2023 White Paper on Science, Technology, and Innovation (Outline) (Annual report on promotion of science, technology, and innovation creation in FY2022)

- This white paper reports the measures taken by the Government of Japan to promote science, technology, and innovation creation in accordance with the Basic Act on Science, Technology and Innovation.
- It consists of two parts: **Part 1, which features topics** from the fiscal year, and **Part 2, which is the annual report (as per previous years)**.

- The feature in Part 1 on **"Science, Technology, and Innovation Starting on the Regional Level"** discusses **examples of how regional universities, colleges of technology, local governments, and businesses are leveraging their respective strengths to bring about innovation on the regional level**, **expanding the appeal of their regions in various ways**, such as giving back to regional society and creating employment opportunities.

Composition of Part 1: Science, Technology, and Innovation Starting on the Regional Level

Chapter 1 — Regional Science, Technology, and Innovation Policies

- A brief history of the government's measures to date.
- In recent years, the formation of a variety of hubs has been expanding through policies such as the Vision for a Digital Garden City Nation and Startup City Project, which are aimed at regional revitalization and target collaboration between local governments or among public entities.

Chapter 2 — Regional Large-Scale Science, Technology, and Innovation Bases

- Introduces examples of region-led initiatives that are contributing significantly to regional revitalization by leveraging the unique characteristics of local industries and technology to form hubs that bring together related industrial sectors and talented personnel.

Open Innovation KAWASAKI! (Kanagawa Prefecture)

(1) Clustering of R&D institutions and establishment of R&D centers

More than 550 R&D institutions are concentrated in the city. Promotion of "KING SKYFRONT, Tonomachi International Strategic Zone," "Shin-Kawasaki Forest of Creation" and other hub projects.

(2) Center of Open Innovation Network for Smart Health (COINS)

Aims to realize "in-body hospitals" where all medical functions are contained inside the body. Accelerating open innovation under one roof at the Innovation Center of NanoMedicine (iCONM).

(3) Operation of Japan's first "gate-model commercial quantum computing system"

Aims to form a "Quantum Innovation Park" to create and cluster startup companies that utilize quantum technology.

KOBE Biomedical Innovation Cluster (Hyogo Prefecture)

(1) Establishment of the Biomedical Innovation Cluster

The Kobe Medical Industry Development Project was a reconstruction project launched in 1998 after the Great Hanshin-Awaji Earthquake. Over 20 years have passed since its launch, and there are now 362 companies and organizations operating in Kobe City, employing 12,400 people. The cluster supports startups by providing a well-developed environment for R&D, including shared laboratories.

(2) Promoting Innovation from Kobe City

Developing and promoting the use of the world's first iPS cell transplantation surgery, the world's first dental pulp regenerative treatment, the "hinotori™ Surgical Robot System," a robot-assisted surgical system, and promoting the use of and promoting the use of computing resources of the supercomputer Fugaku, a RIKEN-developed supercomputer that ranks among the most advanced in the world.

(3) Initiative of Tsuruoka Science Park (Yamagata Prefecture)

- Created in 2001 with the establishment of the Institute for Advanced Biosciences (IAB) at Keio University, and developed through a three-way agreement between Yamagata Prefecture, Tsuruoka City, and Keio University. A total of nine ventures were established, including Spiber Inc., a startup from the university.
- The ventures utilize cutting-edge biotechnology to create new technologies and products every day.

(4) Collaboration Between Universities and Regions to Strengthen the Semiconductor Industry (Kumamoto Prefecture and others)

- Kumamoto Prefecture is leveraging the technological strengths of the semiconductor industry to work on the research and development of cutting-edge semiconductor technology (3D stacking technology) and create related industries, while also collaborating with universities and KOSEN to develop human resources.
- Three Next-generation Novel Integrated Circuits Centers (X-NICS) have been newly established at the University of Tokyo, Tohoku University, and Tokyo Institute of Technology. In collaboration with the Toyohashi University of Technology, Hiroshima University, and others, they are taking new approaches to R&D and promoting the development of talented personnel to lead the semiconductor industry.

(5) Formation of a Research Complex in Tohoku University (Miyagi Prefecture)

- Tohoku University is planning to launch a next-generation synchrotron radiation facility (NanoTerasu) in FY2024 and is promoting the concept of a science park that brings industry, academia, government, and financial players together to create societal value with the university. Through these efforts, a research complex is anticipated to be formed that will serve as a place to contribute to improving industry-academia research capabilities and strengthening international competitiveness.

(6) Various Efforts with an Eye on Overseas Expansion

- **The Global Aqua Innovation Center, a joint project by Shinshu University and others,** has developed a water purification system using reverse osmosis membranes that apply nanocarbon technology, Shinshu University's forte, in the COI. In March 2023, a basic agreement on technical cooperation was reached with a Saudi Arabian business corporation. The Center aims to build an innovative "water production and circulation system" that includes the establishment of a reuse processing technology that produces ultrapure water for semiconductor plants and then produces ultrapure water again from the wastewater.
- **TIER IV, INC.,** a startup from Nagoya University, was founded to develop a fully-automated driving system using open-source automated driving software developed by Nagoya University and others. As of February 2023, more than 500 companies in 20 countries have adopted the system. It has participated in the "Aichi Autonomous Driving Promotion Consortium," promoting automated driving field tests with universities, prefectural and municipal governments, and others.

Chapter 3 — Various Science, Technology, and Innovation Efforts That Take Advantage of Regional Characteristics and Strengths of Universities

- Introduces examples of collaboration among universities, local governments, and industrial sectors that are succeeding in developing innovative technologies that utilize regional characteristics and strengths of the universities.

(1) Center of Well-being Regional Society Innovation, etc., by Hirosaki City and Hirosaki University (Aomori Prefecture)

- Aomori Prefecture is working to develop and commercialize detection and preventive methods for dementia and lifestyle diseases by utilizing big data from around 20,000 healthy individuals accumulated through large-scale, long-term health surveys in order to improve the nation's worst life expectancy.
- Going forward, Hirosaki City's and Hirosaki University's COI-NEXT Center will play a central role in aiming to realize a model regional society for well-being, which includes economic development through the creation of a healthcare industry, a sense of fulfillment, and a high quality of life.
- Aomori Prefecture is also promoting the creation of new industries in the beauty sector, such as cosmetics that utilize "Aomori PG" (proteoglycan, a functional material produced through a new extraction method developed at Hirosaki University), which has high water retention properties.

(2) Iwamizawa City/Hokkaido University Industry-Academia Regional Co-Creation Project (Hokkaido)
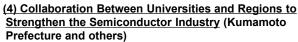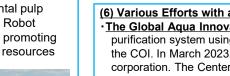
- The COI and COI-NEXT analyzed factors and countermeasures for low birthweight infants based on big data such as Maternal and Child Health Surveys. This has contributed to the reduction of low birthweight infants by realizing Japan's first at-home/remote checkups of expectant mothers and a meal delivery service optimized for each individual.
- The project aims to create a smart agri-city by conducting experiments in which robot tractors are operated using high-speed communications technology and high-precision positioning technology.

Chapter 4 — Science, Technology, and Innovation by Colleges of Technology Based in Regions Across Japan

- Introduces examples of contributions to regional innovation by colleges of technology, including solutions to regional challenges and the encouragement of startup creation.

Innovations from Colleges of Technology (KOSEN)

(1) Colleges of Technology (KOSEN)

- There are 58 colleges of technology nationwide, enrolling approx. 60,000 students. The colleges contribute to regional revitalization and local innovation through industry-university-government joint research. Two colleges of technology have been opened in Thailand that have fully introduced the Japanese-style KOSEN system. The National Institute of Technology supports the educational advancement of similar institutions in Vietnam and Mongolia.

(2) Collaborative Initiatives with Local Communities Supported by the Inter-College Network

- The KOSEN-1 satellite and "Gear 5.0 / COMPASS 5.0" human resource development projects are examples of collaborative efforts among colleges of technology.
- Colleges of technology in the Kyushu region are accelerating the development of human resources in semiconductor-related fields in collaboration with local governments, semiconductor-related companies, and universities.

(3) Innovations from Colleges of Technology

- Tokyo KOSEN has developed a system that automatically translates image data into Braille.
- Kagawa KOSEN has developed a system that monitors the health condition of patients in elderly care facilities and other institutions using images of the room and vital data from a respiration sensor along with respiration and heart rate.
- IntegrAI, a startup from Nagaoka KOSEN, has developed the "IntegrAI Camera," which uses AI to digitize various forms of analog metering devices.
- KiQ Robotics, a startup from Kitakyushu KOSEN, has reproduced the structure of flexible fingertips using resin.

Vaccine freezer management system using IntegrAI