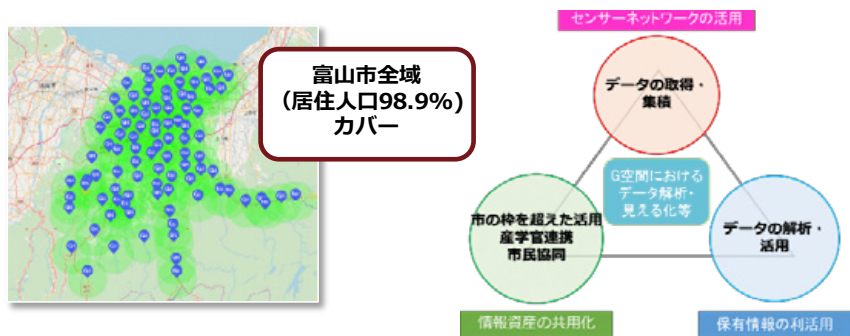


Regional development utilizing sensor network

Triggers of Smart City initiatives

Although Toyama-city has been making initiatives ahead of others in the nation in the form of “Compact regional development centered around public transportation”, there are issues such as lack of manpower for regional activities based on mutual aid and cooperation due to declining birthrate and aging as well as declining population, appropriate maintenance and management of aging infrastructure in public and private sectors, fostering new industries for Society 5.0, human resources development in collaboration with industry-academia-government sectors. Following up the physical (real) measures taken to realize the compact region, it was understood that the smart transformation of cyber space (virtual) would lead to the resolution of the issues.

- “Toyama-city Sensor Network” consisting of LPWA (Low-power Wide-area) network covering the entire Toyama-city (98.9% of residential population) and the IoT platform were implemented.
- It aims at utilizing IoT for local government tasks such as to resolve regional issues and to enhance new capabilities for disaster prevention, as well as at vitalizing local industries by providing them as the environment for verification experiments to private businesses.
- By utilizing not only the new information obtained from IoT sensors and others by way of the Toyama-city Sensor Network, but also the information from “Toyama-city Lifeline Common Platform” and “Toyama-city Open Data Site” to share the information held by public and private infrastructure operators together, to promote the sharing of data between public and private sectors and between private companies, to create new values for Society 5.0, and to improve in new generation citizens services and QoL, and the vitalization of business activities.



図：スマートシティ実現のための取り組みイメージ

Effectiveness (Cost-effectiveness)

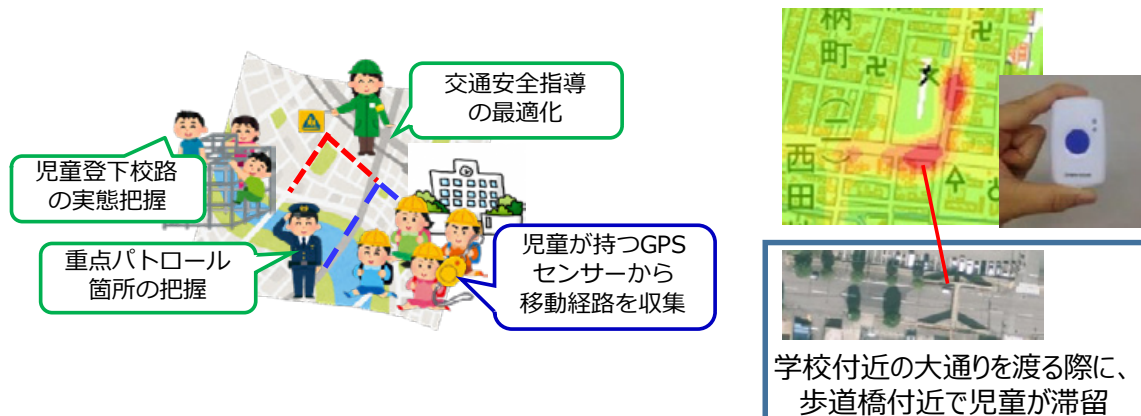
- In the regional collaboration project for the safety-care of children, the actual status of children on the way to and from schools was successfully visualized in 16 elementary school districts in total. The information was shared with elementary schools, PTAs, and self-governing promotion associations.
- For the publicly recruited project in FY 2019 to provide the free-of-charge usage of the Toyama-city Sensor Network for verification experiments and other purposes, 36 organizations with 23 theme subjects participated. It contributed towards the creation of new businesses and the fostering of industries in the region.

Objectives and service overview

■ Verification example 1: Regional collaboration project for the safety-care of children

- GPS sensors (LoRa) were rented out to elementary school students and the investigation was conducted to verify the actual routes of children on the way to and from schools.
- The data obtained were analyzed and “visualized” in collaboration with University of Toyama, and shared with elementary schools, PTAs, self-governing promotion associations of the district, and others as the source materials for EBPM (Evidence-based Policy Making).

- It contributed towards the enhancement of children's safety and security by collaborative efforts with the regional residents utilizing the near future technology such as IoT.



■ Verification example 2: Publicly recruited project for verification experiments of the Toyama-city Sensor Network

- The publicly recruited project was conducted to provide the free-of-charge usage of the Toyama-city Sensor Network as the environment for verification experiments to develop IoT sensors and others and to validate new functions for private business operators and higher education institutions.
- By lowering the barrier for new entries, and the city actively publicizing the results of the verification experiments, it aimed to promote the match-making between different private companies, develop new services for Society 5.0, and vitalize local industries.
- 23 project entries (36 organizations) participated in FY 2019. The verification experiments were conducted by a broad range of private business operators from the field of IT, welfare, agriculture, etc.
- Outcome report meetings were held for the purpose of promoting match-making between public and private sectors and between companies.

The keys to success



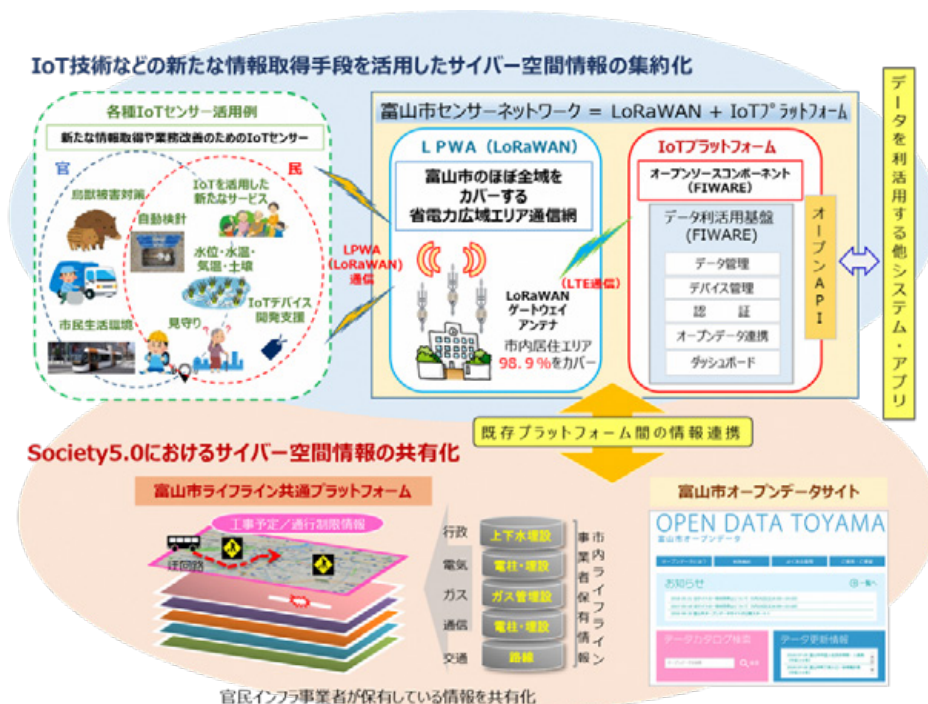
Point1 Construction of the sensor network covering the entire city and the platform equipped with open API

- By establishing the information infrastructure of Toyama-city in the form of the LPWA network covering 98.9% of residential area, we have come to own a social infrastructure to collect regional information related to the citizens' lives.
- In addition to establishing the communication environment, by adopting an easy-to-access cloud-based IoT platform equipped with open API to promote collaborations between industry-academia-government sectors, the city itself as a platformer has become capable of providing the environment for the sections of City OS corresponding up to the asset layer, data federation layer, data layer, and function layer of the Society 5.0 Reference Architecture.



Point2 Information exchanges with the existing platforms

- By connecting the IoT platform with the "Toyama-city Lifeline Common Platform", which allows the sharing of information on city road constructions between Toyama-city and lifeline operators, and the "Toyama-city Open Data Site", it has become possible to generate new values.



Notional diagram of Toyama Smart City Promotion Project

Future development

We will continue to promote the Smart City transformation initiatives of Toyama-city by utilizing the Toyama-city Sensor Network and existing assets.

■ Resolving regional issues

- Collaborative regional project for the safety-care of children

■ Resolving regional issues

- Continuation of the publicly recruited project for verification experiments of the Toyama-city Sensor Network

■ Promoting utilization of IoT in local government tasks

- Installation of a monitoring system for the real-time monitoring of the progress of damages on aging bridges
- Verification experiments to determine whether or not the operating status of snow removal equipment can be obtained
- Encouraging self-help and mutual assistance of the citizens by providing the monitoring information on river water levels measured by sensors



Future usage examples

(notional diagram of Toyama-city Sensor Network utilization)

■ Toyama City Laboratory promotion project

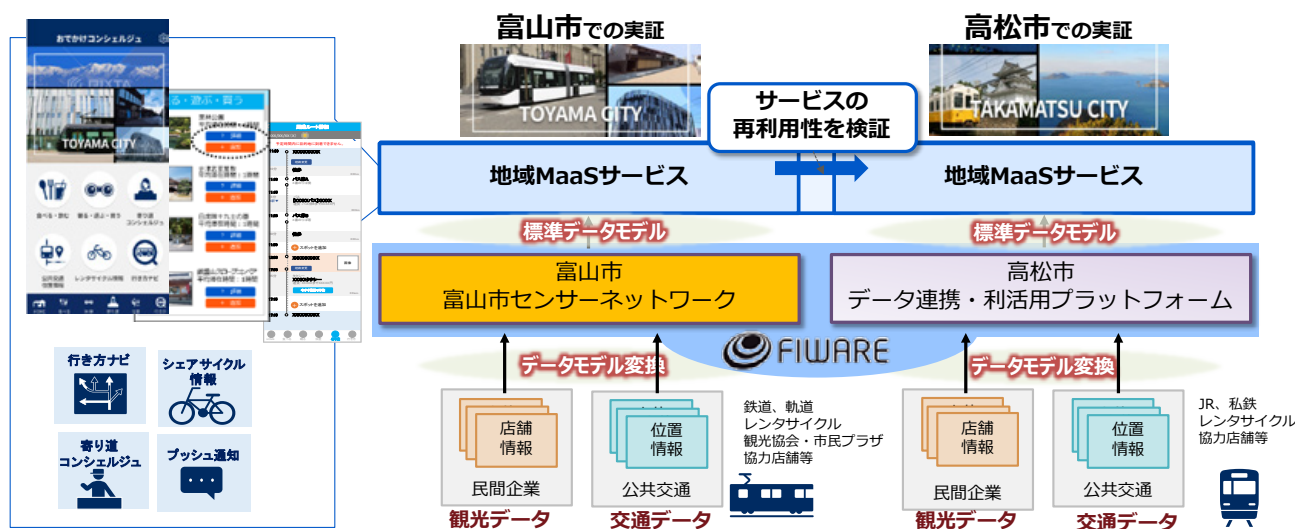
- By regarding the whole Toyama-city as a “laboratory” and establishing the “Toyama City Laboratory (tentative name)”, which is a public-private sector collaboration platform aimed at the resolution of regional issues, we aim to

increase the relevant population through the circulations and interactions between urban human resources (adults, students, etc.) and local human resources and to foster local human resources, as well as to promote Smart City initiatives by public-private sector collaboration and open innovations.

Reference: SIP verifications in Toyama-city and Takamatsu-city

Making use of the publicly recruited project for verification experiments of the Toyama-city Sensor Network (2019), NEC Corporation conducted verification experiments for the “Implementation study of the cross-sectoral services through the collaboration of different systems within a city including private business operators” in Toyama-city, as a part of the SIP R&D item “Smart City field: Implementation of verification study”.

- Verification of cross-sectoral services that contribute to the compact regional development by improving the mobility of citizens and visitors using public transportation and encouraging local consumption
- Collection of streetcar location information and transmission of store information making use of the Toyama-city Sensor Network (LPWA communication network)
- Verification in Takamatsu-city of the feasibility to provide the services readily in other cities just by changing data



Information source: Toyama-city, University of Toyama, NEC Corporation

International business center by way of digital & content

Triggers of Smart City initiatives

Smart City initiatives in Takeshiba area (Minato-ward, Tokyo Metropolis) are triggered by the “Urban Regeneration Step-up Project” and the “Regional Development Guidelines for Takeshiba Area” by Tokyo metropolitan government.

■ “Urban Regeneration Step-up Project (Takeshiba area)”

- A regional development project led by Tokyo metropolitan government aiming at urban regeneration of the whole area utilizing the land space of about 1.7 ha in Takeshiba area owned by Tokyo metropolitan government

■ “Regional Development Guidelines for Takeshiba Area”

- Regional development policies established by Tokyo metropolitan government to conduct the project.

Promoting area management to increase the liveliness and the value of the area developed as the international business base by taking advantages of the concentration of content industries and the like.

Based on them, we have initiated the studies on the establishment of an area management organization and the activities making use of digital content and advanced technology.

Effectiveness (Cost-effectiveness)

We have achieved synergy effects between the liveliness creation in the area and the PR promotion of advanced technologies through the area management activities (planning and staging of the local events incorporating the utilization and demonstration of advanced technology).

■ Number of visitors to the verification field

Robot demonstration at Takeshiba Summer Festival

- about 5,000 people (Aug. 2019) * 3 days total

Lighting-up of the former Shiba Imperial Garden incorporating advanced technology

- about 4,100 people (Nov. 2019) * 4 days total

Daily average number of visitors

in FY 2018: about 450 people



Daily average number of visitors during the event: about 1,000 people



Takeshiba area and the area management district

About 28 ha (Minato-ward, Tokyo Metropolis)

Objectives and service overview

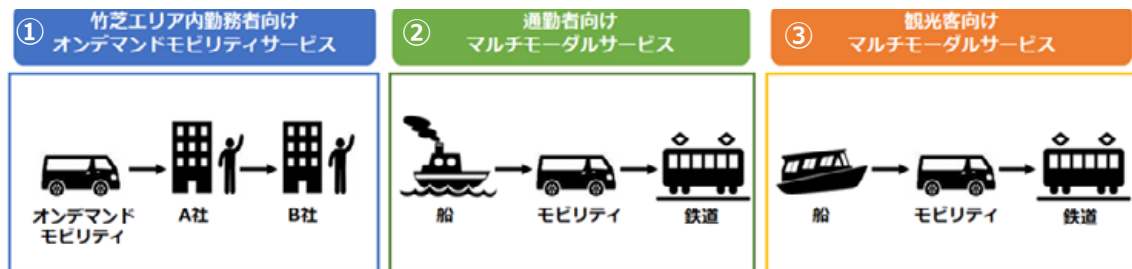
As a field to demonstrate and send out messages on advanced technology, we strive to make further efforts to establish the international business base and to create the liveliness of the area.

■ Verification experiments of new mobility services

Verification experiments for three services were conducted with the aim of improving mobility convenience in the Takeshiba area (conducted as a publicly recruited project by Tokyo metropolitan government "Verification experiments for the construction of the social implementation model for MaaS")

- Validation of the circulating mobility service that can be reserved for pick up by the workers in the area using an application (1)

- Validation of the use of boat transportation as a means for commuting, and validation of the feasibility of services federating boats, mobility services, and railways (2)
- Validation of the feasibility of services federating boats, mobility services, and railways by the operation of mobility services synchronized to the scheduled ship timetable of the Oshima-Takeshiba line (3)



■ Verification experiments for service robots (concurrently staged in collaboration with the area management events)

- “Tokyo Robot Collection”, an advanced technology showcase project sponsored by Tokyo metropolitan government was held concurrently with the area events held along the Takeshiba wharf.
- Service robots were in action at the venue as a demonstration field for service robots using advanced technology.

■ Experiencing remote travel in Ogasawara by way of remote-controlled robots

An event was held in collaboration with a venture company to enable VR experiences as if being in a remote location.



The keys to success



Point1 Establishment and expansion of the area organization as a primary promoter

1. Establishment and expansion of the area management organization and promotion by a two-pronged system (Takeshiba Area Regional Development Council, Takeshiba Area Management General Incorporated Association)
 - A two-pronged promotion system was established with the Council comprised of local stakeholders and government stakeholders, and the incorporated organization as a primary project operator
 - The initiative was started with the formation of a preparatory organization and voluntary cleaning activities of the area and expanded while forming the local region.
 - In 2018, we were designated by the Urban Renaissance Promotion Corporation to strive for further efforts.
2. Establishment and expansion of the activity base for the formation of digital & content industry base (CiP Council General Incorporated Association)
 - We are currently promoting R&D, human resources development, start-up support, and business match-making along with the members coming from more than 50 companies and organizations.
 - In 2019, we formed a City & Tech committee by industry-government-academia sectors and initiated the activities of preemptive implementation of advanced technology in the Takeshiba area.



Point2 Active utilization of the strength (local resources) of the area by areal collaboration

Active utilization of the local public resources such as the Takeshiba wharf cruise ship terminal and the former Shiba Imperial Garden for the enhancement of attractiveness of the area.

Lighting-up of the former Shiba Imperial Garden incorporating advanced technology

Sponsored by: Tokyo Metropolitan Park Association (member of the Council),
Co-sponsored by: Takeshiba Area Management, and others



Future development

■ Utilization of the leading-edge technology in the whole area

In collaboration with local technology companies and others, we aim to co-create Smart City that utilizes the leading-edge technology throughout the region, and take initiatives to utilize data in the area and construct smart buildings. In addition, we will promote the validation of technology in a wide range of areas, including robotics, mobility, AR (augmented reality), VR (virtual reality), 5G (fifth-generation mobile communication systems), and drones.



Information source: Tokyu Land Corporation, Kajima Corporation, Albero Grande K.K., Takeshiba Area Management

Now, let's get started with what we can.

What does the Smart City blueprint of your region look like?

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Big-data and AI-enabled Cyberspace Infrastructure Technologies
Architecture Design and Verification Study Project

How to use Smart City Reference Architecture

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