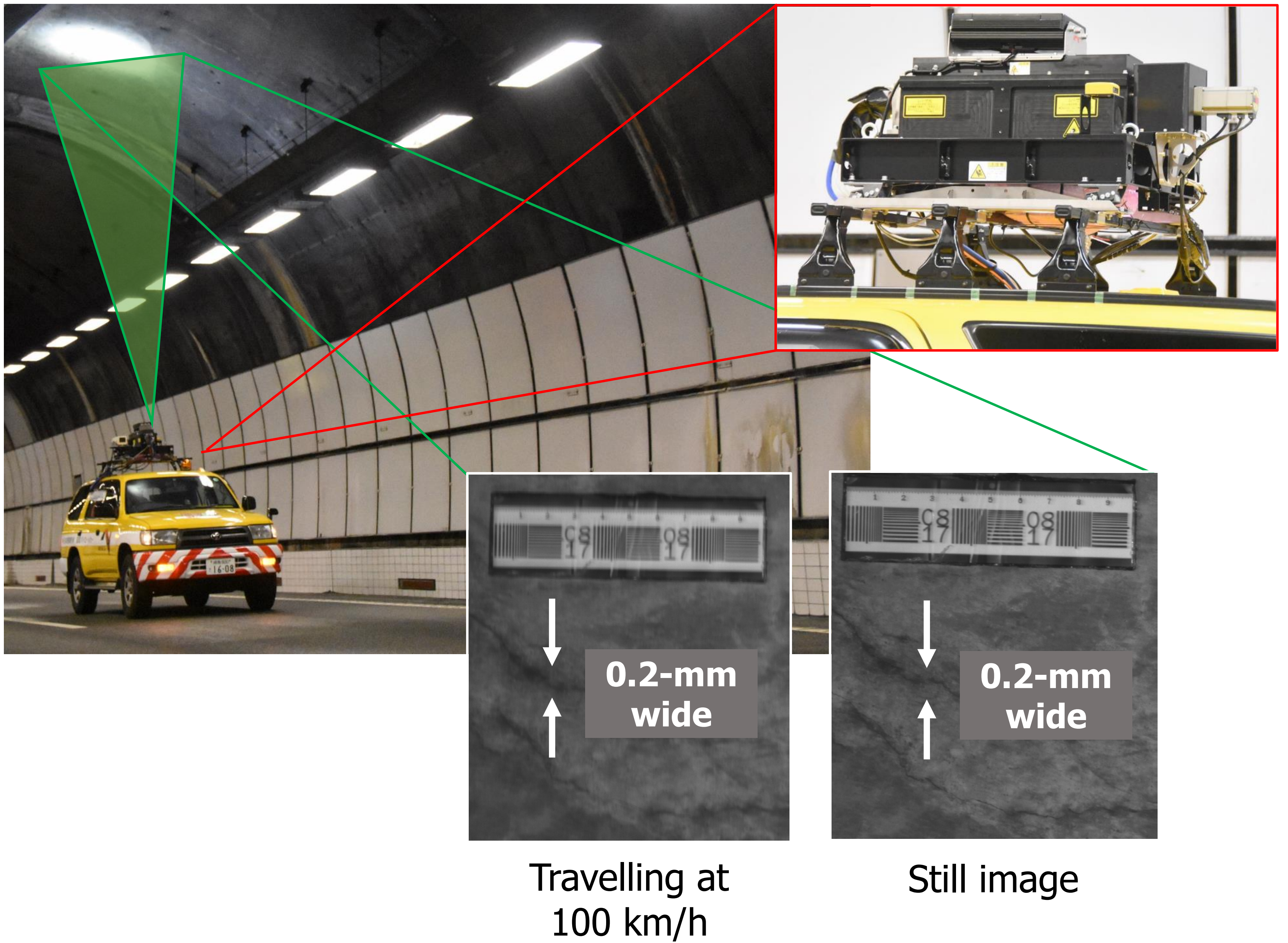
NEC



Tunnel Inspection

فحص الأنفاق

High-Speed Visual Inspection Vehicle



Our new technology records the tunnel cracks while traveling at a high speed.

- Labor-saving in regular inspection
- With high accuracy and efficiency in detailed inspection
- Enables early and timely repairs by identifying the condition of the structure

Unique Features

- ✓ Accurate detection 0.2-mm cracks while travelling at 100 km/h
- ✓ No need of large-scale lighting
- ✓ The recording device is compact in size

A joint study by the University of Tokyo.

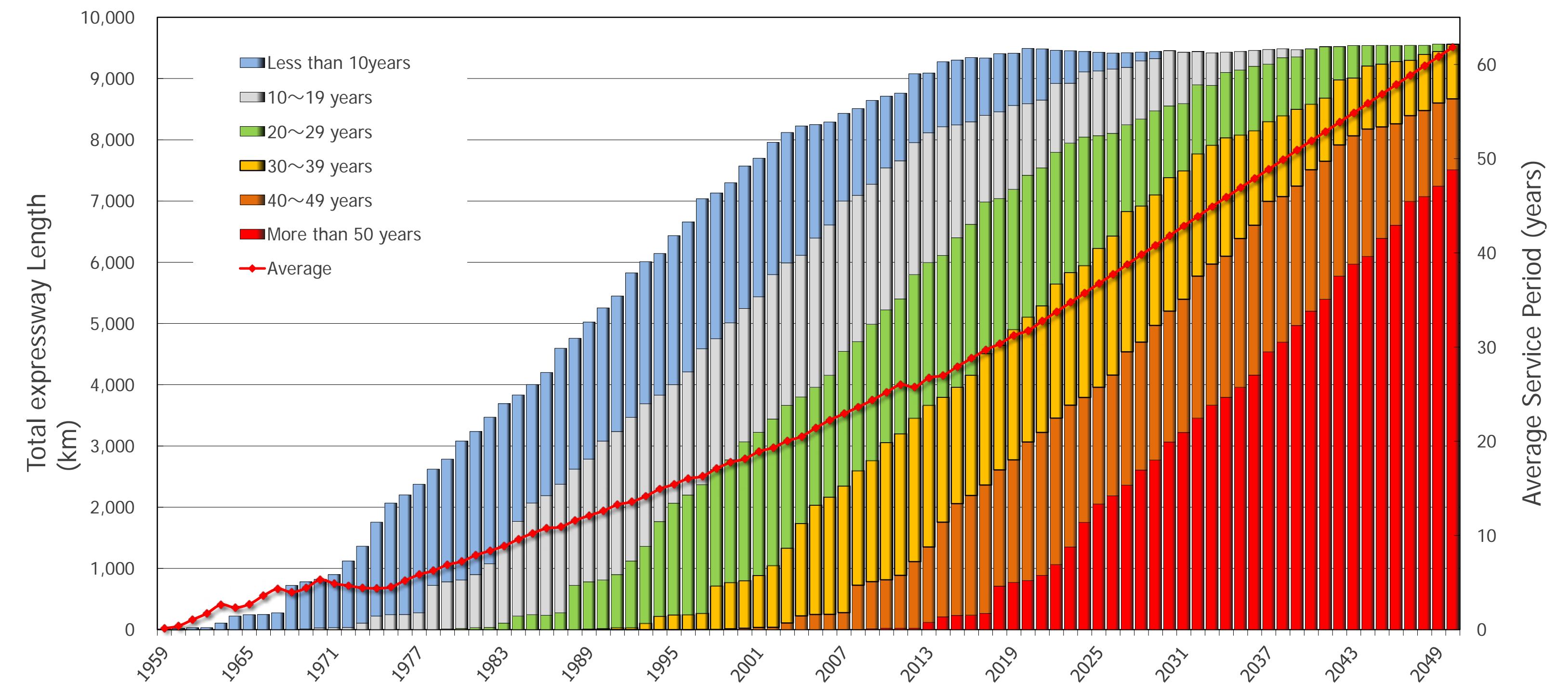


Ageing Road Assets

متقادم

Current situation and problem of expressways

- ◆ At least 40% of the total expressways-length has been operated for more than 30 years and because of this, the expressways are seriously deteriorated.
- ◆ At least 40% of the total bridge-length and 20% of total tunnel-length were also constructed more than 30 years ago and they are facing increased risk by the aged deterioration.
- ◆ The total vehicle weight is increasing with the increase in the number of large-scale vehicle on the expressways. The expressways are under severe conditions such as increasing in the usage of anti-freezing agent (NaCl) and the increase in the amount of extreme rainfall for a short time.



Elapsed years of the expressway transition



Severe environment in snow region



Concrete cracks and float



Concrete free lime

Damaged Condition

Expressway Renewal Project

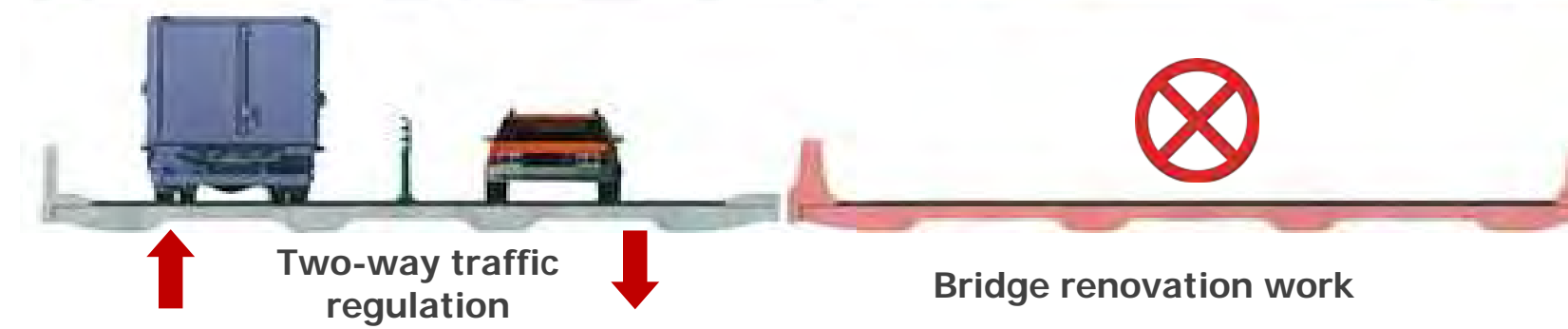
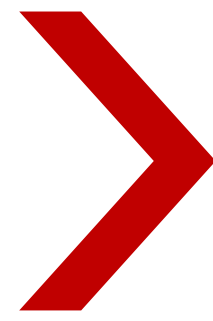
التجديد

Severe deterioration on slab lower surface



Large-scale renovation for bridges

e.g. Replacement of RC concrete slab with PC precast slab



Open to Traffic (1963)



Deteriorated Structure (2014)



Undergoing Renewal Works (2019)



Renewed Segment (planned in 2026)

Expressway Inspection & Diagnosis

التفتيش والتشخيص

Road Surface

One of unique road surface inspection vehicles, not only can measure rutting, cracking, and flatness ($\sigma 10ft$, IRI) but also longitudinal and transverse pavement measurements without making contact with the pavement.

It can smoothly and safely perform all 6 functions at 100km/h without impacting the flow of other traffic.



High-Speed Road Surface Measuring Vehicle (Road Tiger)

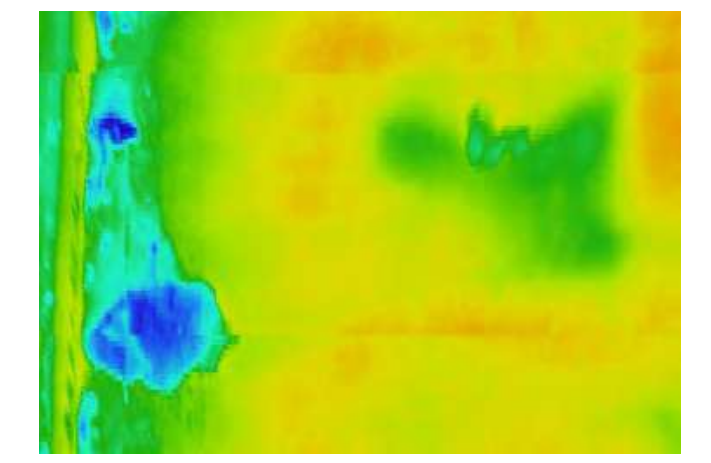
Bridge

Digital camera/video camera system - Crack inspection:

High definition images taken by digital camera or video camera makes it possible to inspect the surface of a structure in the same way as the close visual inspection. Through a computer analysis of the images, the cracks are automatically detected.

Infrared Camera System – Delaminations /spill inspection:

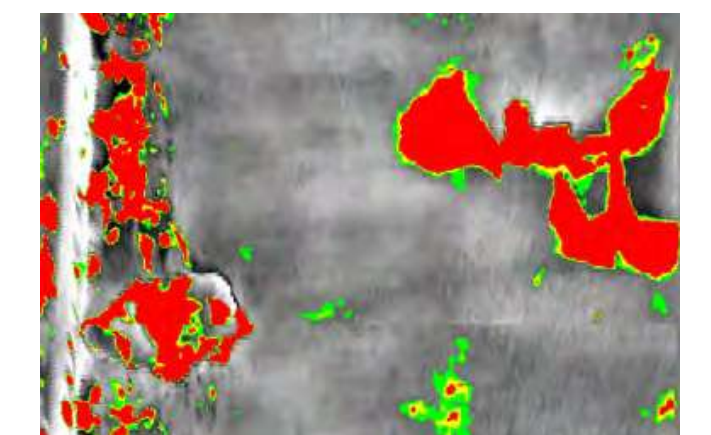
The infrared camera system takes images which is analyzed automatically and displays the damage level in three stages. Because damages are objectively analyzed by software, bias or oversight in measuring caused by skill difference can be prevented. In addition, this system helps to create a research report since the detected results are easily captured on spreadsheets or word processing software. This system has gotten track records in the U.S.



Infrared thermal image



Bridge inspection using Infrared Camera System



Damage is detected by computer analysis

Tunnel Liner



Filming in a tunnel



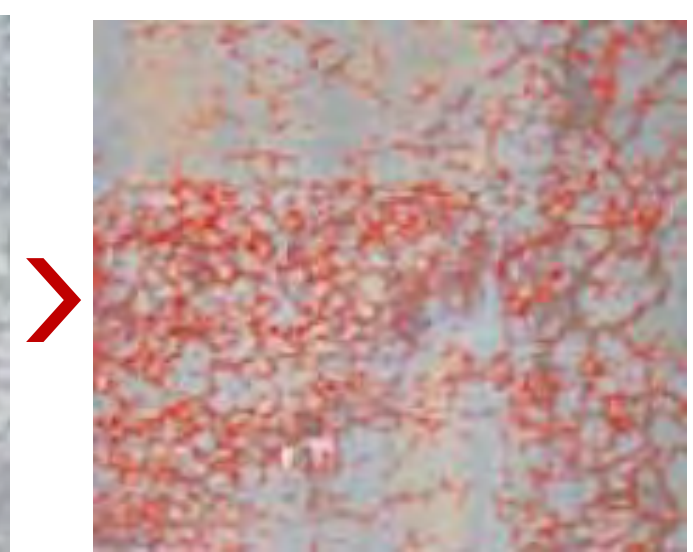
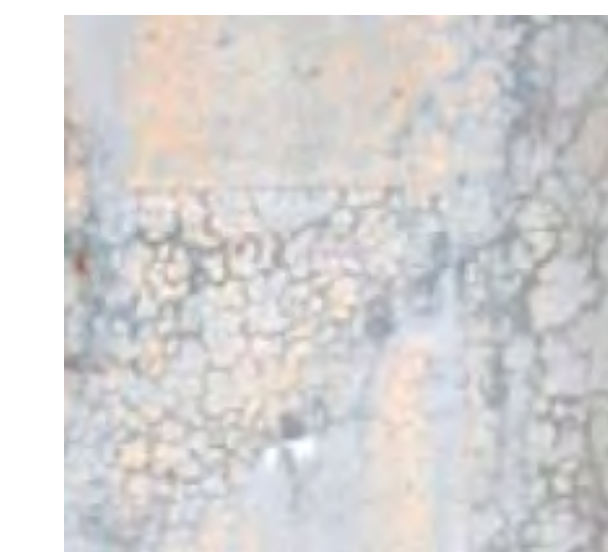
Crack analysis (minimum 0.2mm in width)

Tunnel liner inspection vehicle:

It is now possible to obtain a clearer image at a speed of 100km/h by adopting the line sensor camera instead of the conventional video camera. In addition, because the photographing illumination using LED infrared illumination is not visible to the naked eye, it no longer influences on the passing vehicles on the opposite direction. Moreover, this vehicle automatically identifies the cracks by the captured image.



Bridge inspection using Digital Camera System



Automatic crack-analysis by computer



Video Camera System

Disaster Management

الوقاية من الكوارث

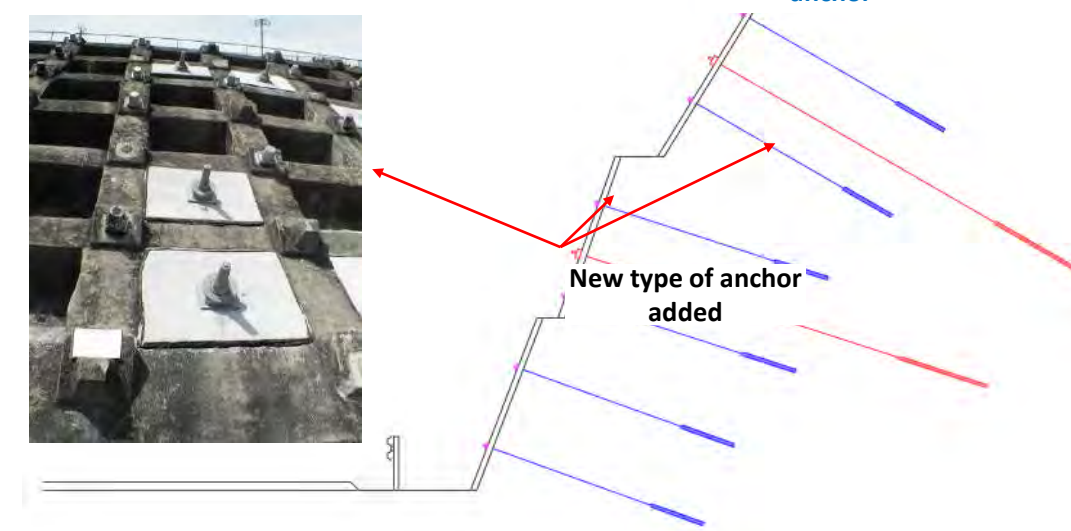
Disaster Prevention

Disaster caused by extreme rainfall for a short time



◆ Ground anchor

New type of anchor installation filling up traditional anchor with inadequate anticorrosion function



◆ Slope Protection Work

Measures against land slide



Use of rest areas as disaster-management bases

In the Great East Japan Earthquake, the Self-Defense Forces and firefighters heading to stricken areas used expressway rest areas as relay and support bases. Based on this experience and various issues, authorities are bolstering their disaster-response capabilities across Japan to respond effectively and efficiently to emergencies, using Moriya SA on the Joban Expressway as their model.

◆ Moriya Service Area (Southbound) on Joban Expressway, as a disaster management base

Disaster-response warehouse

Inflatable tents for outdoor use, emergency food and rations, relief supplies, traffic regulation equipment and other supplies are store at this Disaster-response warehouse



Emergency vehicle entrance/exit

Used by emergency vehicles to enter and exit outside of expressway in times of disaster



Generators and rooftop solar-power generation facilities



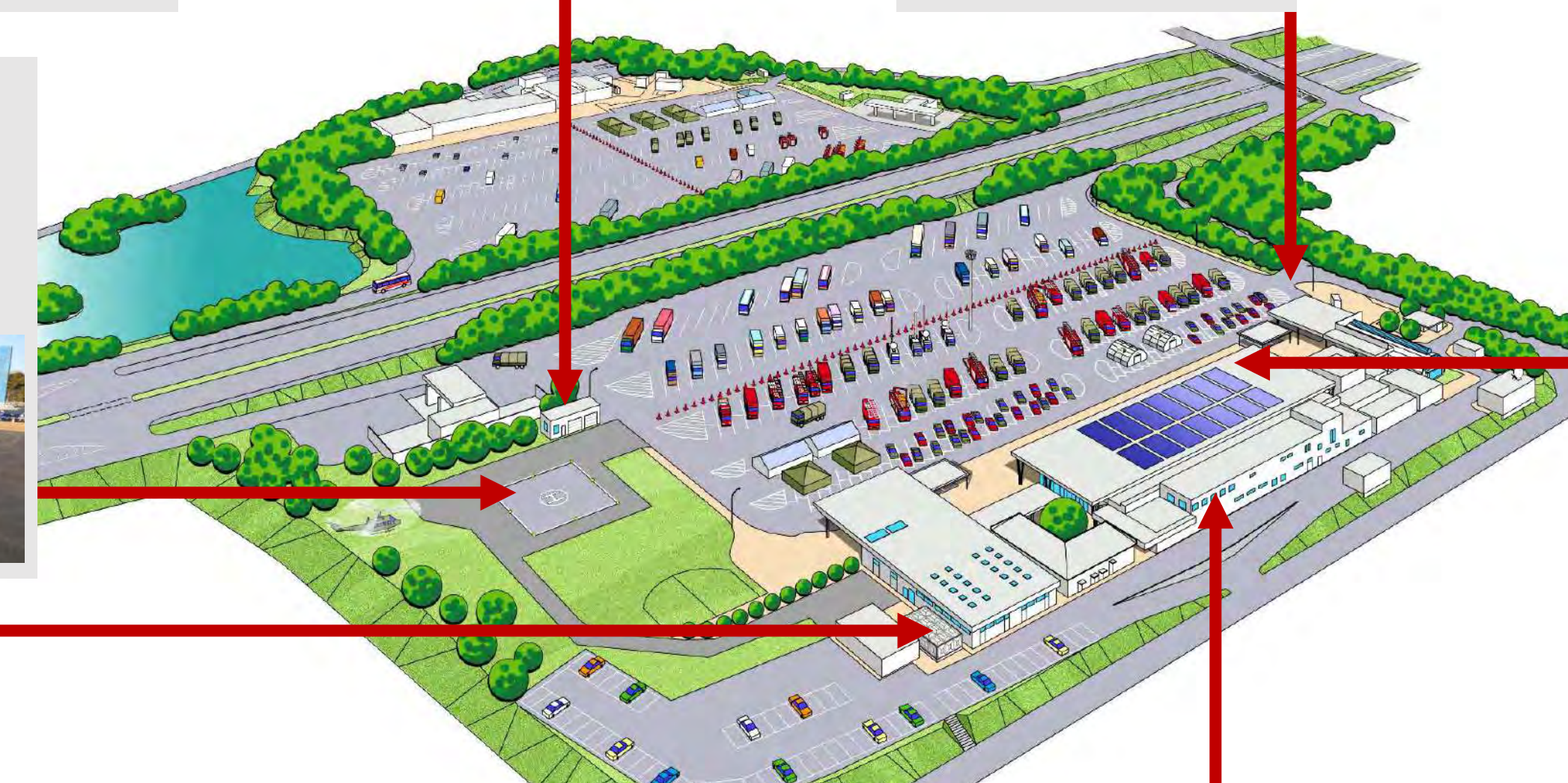
Solar-power generation panels on the roofs of commercial facilities



Generators enable continuous use for 72 hours

Heliport for mid-size Helicopters

Nighttime illumination and a helicopter office have been installed, enabling safe landing and take-off day and night



Well

A well has been dug in case of interruption of water supply



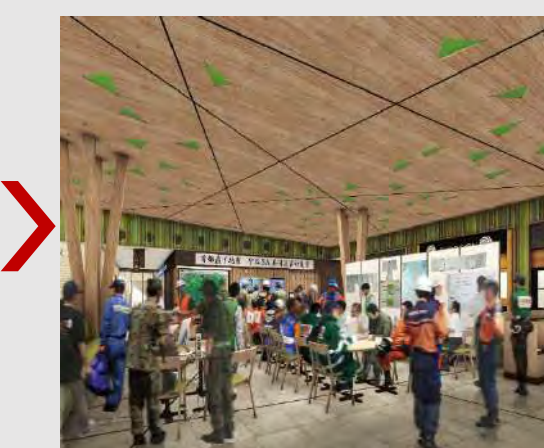
The food court is used as a disaster management office (1st Floor)

The food court layout can be rearrange for use as a disaster management office, under disaster situations

- Electrical power outlets and TV antenna terminals are installed
- Large monitors and whiteboards are installed



General situation



Emergency situation

First-aid space (2nd Floor)

The employee break lounge can be used as a first-aid



The recovery of the Tomei expressway in Makinohara area

Immediately after the Surugawan earthquake, NEXCO-Central started emergency checkup and stopgap recovery, and 4 days later, finished temporary recovery for general traffic.



Aug. 11th 2009



Aug. 15th 2009 (4 days later)

Earthquake Museum for educational assistance on disaster prevention

Great Hanshin-Awaji Earthquake occurred in January 1995, took precious lives and destroyed cherished livings of local communities. Earthquake Museum conveys how Hanshin Expressway responded in the 623 days to complete the restoration of the expressway system. It displays damaged structures and introduces new technologies and various activities which put into practice based on the lessons including disaster management support and educational assistance for disaster prevention.



Expressway Network in Japan

شبكة الطرق السريعة في اليابان

Japan's Expressways are built and operated by six companies.
The total length in operation is 10,351km, and 331 km is under construction.



Company Name:
West Nippon Expressway Company Limited
Head Office: Osaka
Expressways in Operation: 3,533km
Traffic Volume: 2.95million vehicles/day
Toll Revenue: US\$ 7.1billion
Expressway under construction: 72km



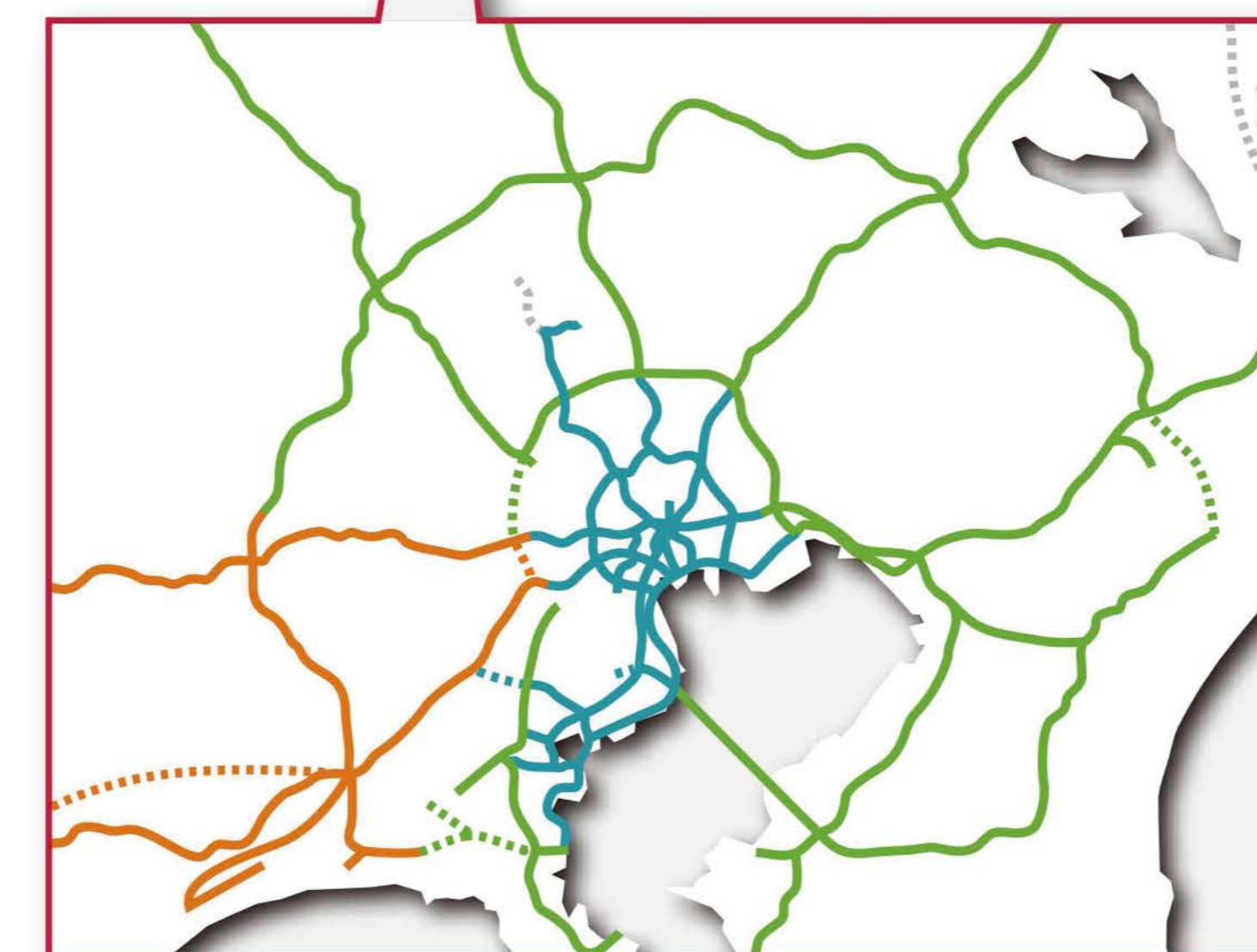
Company Name:
Hanshin Expressway Company Limited
Head Office: Osaka
Expressway in Operation: 250.4km
Traffic Volume: 0.72million vehicles/day
Toll Revenue: US\$ 1.7billion
Expressway under Construction: 34.2km



Company Name:
Honshu-shikoku Bridge Expressway Company Limited
Head Office: Kobe
Expressway in Operation: 172.9km
Traffic Volume: 0.12million vehicles/day
Toll Revenue: US\$ 0.6billion



Fukuoka



Sapporo

Sendai



Company Name:
East Nippon Expressway Company Limited
Head Office: Tokyo
Expressway in Operation: 3,943km
Traffic Volume: 2.95million vehicles/day
Toll Revenue: US\$ 7.82billion
Expressway under Construction: 75km



Company Name:
Central Nippon Expressway Company Limited
Head Office: Nagoya
Expressway in Operation: 2,132km
Traffic Volume: 1.98million vehicles/day
Toll Revenue: US\$ 6.30billion
Expressway under Construction: 132km



Company Name:
Metropolitan Expressway Company Limited
Head Office: Tokyo
Expressway in Operation: 320.1km
Traffic Volume: 1.02million vehicles/day
Toll Revenue: US\$ 2.4billion
Expressway under Construction: 17.5km

———— In operation
..... Under construction

As of JULY 1st, 2019

Note: Revenue is for year ended March 31, 2019 and calculated by the exchange rate of 110 JPY for 1 US\$