

# Road Heating Technology Using Heat-Generating Washi Paper

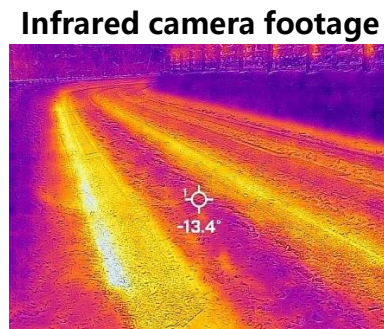
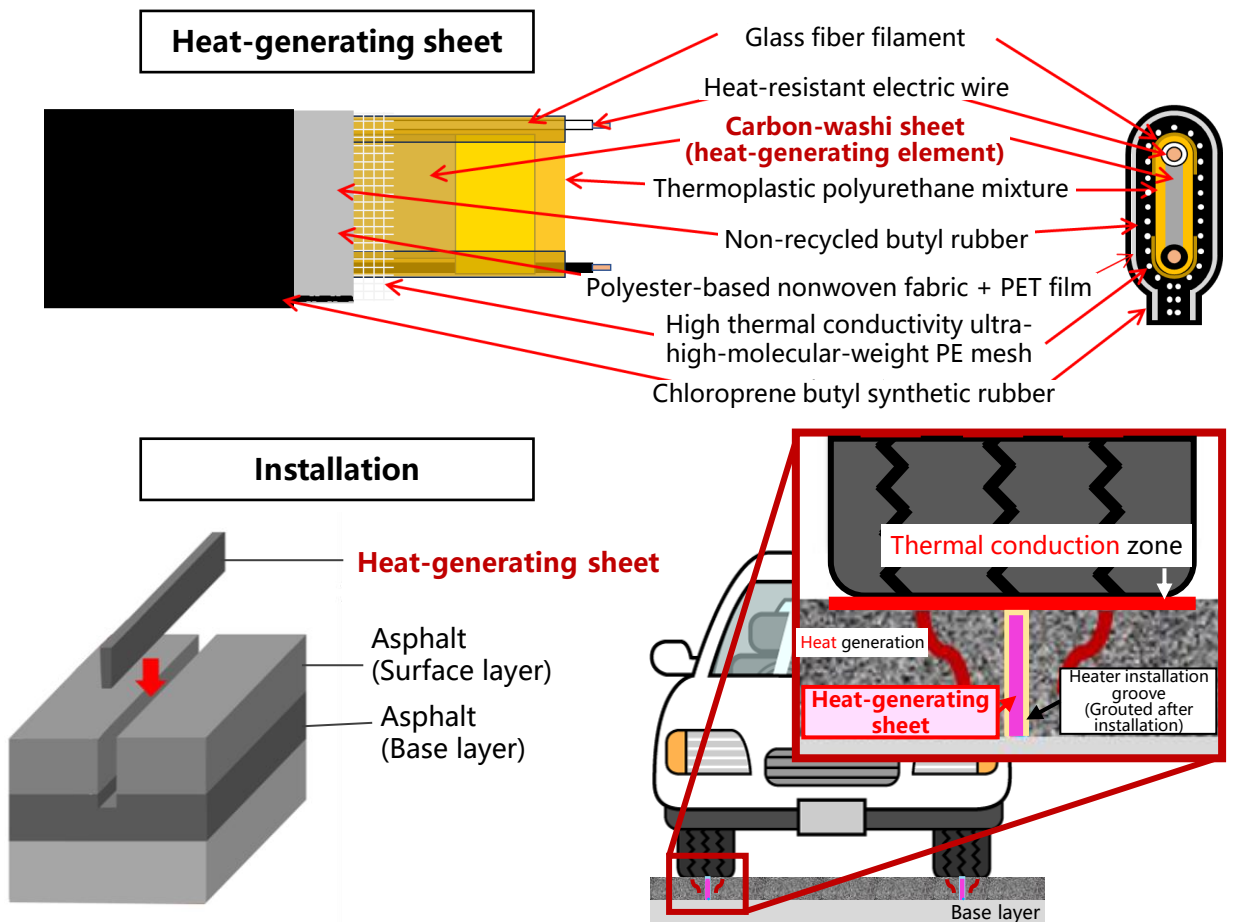
Technologie de prévention du verglas par chauffage routier utilisant du washi (papier japonais traditionnel)



A heat-generating sheet has a simple structure. It consists of a carbon-washi (Japanese Traditional paper) sheet sandwiched between waterproof sheets. The carbon-washi composite sheet can generate heat simply by supplying it with an electric current.

Washi-based heat-generating sheets can be easily installed by cutting several-millimeter-wide grooves on the pavement surface. These sheets can be installed on existing pavement surfaces, and the installation cost is lower than conventional technologies because they only need to be installed on wheel tracks. Electric power consumption, therefore, is significantly lower than in conventional methods.

The snow-melting performance and durability of the washi-based road-heating sheets have already been confirmed on roads, expressways, and parking lots in heavy-snow regions. The road-heating sheets have already been installed in three Metropolitan Expressway sections. They have proven effective in melting snow in winter.



Metropolitan Expressway Company Limited.  
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# Eco-Safe Pavé

~ Fine-Grained Porous Asphalt Pavement ~

Revêtement Eco-Safe Pavé

~ Asphalte poreux à granulats fins ~



**Eco-Safe Pavé**, a fine-grained porous asphalt pavement, was jointly developed by Metropolitan Expressway Co., Ltd. and Nichireki Group Co., Ltd. to mitigate pothole formation in drainage pavements. First adopted in 2015, it now covers approximately 30% of the total Metropolitan Expressway network.

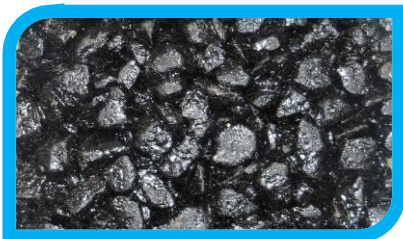
## Characteristics of Eco-Safe



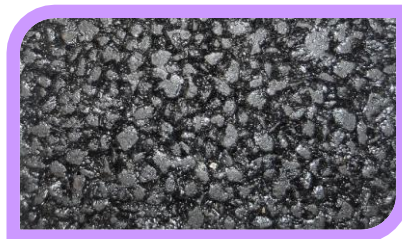
**Economical:** Low fuel cost and high durability (low life cycle cost)

**Eco-friendly:** Ultra-low traffic noise and reduction of CO<sub>2</sub> emissions

**Safety:** Potholes, splash reduction, and hydroplaning prevention



Conventional pavement  
(Permeable, low-noise pavement)



Eco-Safe Pavé  
(Fine surface texture)



Infrastructure Technology  
Development Award

## Economical

The fine surface texture prevents rubber tire deformation, improving the fuel efficiency of passing vehicles by **4.5%**, compared with conventional permeable low-noise pavement.

## Eco-friendly

Improving the fuel efficiency of passing vehicles reduces CO<sub>2</sub> emissions. The installation of this pavement is scheduled to be completed in 2034, by which time CO<sub>2</sub> emissions are expected to be reduced by approximately **57,000 tons/year** (equivalent to emissions from 15,000 households). Traffic noise is also lower than that of conventional low-noise pavement by 7.5 dB, so environmental traffic noise loads are significantly reduced.

## Safety

Eco-Safe Pavé has higher durability than conventional high-performance pavement and excellent pothole resistance. Since pavement thickness has been reduced to 3 cm, even if a pothole occurs, it will not damage the wheels of passing vehicles.

Eco-Safe Pavé is also as effective as conventional permeable pavement in terms of **splash reduction and hydroplaning prevention**, thereby helping to create a safe driving environment even under wet weather conditions.

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Metropolitan Expressway Company Limited  
一般財団法人  
首都高速道路技術センター  
Shutoko Technology Center

# Smart Infrastructure Management System (i-DREAMs®)

## Système intelligent de gestion des infrastructures (i-DREAMs®)

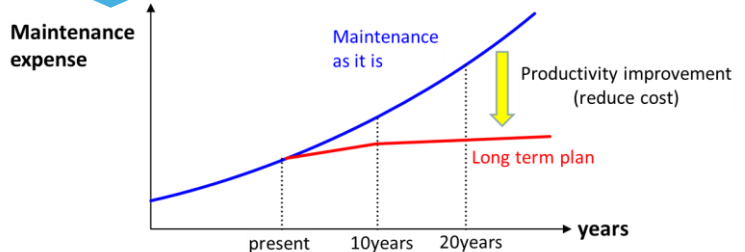


### ■ The Future of Maintenance and Management through Increased Productivity

- If the infrastructure continues to be maintained as it is, significant maintenance costs will be required due to the increasing deterioration and damage caused by aging.
- There is also concern about a shortage of engineers, inspectors, and other human resources, as well as increased costs, due to the declining population.

The development of innovative infrastructure management systems such as i-DREAMs® is expected to be required to accurately and efficiently perform an ever-increasing number of maintenance tasks with limited resources in terms of people, budget, materials, information, and time, and to dramatically improve productivity.

As a result, the efficiency and productivity of maintenance and management would be improved. Sustainable infrastructure management would be achieved.



### ■ Architecture of "Smart Infrastructure Management System" i-DREAMs®: i-ntelligence-D-ynamic REvolution for A-sset M-angement s-ystem



### ■ Practical use and function of i-DREAMs®

- Intelligent search from GIS platform
- Site condition survey from the system
- Creation of 2D/3D CAD drawings
- Simulation on 3D space
- Damage detection of structures
- Automatic pavement damage evaluation and repair plan
- Prediction of structural deterioration using AI and structural simulation
- The knowledge obtained from maintenance can be fed back to the design and construction phase.

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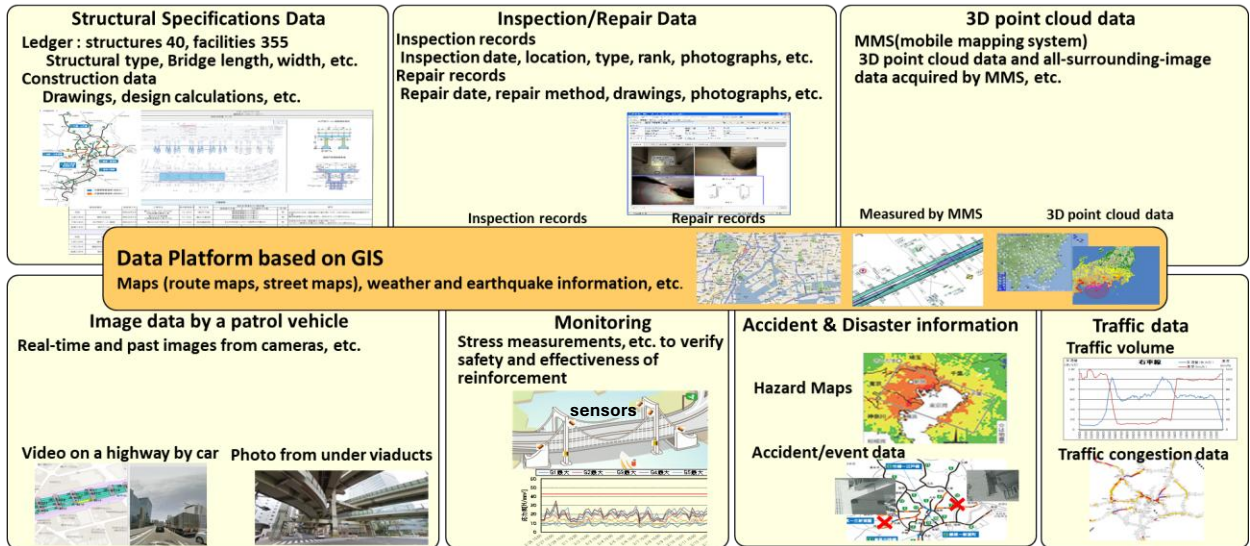


# Smart Infrastructure Management System (i-DREAMs®)

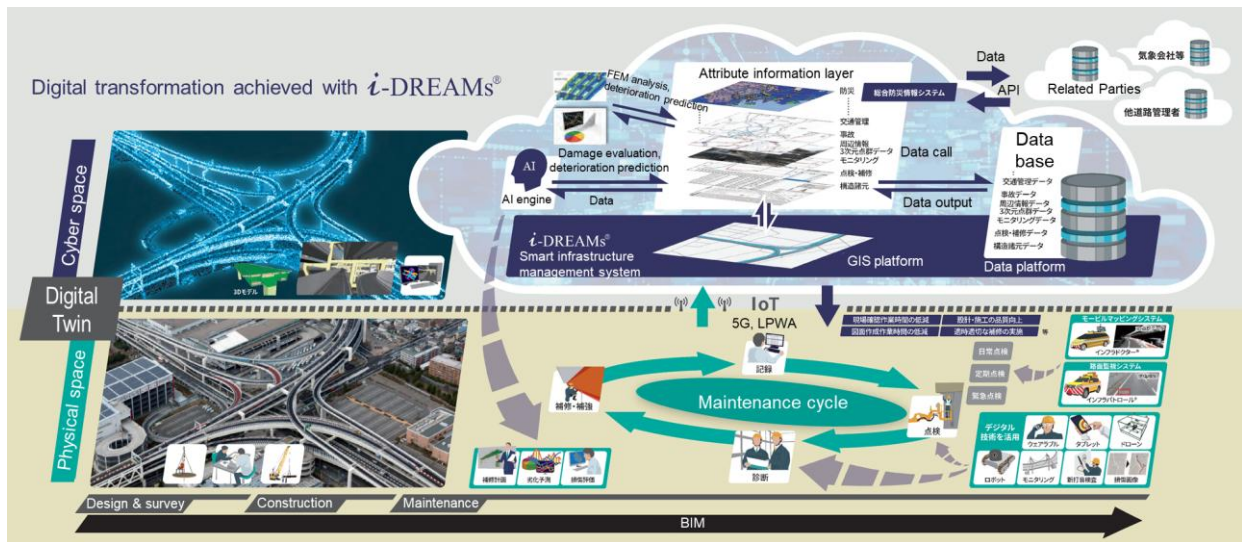
## Système intelligent de gestion des infrastructures (i-DREAMs®)



■ Data Platform based on Geographic Information System (GIS)  
Integrate all information required for maintenance and management into a GIS-based data platform



## ■ Implementation of Digital Twin with Integrated Data Platform



- Data is collected from the physical space, and then integrated and stored on the GIS platform.
- This big data is analyzed using AI and simulation, and the resulting solutions are fed back to the facilities in the physical space.
- By introducing BIM architecture into this data platform, we will achieve more efficient and advanced infrastructure management through a digital twin that seamlessly integrates and utilizes data throughout the entire lifecycle—from survey, design, and construction to maintenance and management.

