The 5th ASEAN-JAPAN Smart Cities Network

Smart Lighting & Smart City Solutions

by *MinebeaMitsumi*

Smart City Promotion
October, 2023

MinebeaMitsumi
Passion to Create Value through Difference

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Overview of MinebeaMitsumi Business

MinebeaMitsumi Business Overview

Toward becoming a one-of-a-kind INTEGRATION manufacturer of precision components by maintaining a diverse portfolio

Consolidated Net Sales
1,292,203 million yen

Operating income
101,522 million yen

(Fiscal year ended March 2023)

16%	28%	41%	15%

Precision Technologies Business

197.3 billion yen

Composition **16%**

Main Product

Ball bearings, rod-end bearings, spherical bearings, fasteners, pivot assemblies

Motor, Lighting & Sensing Business

366.2 billion yen

Composition **28%**

Main Product

HDD spindle motors, stepping motors, fan motors, DC motors, LED backlights, resonant devices, sensing devices

Semiconductors & Electronics

530.4 billion yen

Composition **41%**

Main Product

Precision components, optical devices, power supplies, mechanical components, automotive products, analog semiconductors

Access Solutions Business

194.6 billion yen

Composition **15%**

Main Product

Automotive parts (door latches, door handles, etc.), industrial machinery components, components for home security units (house and general buildings' locks and others)

* Net sales of 3.0 billion yen for Other business is omitted here.

*INTEGRATION means "combining" rather than "simple gathering" of the Company's proprietary technologies to create new products in various fields through the INTEGRATION of our advanced technology.

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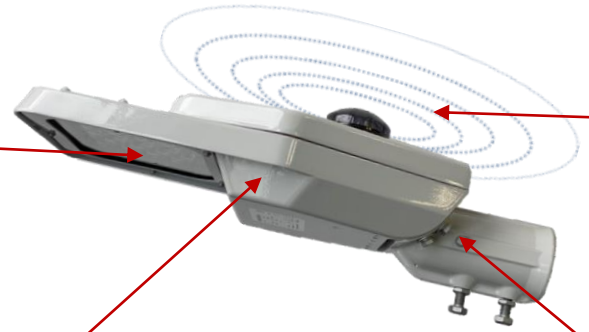
Overview of MinebeaMitsumi Smart Lighting

Synergy of MinebeaMitsumi technology

Integration of MinebeaMitsumi`s original technologies and IoT technology toward development of smart lighting and smart city solutions.

Backlight＝ Lens/Optical technology



Smart LED Streetlight

Wireless technology

Power unit technology

Energy Saving

Semiconductor technology

Development of sensors and IoT products to support smart city solutions

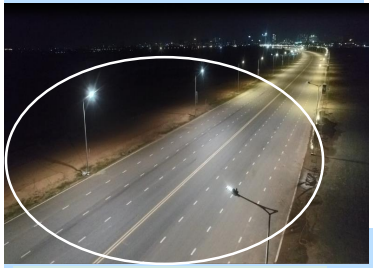
Smart Env. Sensor | Smart Parking Sensor | Smart waste Sensor | Smart Module

Die casting technology

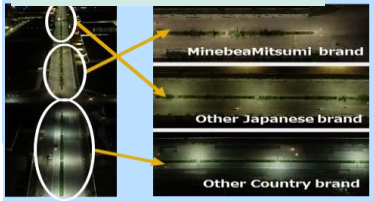
Overview of MinebeaMitsumi Smart Lighting: 5 features

[1] Efficient lighting

- *High uniformity.*
- *Dynamic lighting.*
- *Customized dimming.*

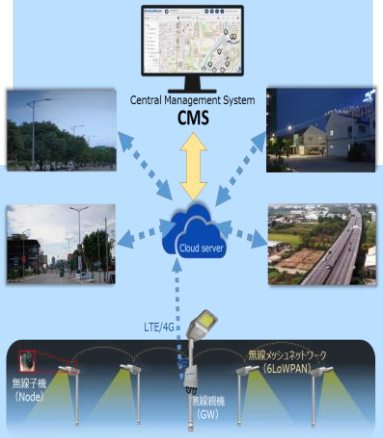


High uniformity



[2] Wireless technology

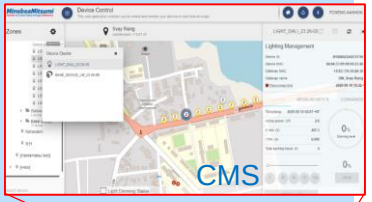
- *6LoWPAN mesh network.*
- *Effective operation and monitoring.*



[3] Centralized management

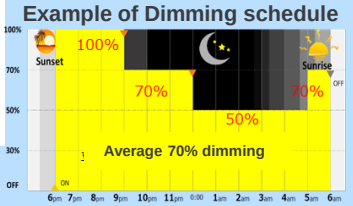
- *Manage all devices by CMS.*

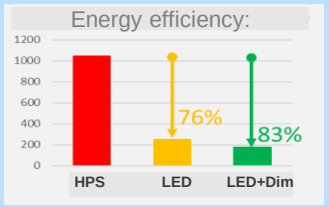
CMS=Central Management System



[4] Energy efficiency

- *Reduce power consumption by dimming.*
- *Reduce CO_2 emission.*
- *Reduce electricity cost.*





[5] Expandability

- *Add new devices in same network.*
- *Design innovative solutions.*

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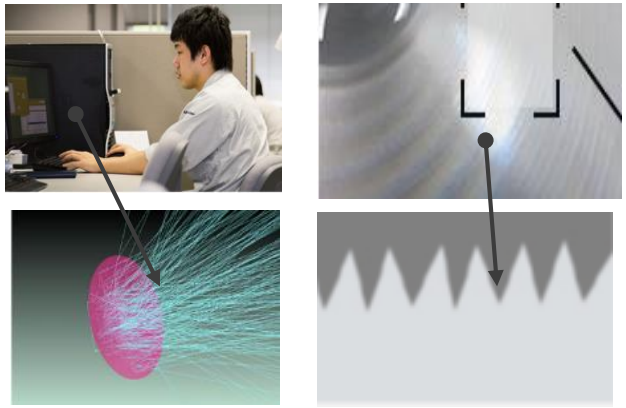
Overview of MinebeaMitsumi Smart Lighting: 5 features

[1] Efficient lighting

- ✓ Our smart LED streetlights enable dynamic adaptive lighting with customizable dimming control function.
- ✓ Tailor-made dimming setting can be programmed on each streetlight via wireless network remotely.
- ✓ High uniformity of brightness on the road surface provides comfortable lights with reduced dazzling.

❑ Comparison of uniformity



Distribution of light from LED is improved by using optical design technology to enhance Illuminance and the efficiency

Adjustment of Clamp Angle of Smart LED head can help to cover different road width.

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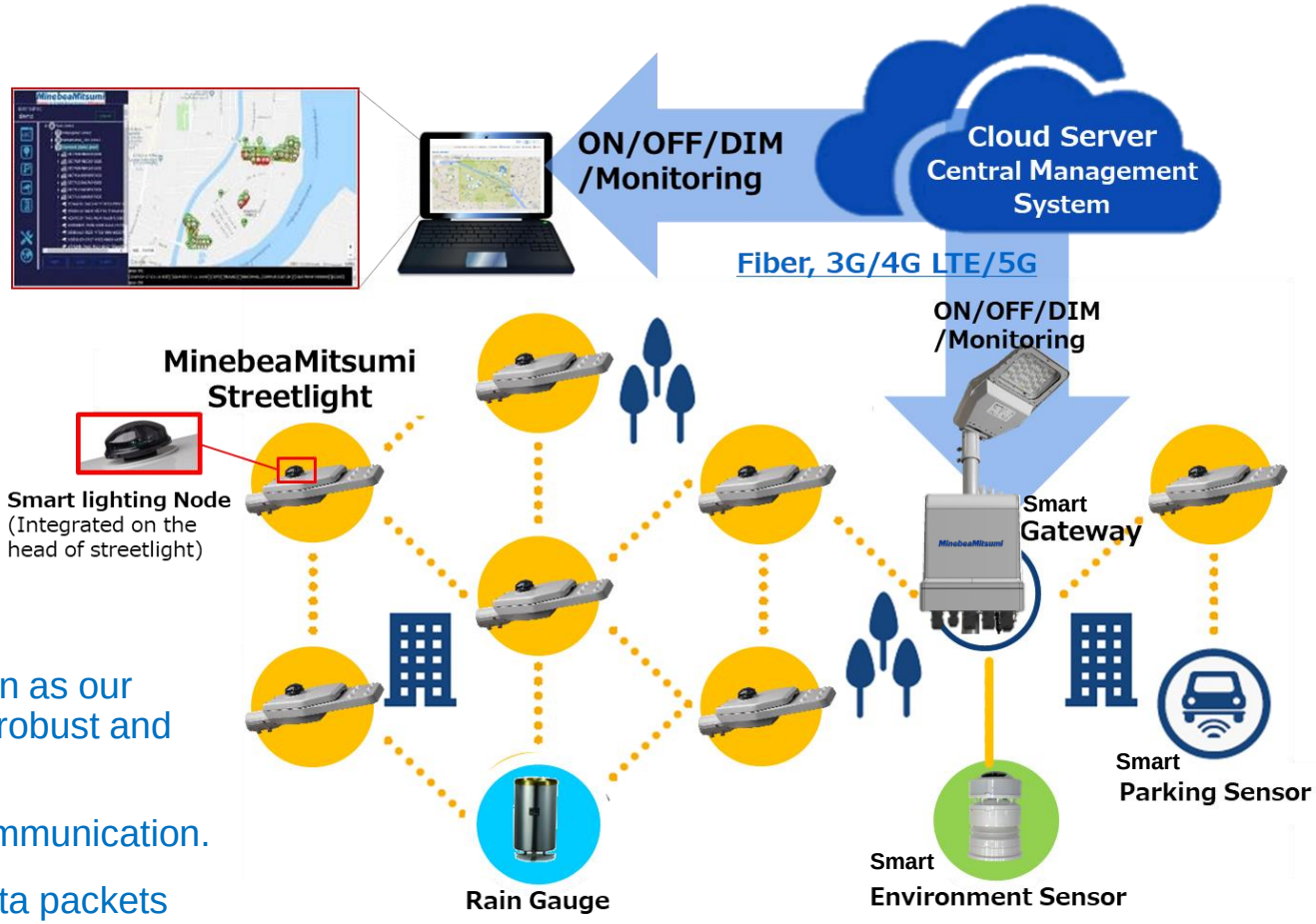
Overview of MinebeaMitsumi Smart Lighting: 5 features

[2] Wireless technology

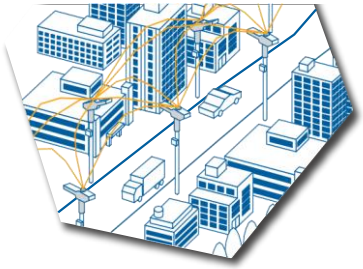


- ✓ We adopt 6LoWPAN communication as our smart lighting IoT network which is robust and resistant to obstacles.
- ✓ Gateways support dual network communication.
- ✓ IoT devices that use low volume data packets and high bandwidth devices such as camera can be used with same Gateway.
- ✓ Long range LoRa technology is also under development.

Overview of MinebeaMitsumi Smart Lighting: 5 features

[3] Centralized management

- ✓ CMS (Central Management System) can monitor and control all installed devices.
- ✓ Real time monitoring and data collection to facilitate instant sharing of any incident.



CMS: Central Management System

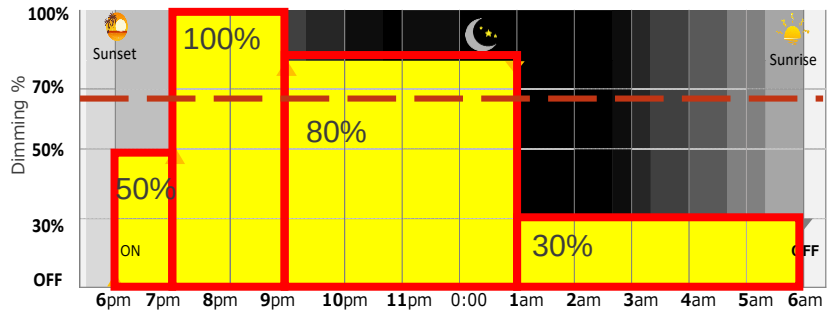
Overview of MinebeaMitsumi Smart Lighting: 5 features

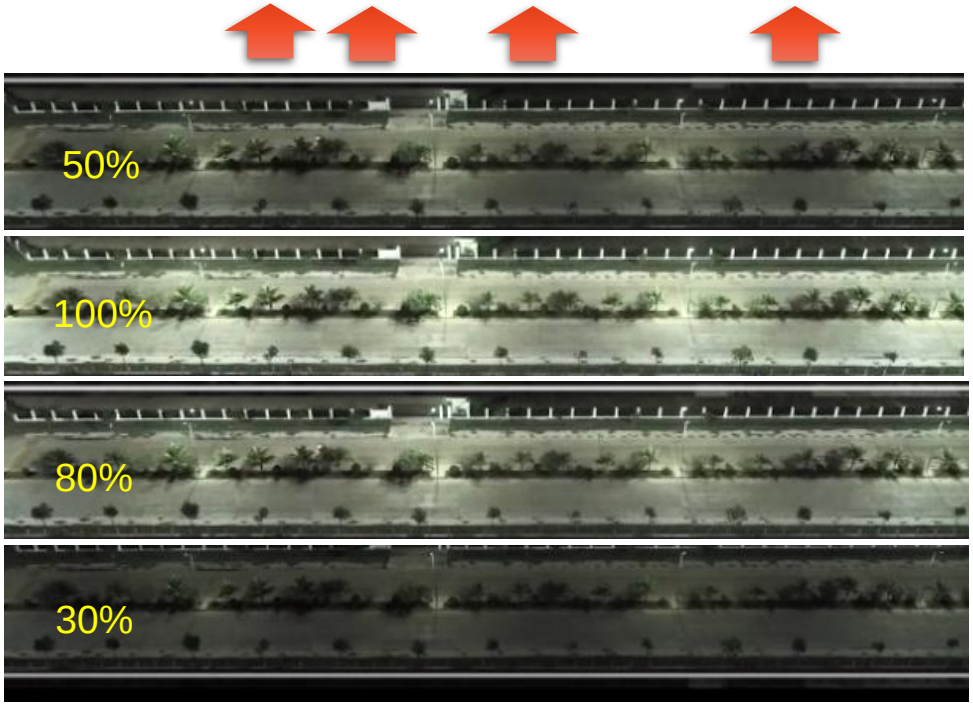
[4] Energy efficiency

What is dimming control?

✓ We offer advanced lighting system that significantly helps in energy savings by applying dimming control of lights to provide optimum brightness on road and walkways.

■ Example of dimming pattern





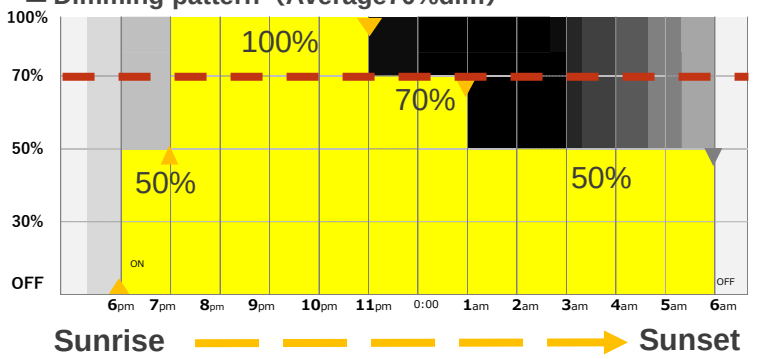
Drone shooting

Overview of MinebeaMitsumi Smart Lighting: 5 features

[4] Energy efficiency

✓ Excellent energy-saving performance and contribution in CO_2 emission reduction

■ Dimming pattern（Average70%dim）



■ **If 1,000 conventional streetlights are replaced by smart lighting,**

■ **Annual Electricity cost saving**

- ✓ **26.9 Million Yen** saving from mercury lamps
- ✓ Or **16.8 Million Yen** saving from HPS lamps

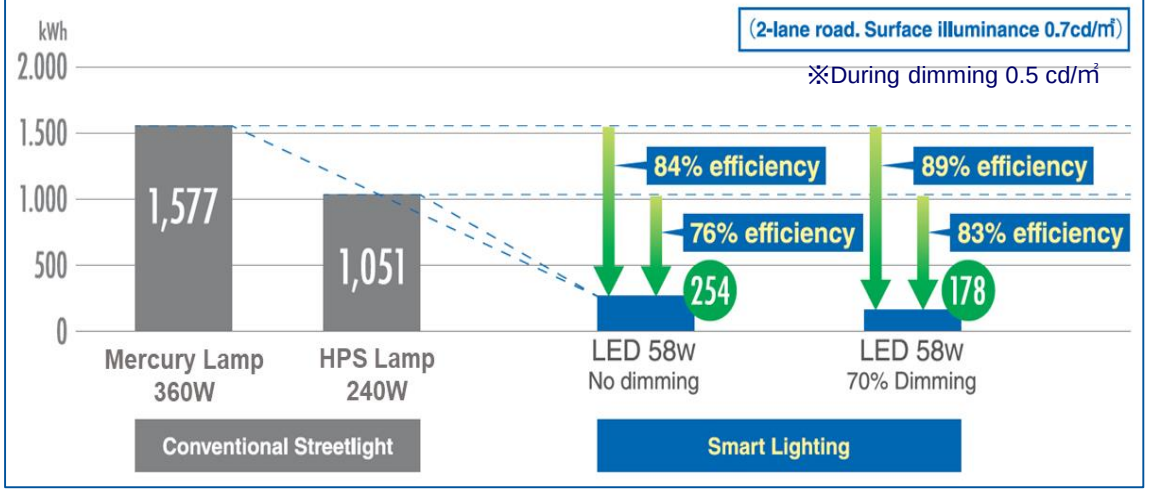
(average *70% dimming*)

■ **Annual CO_2 emission reduction**

- ✓ **646 t-CO_2** from Mercury
- ✓ Or **403 t-CO_2** from HPS

Equivalent to CO_2 absorbed by 46,142 cedar trees in 1 year.

■Energy efficiency achieved after implementation of Smart Lighting:
Comparison of annual power consumption by 1 unit of lamp



※Electricity tariff：19.25 Yen / kWh ※CO_2 emission factor is 0.462 t-CO2 / KWh ※1 Cedar tree can absorb 14kg of CO2

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Overview of MinebeaMitsumi Smart Lighting: 5 features

[5] Expandability

- ✓ Our wireless network can be expanded by integrating additional sensors and IoT devices.
- ✓ This allows our valued customers to innovate and design new applications of their needs.

Weather and Environment

Smart Environment Sensor Unit※1

Pyranometer

Rain gauge

Energy Saving

Smart LED streetlight※1

Traffic and Urban planning

Smart Parking Sensor※1

Smart Waste Sensor※1

Guide lamp

Disaster preparedness

Rain gauge

Water level sensor

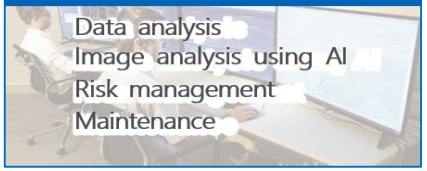
Smart Flooding Sensor※1

Smart camera

Security

Smart Camera

Manage, Analysis, Forecast, Control



Smart Communication Module※1

Integrating this module to any other sensors enable wireless connectivity to 6LoWPAN mesh wireless network.

**1:Product of MinebeaMitsumi*

**2:Central Monitoring System（CMS）. Software management platform to monitor and control all IoT devices and sensors.*

**3:Paradox Engineering is a MinebeaMitsumi Group company.*

3

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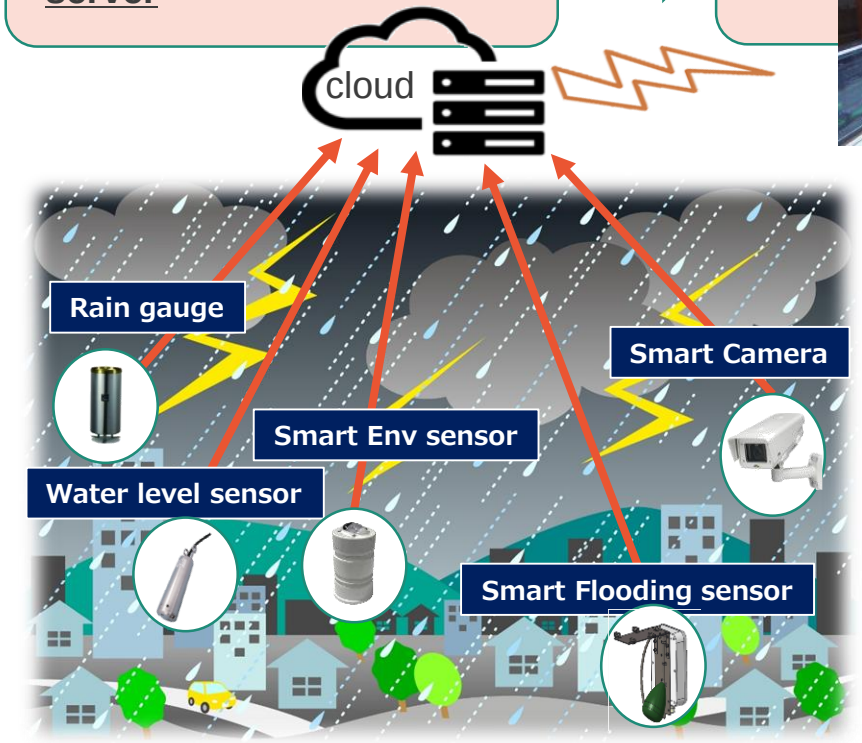
Smart City Solutions by MinebeaMitsumi and Use Cases

Disaster preparedness: Detect potential risks in advance.
Install sensors at high-risk zones to check risk level in real time

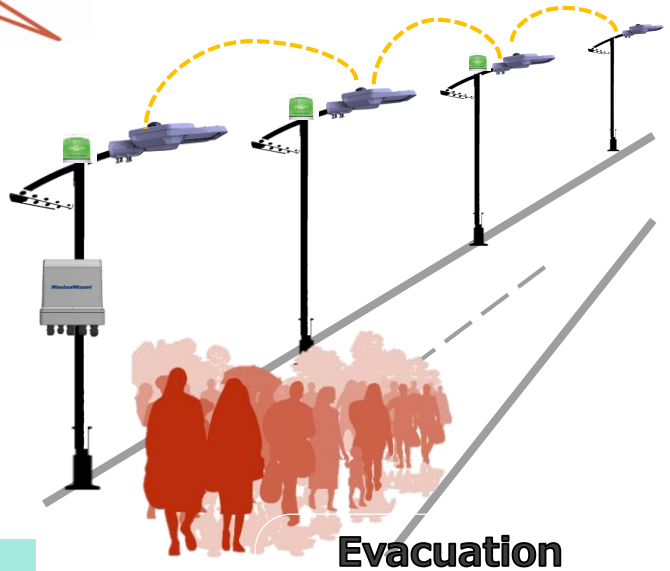
Sensor data from various locations collected in **Cloud server**

Central monitoring in **City control center**

Real time status update to residents.
Alert dispatch and **evacuation guidance.**

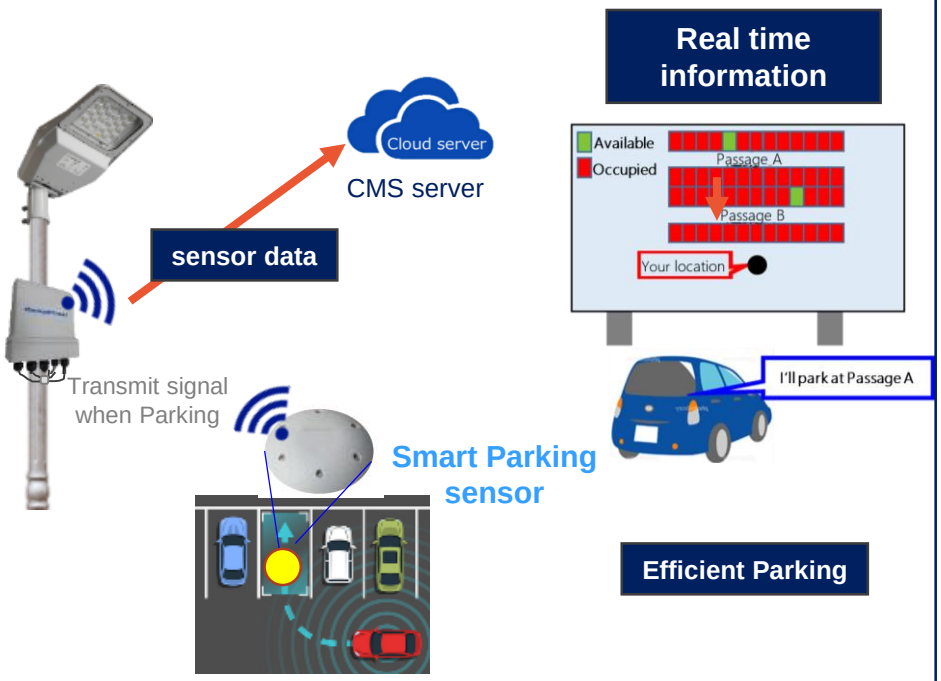


Evacuation guidance !



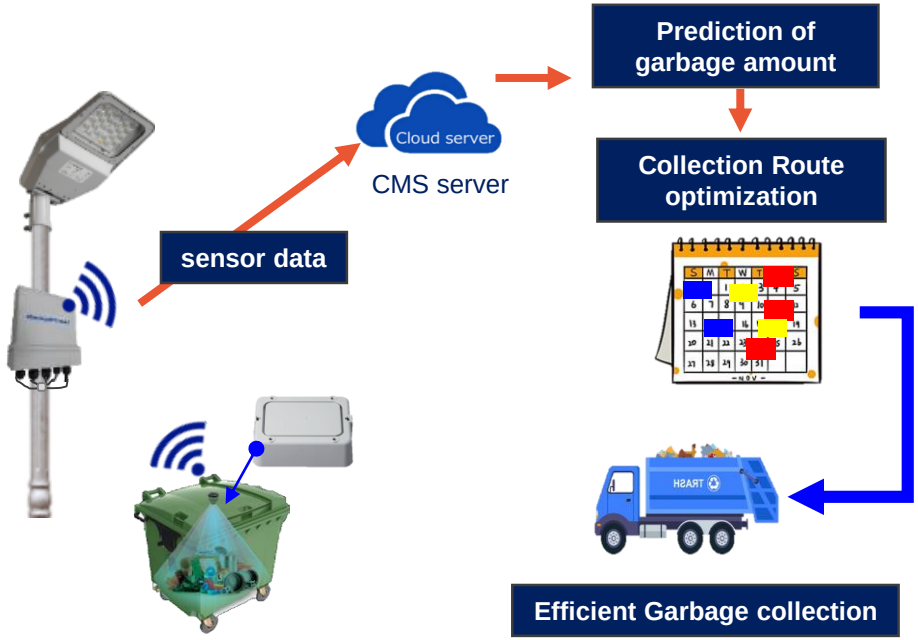
Also it helps to prepare more effective evacuation guidance.

Traffic solution
Contribution to efficient parking



- Mitigate traffic congestion by guiding to the facilities with available parking spaces.
- Easy installation of parking sensors.
- By integration camera, can prevent illegal parking.

Waste solution
Efficient collection of waste

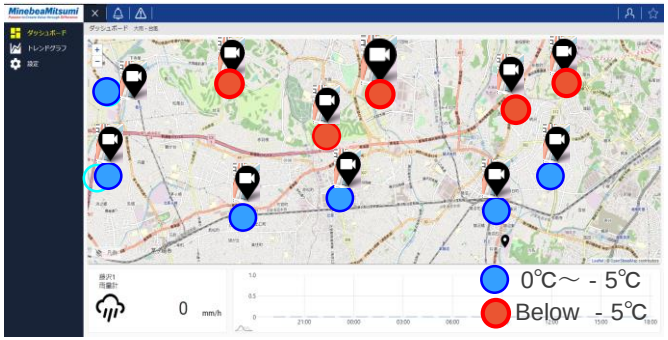


- Detection of filling level of garbage bin.
- Route optimization for waste collection
- Efficient waste collection by saving Fuel/gasoline and time. Also contribute in CO_2 emission reduction.

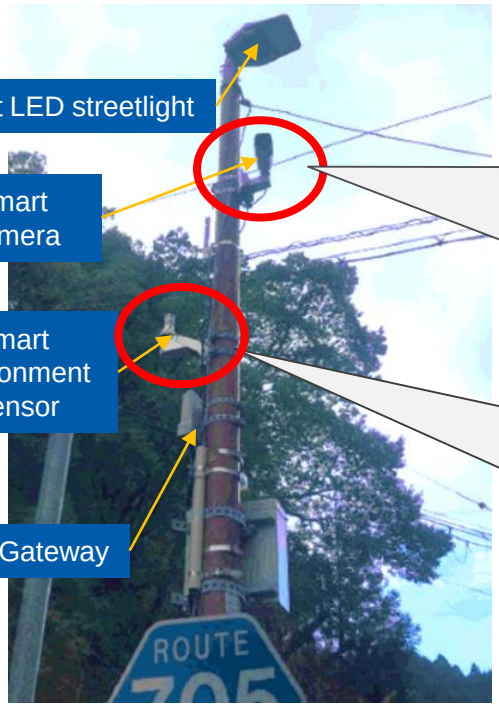
Contribution in creating zero carbon society.

Smart City Solutions by MinebeaMitsumi: Use Cases in Osaka prefecture

Environment Sensor + Camera
Monitoring road condition in mountain regions

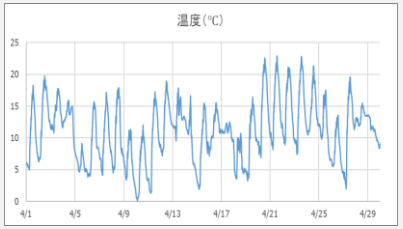


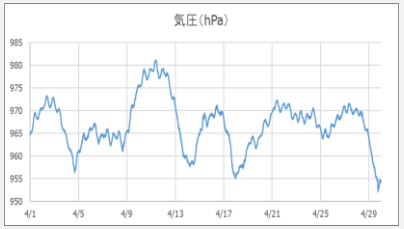
Based on sensor data and camera image, city can check the road condition.
If there is "heavy rainfall" or "snowfall" or "road icing", city can issue alerts to vehicles moving toward those roads or make decision to block traffic for safety and to prevent road accidents.

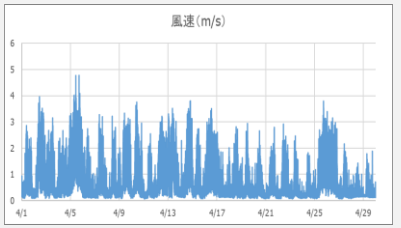


Live monitoring of road status via the installed camera on the streetlight.

・Temperature, ・Atmosphere pressure, ・Humidity, ・Wind speed, ・Rainfall, ・Illuminance etc.







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Smart City Solutions by MinebeaMitsumi: Use Cases in Nasushiobara City

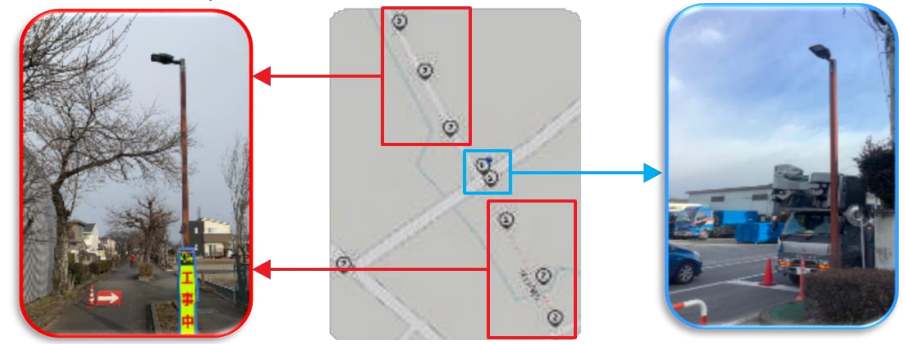
- **IoT network for central management of lamps.**
- **Quick response to Government request to save electricity**

On March 16, 2022, a strong earthquake of M7.4 struck off the coast of Fukushima Prefecture. After that, smart LED streetlights at some roads excepts for those intersections were operated at 50% dimming level and this kind of operation reduced about 36% of electricity consumption.

Power Saving request from Gov. → Preparation of dimming schedule → Apply dimming program → Operation of lamps with dimming

■ 50% dimming at the walkway.

■ No dimming at the intersection

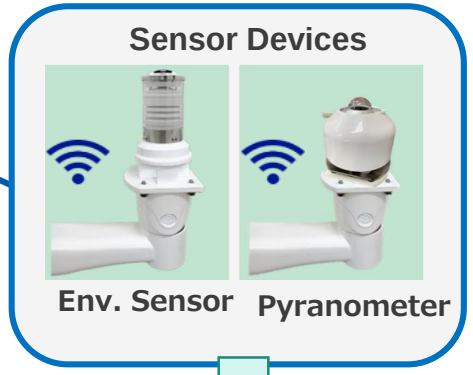


■ Dimming level 50%

■ Dimming level 100% (no dimming)

Utilize sensor data

- **to prevent Heat stroke,**
- **to predict solar power generation.**



Prevent heat stoke accidents by monitoring weather condition and alert dispatch to residents about the risk.

Predict Solar power generation using solar radiation data.

Energy saving/CO_2 emission reduction by Advance Energy Management

Weather Association/Company

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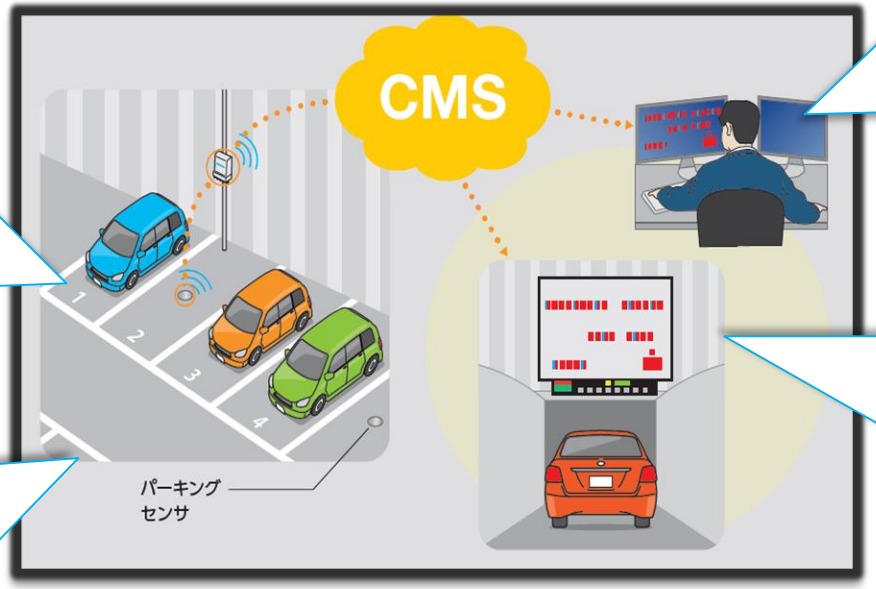
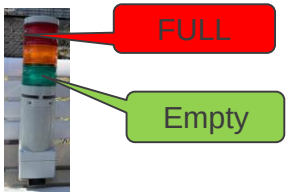
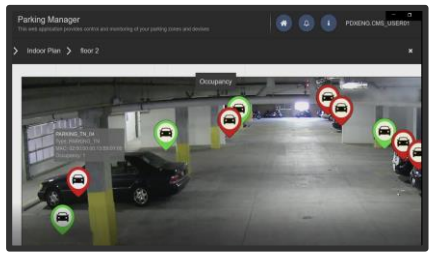
Smart City Solutions by MinebeaMitsumi: Use Cases in EU and Chile

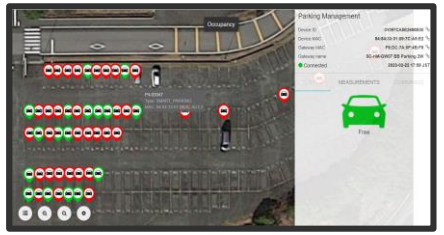
Effective parking

- ✓ Detect the occupancy status.
- ✓ Guidance to driver about available parking spaces.
- ✓ Can avoid driving to fully occupied parking area.
- ✓ Can be used to detect illegal parking.









Thank you very much

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