

## Chapter 2

# Regional Large-Scale Science, Technology, and Innovation Bases

Japan’s science, technology, and innovation bases include those formed on the initiative of regions. These bases utilize their features, such as their own industries and technologies, and accumulate relevant industrial sectors and human resources. They serve as pillars in making significant contributions to regional vitalization. This chapter introduces two major examples.

### Section 1 Open Innovation KAWASAKI

Kawasaki City is advancing the implementation of policies for the development of businesses based on the “Kawasaki Industry Promotion Plan” toward the realization of “ensuring a vigorous industrial city,” a basic city development target described in the “Kawasaki City Comprehensive Development Plan.” The city is home to incubation facilities such as the “Kawasaki Business Innovation Center (KBIC),” with over 550 research and development (R&D) institutions in the city. In particular, the Tonomachi District of Kawasaki City has witnessed the formation of “KING SKYFRONT, Tonomachi International Strategic

Zone,” which creates new industries from R&D of the world’s highest standard in the life science and environmental fields. Taking advantage of its convenient location directly linked to Haneda Airport on the opposite side of the Tama River via the Tamagawa Sky Bridge and its concentration of R&D institutions, foundations have been laid to promote the development of businesses and innovation (Figure 1-2-1).

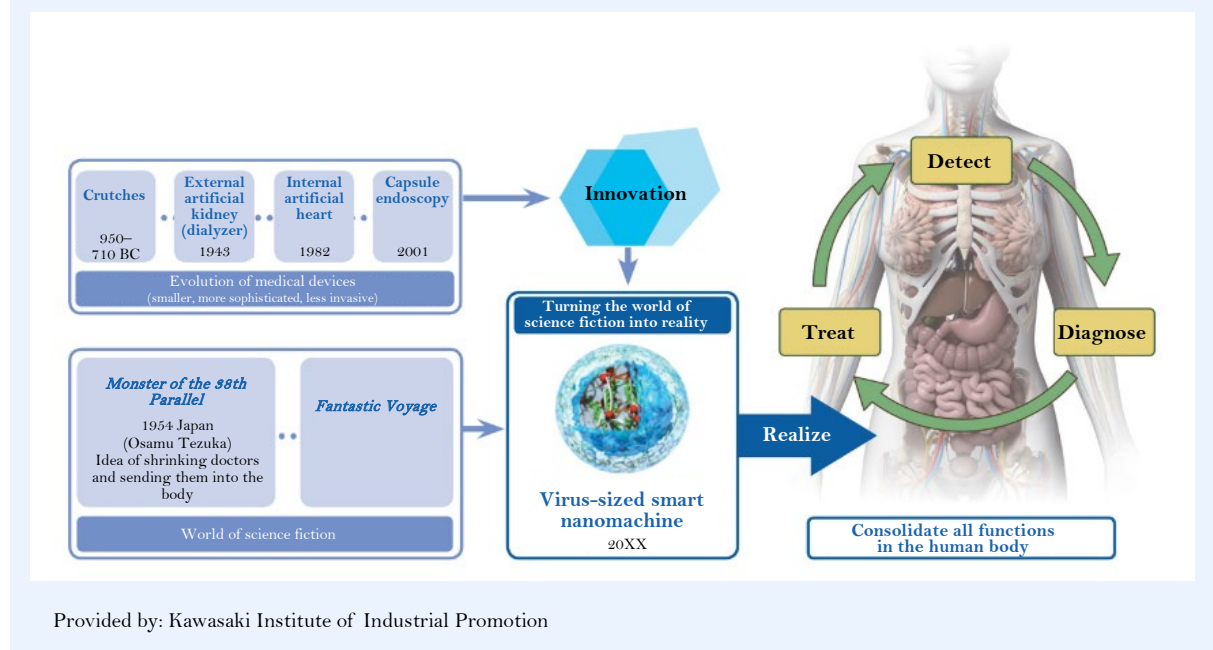
KING SKYFRONT brings together industrial, academic, and governmental players under one roof, and houses the “Innovation Center of NanoMedicine (iCONM),” a base to accelerate

Figure 1-2-1/KING SKYFRONT, Tonomachi International Strategic Zone



Provided by: Kawasaki City Fire Department Aviation Corps

■ Figure 1-2-2/Image of In-Body Hospitals



open innovation. iCONM is the base of operations for the “Center of Open Innovation Network for Smart Health (COINS),” a project adopted for the COI STREAM program run by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), with the Kawasaki Institute of Industrial Promotion as its core institution. COINS upholds the vision of “a society where everyone can become healthy autonomously, by being freed from diseases that have a heavy social burden, without any physical or financial burden, anytime, anywhere” and seeks to realize “In-Body Hospitals,” which integrate all the functions of medical care within the body. Specifically, they concern the development of smart nanomachines that patrol the body 24 hours a day, detect signs of disease, administer medical treatment, and immediately communicate the information to the outside of the body. Toward their realization, more than 30 universities, companies, and other institutions engaged in the world’s most cutting-edge nanomedical research joined together to facilitate integrated research that cuts across the boundaries of the industrial, academic, and

governmental sectors. Through ten startups established to act as players in social implementation, feasibility is being examined for the radical treatment of intractable cancers by targeting cancer stem cells within the body using nanomachines, and for portable preventive diagnostics that monitor health conditions at home via micro chips and do not require blood sampling, among other applications (Figure 1-2-2).

In addition, with the installation of Japan’s first gate-model commercial quantum computer (Figure 1-2-3) in the “Shin-Kawasaki Forest of Creation” in the Shin-Kawasaki District in 2021, a joint project involving universities, companies, and other organizations engaged in cutting-edge quantum research was adopted for MEXT’s “Program on Open Innovation Platform for Industry-Academia Co-Creation (COI-NEXT)” in 2022. The gate model is a mainstream type of general-purpose quantum computer that is not designed for specific uses. Under this project, the University of Tokyo and Keio University play a central part in establishing a system that will enable companies and universities seeking to use

quantum computers to work together on joint research activities. The project is aimed at creating a quantum computing ecosystem in Japan by realizing a “Quantum Innovation Park,” an industry-university-government co-creation base that brings together people, knowledge, and information related to quantum technologies to encourage their interaction.

Furthermore, Kawasaki City is also working on the development of next-generation human resources in the field of quantum technologies under industry-university-government

collaboration (including the “Kawasaki Quantum Summer Camp,” a quantum native human resources development program for high school students in the city), with a goal of producing next-generation talents from Kawasaki who will lead the industrialization of the quantum field.

As seen above, Kawasaki City has seen the formation of open innovation bases that accumulate R&D facilities and human resources and go beyond the borders of the industrial, academic, and governmental sectors.

■ Figure 1-2-3/Japan's first “gate-model commercial quantum computing system”



IBM Quantum System One “Kawasaki”

Provided by: IBM Japan Ltd

## Section 2 KOBE Biomedical Innovation Cluster

Kobe City launched the “Kobe Biomedical Innovation Cluster (KBIC)” in 1998 as a recovery project to rebuild the economy of Kobe, which was severely damaged by the Great Hanshin-Awaji Earthquake that occurred on January 17, 1995.

To achieve the goals of securing employment, vitalizing the economy, improving the well-being of citizens through the provision of advanced medical technologies, and making international contributions by raising the medical standards of Asian countries, Kobe City has developed an R&D base for advanced medical technologies on “Port Island,” an artificial island in the city, under

collaboration among the industrial, academic, governmental, and medical sectors, with the aim of building up a cluster of medical-related industries, which are growth industries in the 21st century (Figure 1-2-4).

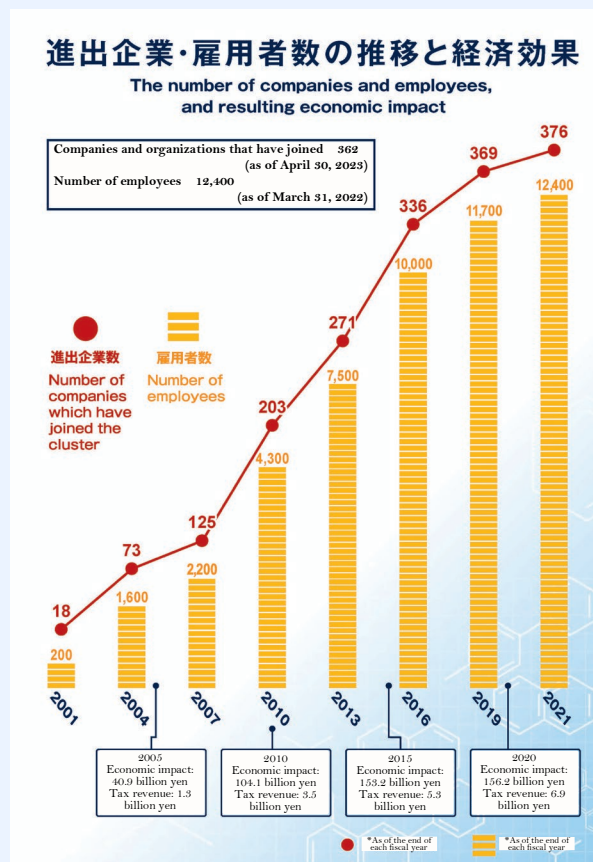
More than 20 years into the launch of the project, the KBIC has grown to become one of Japan’s largest biomedical clusters with a concentration of many research institutions of advanced medicine and a group of highly specialized hospitals, companies, and universities, while hosting 362 such companies and organizations (as of March 2023) and employing 12,400 people (as of March 2022) (Figure 1-2-5).

■ Figure 1-2-4/Bird's - eye photo of the KBIC



Source: KBIC's website

■ Figure 1-2-5/Changes in the number of companies and organizations joining the KBIC as well as the number of their employees



Provided by: Kobe City

Companies and organizations find it easy to enter the KBIC thanks to generous support for life science startups that they can receive in the cluster.

Specifically, the KBIC has held the “Medtech Grand Prix KOBE,” an annual acceleration program to discover and foster startups from around the country, since FY2018, while supporting commercialization through demo days and the matching of startups with business

companies and other companies. The KBIC also offers a variety of support menu items, including the Kobe Life Science Gap Fund, which consists of subsidies to promote the commercialization of startups, and the “Kansai Life Science Accelerator Program,” an accelerator program aimed at helping startups enter the global market.

One of the KBIC’s achievements is the “hinotori™ Surgical Robot System,” a domestic

Figure 1-2-6/Innovative results in the KBIC<sup>1</sup>

**World's first iPS cell transplantation surgery**  
2014: World's first transplantation in Kobe for patients with wet age-related macular degeneration

**World's first dental pulp regenerative treatment**  
Regeneration of nerves damaged by cavities and other causes using cells from non-essential teeth such as wisdom teeth

**Robot-assisted surgery**  
2020: Developed the hinotori™ Surgical Robot System, a robot-assisted surgical system

**Key person**  
President and Representative Director, Vision Care Inc.  
**Dr. Masayo Takahashi**

**Advanced medical technology**  
Air Water Group  
**Aeras Bio Inc.**

**Innovative medical device**  
**Mediaroid Corporation**

Dr. Takahashi led the project as a RIKEN project leader in 2014. She has contributed to numerous clinical research studies in collaboration with Kobe City Eye Hospital and established a startup company to accelerate the practical application of new treatments.

The world's first practical application of a technology that extracts dental pulp from non-essential teeth (wisdom teeth, teeth extracted for orthodontic treatment, etc.), promotes culture growth of dental pulp stem cells, and transplants them into teeth with nerve damage. The company is also conducting a dental pulp stem cell bank project in which dental pulp stem cells are cultured and cryopreserved long-term.

The company was established in 2013 in the KOBE Biomedical Innovation Cluster as a joint venture between industrial robot manufacturer Kawasaki Heavy Industries and medical instruments manufacturer Sysmex Corporation. In 2020, it was approved for the manufacturing and sales of a robot-assisted surgical system. Applicable medical fees have been expanding since then.

Provided by: Kobe City

<sup>1</sup> Barcodes in the figure are available here.  
World's first successful transplant of iPS cells  
<https://www.fbri-kobe.org/kbic/cases/cs009/>



World's first practical application of regenerative medicine using dental pulp  
<https://www.fbri-kobe.org/kbic/cases/cs010/>



Development support for the hinotori™ Surgical Robot System  
<https://www.fbri-kobe.org/kbic/cases/cs001/>



robotic assisted surgery system developed by Mediaroid Corporation. This product received approval for marketing as a robot to assist in endoscopic surgery in the field of urology in August 2020, with the first operation conducted in December of the same year at the Kobe University Hospital International Clinical Cancer Research Center, which cooperated in the development of the product and is located in the KBIC. Since then, the number of use cases has steadily increased, and approval was also granted for indication for gastroenterological surgery and gynecology in October 2022. The Kobe University Graduate School of Medicine's Department of Medical Device Engineering, which was founded in April 2023, is currently playing a central role in advancing open innovation through the R&D of advanced medical devices centered around hinotori™, and the development of human resources specializing both in medicine and engineering, and is aiming to form a medical device development ecosystem in the KBIC. It serves as a representative example of collaboration among the industrial, academic, governmental, and medical sectors. This project also receives support through the Cabinet Office's "Grants for Revitalization of Regional Universities and Industries," for which Kobe City was selected.

In addition, Port Island—where the KBIC is located—is home to "Fugaku," a RIKEN-developed supercomputer that ranks among the most advanced in the world (see Part 2, Chapter 2 [2](#) [5](#)), which enables a wide range of simulation support activities, including research instrumental in combatting COVID-19 and studies that will contribute to the safety and security of the people.

As seen above, the KBIC is vigorously promoting innovation under collaboration among the industrial, academic, governmental, and medical sectors through the offering of a base of

activities by Kobe City, support for startups with grants, and the establishment of a contact point that connects companies, research institutions, universities, and other organizations with medical institutions for consultation. The KBIC's efforts have generated innovative results, as shown by the world's first successful transplant of iPS cells, the world's first practical application of regenerative medicine using dental pulp, and the development of a robotic assisted surgery system.

Originally launched as part of a recovery project, Kobe City's initiatives have steadily grown over a long period of time and now boast the successful formation of a unique innovation base which hosts a concentration of highly talented medical personnel and produces innovative accomplishments as described above ([Figure 1-2-6](#)).

"Open Innovation KAWASAKI" in Section 1 built up a cluster of many R&D organizations through, for example, programs for the development of businesses. Meanwhile, the KBIC in Section 2 used an earthquake disaster as a springboard for innovation. The initiatives that led to the formation of both bases demonstrate how strong region-led industry-university-government collaboration has borne fruit. When it comes to science, technology, and innovation, we can conclude that proceeding with R&D in collaboration with companies, public entities, and other stakeholders under one roof, without keeping such efforts confined to universities or research institutions, is one of several ideal systems to realize open innovation.

There are high expectations that going forward, similar region-led formations of bases for science, technology, and innovation that leverage regional strengths will continue to take place in various parts of Japan.