



Overview of the 14 Projects of Cross-ministerial **S**trategic **I**nnovation Promotion **P**rogram (SIP)

Secretariat of Science, Technology and Innovation Policy
Cabinet Office



Building a Resilient and Nourishing Food Supply Chain Management for a Sustainable Future

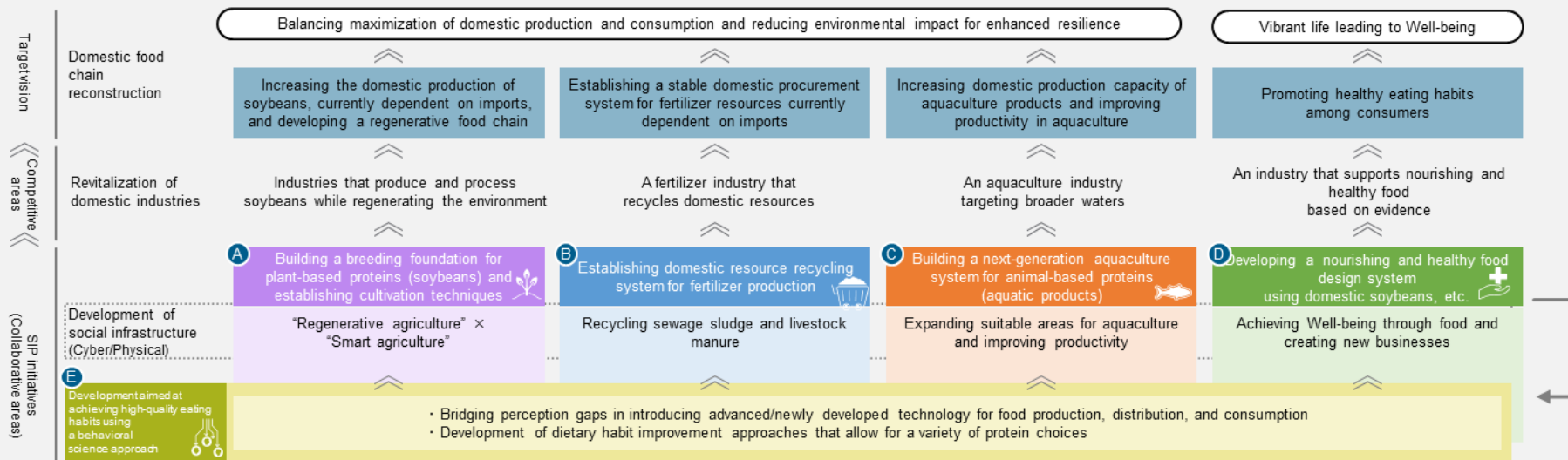
■ Future Vision in Society 5.0

A society that is sustainable and resilient against threats and unpredictable and uncertain situations, that ensures the safety and security of the people, and that individual to realize diverse well-being

■ Overview of Issues

Revitalizing domestic industries and reconstructing a food chain in Japan through a highly integrated system of cyberspace and physical space

● Overview of the Initiatives for This Issue



● Mission

To compensate for the vulnerability of the global food chain, our food chain which depends on overseas should be reconstructed domestically.

● Strategy for Social Implementation

The research and development should be carried out steadily by each sub-project. For utilizing the outcomes by stakeholders and disseminating them our society deeply, information dissemination and environmental improvements would be established.

Additionally, to create new businesses utilizing the outcomes, involve startup companies and promote the development of human resources responsible for social implementation.

A Building a Breeding Foundation for Plant-Based Proteins (Soybeans) and Establishing Cultivation Techniques

- Development of an integrated analysis-based breeding platform for creating high-yield, high-quality varieties
- Development of genome editing and other technologies for the advancement of bred varieties
- Establishing cultivation technology systems to unlock variety potential and environmentally regenerative agriculture systems

B Establishing a Domestic Resource Recycling System for Fertilizer Production

- Development and demonstration of a high-performance composting device using AI
- Recovery and demonstration of fertilizer components using Prussian blue-type metal complexes
- Development and demonstration of regional resource recycle-based agriculture

C Building a Next-Generation Aquaculture System for Animal-Based Proteins (Aquatic Products)

- Development of a real-time fish management system for improving productivity
- Advancement of large-scale aquaculture technologies for expanding aquaculture
- Establishing a breeding improvement platform for creating fish strains dependent on less fishmeal

D Developing a Nourishing and Healthy Food Design System Using Domestic Soybeans, etc.

- Data collection and database construction for analyzing optimal combinations of ingredients according to individual health conditions, preferences, and habits
- Development of a nourishing and healthy food design system

E Development aimed at Achieving High-Quality Eating Habits Using a Behavioral Science Approach

- Creation of a nudge-type communication method through interdisciplinary research for realizing a resilient and nourishing food chain
- Development and demonstration of a perception gap resolution system using business SNS
- Development of a nudge support system for smart food choices: Towards sustainable food behavior design

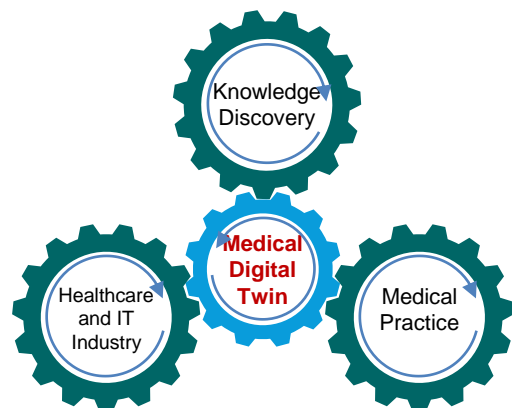
Integrated Healthcare System

■ Future Vision in Society 5.0

Structuring medical knowledge with real-world data simplifies discoveries and enhances healthcare practices.

■ Summary

Develop a 'Medical Digital Twin' standardizes clinical data and projects it into the digital space.



● Mission

Visualizing and managing complex medical and health systems using new insights in medical care, healthcare, research and development, and medical policy.

● Strategy for Social Implementation

This project aims to leverage medical digital twins to autonomously promote the cycle of "knowledge discovery" and "medical practice" in healthcare, thereby improving the quality of medical care, extending healthy life expectancy, promoting the healthcare industry, and contributing to a sustainable healthcare system. To achieve this, we will undertake the following:

- Commercialize solutions for medical and healthcare challenges using medical digital twins and develop the necessary technologies.
- Collaborate with potential leaders, including private companies.
- Resolve common issues in business development, establish common infrastructure, and remove entry barriers.
- Promote the standardization of medical information systems, advance systems and social acceptance, address legal issues related to medical data utilization, and cultivate talent.

The Ideal Future Vision

Integrating Medical Research (Discovery) and Practice (Delivery)

- Discovering Knowledge Using Real-World Clinical Data
- Improving Healthcare Quality through Data-Driven Feedback and Adjustments



Medical Knowledge Discovery Digital Twin

- Building real-world data for industry and academia use
- Adding value by discovering and applying medical knowledge for new drug and treatment development



Medical Practice and Patient Support Digital Twin

- Developing solutions to support medical practices and patient lives using advanced medical knowledge
- Enhancing healthcare efficiency by reducing the burden on professionals through diagnostic support and promoting patient self-management



Community Healthcare Digital Twin

- Building a platform to analyze regional data in healthcare, elderly care, and disaster management
- Optimizing healthcare policies, including rapid medical resource allocation

● Development of R&D Support and Knowledge Discovery Solutions

Building a medical data platform to advance research, develop new treatments, drugs, and devices, and improve medical care quality.

● Development of Patient and Healthcare Institution Support Solutions

Enhancing healthcare quality, fostering new healthcare service providers, and creating economic value through solutions that support medical settings and patient lives.

● Development of Solutions to Support Local Government and Healthcare Policy

Optimizing the allocation of medical and financial resources by building a medical data platform to assist local government decision-making.

● Development of Advanced Medical Information System for Digital Twins

Developing infrastructure and technology to integrate medical data from electronic medical records and departmental systems across various vendors.

● Development of Large-Scale Medical Data Analysis Infrastructure Technology

Developing foundational technologies for efficient management, high-speed processing, and advanced analysis of large-scale diverse data, along with natural language processing (NLP) technologies for medical documents.

● Development of Generative AI in Integrated Healthcare Systems

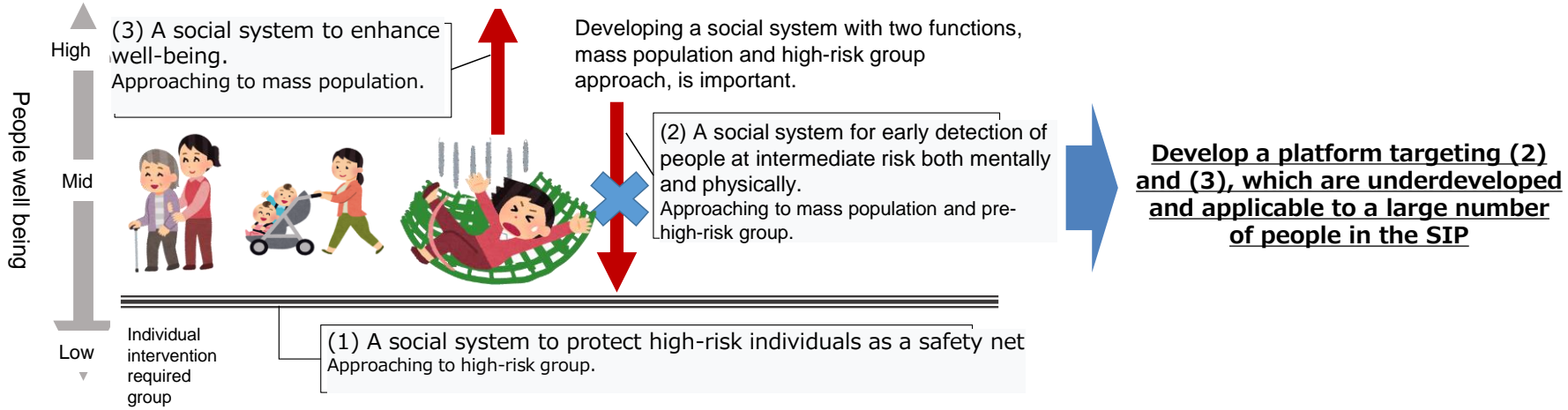
Developing medical LLM/LMM platforms and applications and building a medical data platform to support continuous LLM/LMM development for standardized and integrated medical information.

Innovation of Inclusive community platform

Future Vision in Society 5.0
 Communities are being formed across the country where diverse people can be socially, physically, and spiritually enriched, maximizing well-being throughout society.

Summary
 We aim to create and offer a platform for a group of businesses and services. Such a platform can be selected and adopted by residents, local governments, businesses, etc., to form an inclusive community.

Target concept of Inclusive community platform



Mission
 Our mission is to develop and socially implement a platform that deploys social technologies, based on science and technology. This helps to enhance tolerance and autonomy, thereby realizing inclusive communities.

Strategies for Social Implementation
 By the end of the second year of the R&D period, the first demonstration will have been conducted as thoroughly as possible while developing the main scientific and social technologies, exploring various business models, studying measures to improve social acceptability, and developing human resources, etc. The second demonstration will be conducted in the third year and beyond, and corresponding improvements will be made. For each subproject, Level 5 (which indicates that the demonstration has already started) is assumed in the third year in terms of technological development, business, social acceptability, and human resources. For the system, the project aims to achieve at least GRL 4, "conceptualization of the system," in the third year, in cooperation with the relevant ministries and agencies.

- Measures to improve social tolerance**
 Develop community-building methods that enhance tolerance among residents, including those who have difficulties living in the community and their families, to maximize the diverse happiness of each individual.
- Measures to improve individual autonomy**
 Leverage AI technology to analyze life course data across all generations to visualize individual health risks, improve health literacy, and encourage autonomous health behaviors at each life stage.
- Measures to improve the well-being of child-rearing generations and women**
 Foster positive momentum for child-rearing in society as a whole, promote tolerant values regarding body image, and support values that facilitate women's lifelong promotion of good health and well-being.
- Measures to improve the quality of life for people with disabilities and older adults**
 Develop innovations in home care that maintain and promote a sense of purpose in life, provide mobility within the community, and promote ongoing and autonomous economic activity aligned with cognitive function.

Building a platform for learning and working styles in the post-pandemic era

Future Vision of Society 5.0

- ✓ A human-centered society where everyone's diverse well-being is realized. As people unlock their unique abilities and create new value, society progresses, contributing to personal happiness.
- ✓ A society where everyone can develop their skills through diverse 'learning styles' at any time and place and apply various 'working styles' to make the most of those skills. In this society, people can actively contribute and participate throughout their lives.
- ✓ **A future society that embraces the opportunities of a declining population: A thriving society where individual brilliance resonates and continues to evolve.** The social structure established during the period of high economic growth and population increase is no longer suitable for today's Japan, where the economy has matured and the population has begun to decline. As we move into the post-pandemic era, a new system is required to function effectively even amidst population decline. By understanding the current state of Japanese society and leveraging the sense of crisis surrounding the 'collapse of society due to population decline,' we aim to swiftly transform a society that has grown stagnant and stalled.

Mission

- ✓ Design the 'new learning' essential for individuals to thrive in Society 5.0 and create a *ba* (platform) to cultivate people who can think independently about their own way of life, respect the diverse values of others, collaborate with those around them, and maximize their potential within society throughout their lives.
 - ✓ Create an environment where everyone can choose their learning and working styles, free from traditional schedules or physical locations.
- ⇒ Achieve a socially flat society by 2030, where everyone in Society 5.0 can realize diverse forms of well-being.

Outline of Research and Development

◆ Sub-Project A

We will develop educational content that enhances the abilities to explore, take initiative, be creative, and collaborate—skills essential for people living in the new era. We will design evaluation methods that align with this 'new learning.' We will also consider ELSI (ethical, legal, and social implications) in the collection of learning data and design an iterative cycle that encompasses educational goal setting, teaching, learning, data collection, evaluation, and continuous improvement.

◆ Sub-Project B

We will create an environment where individuals can envision their future from a range of possibilities, build systems that promote independent learning to help them achieve their goals, and ensure they can apply their abilities across diverse working styles. Additionally, we will focus on building a social infrastructure that enables everyone to choose their preferred ways of learning and working by promoting the values of D&I (diversity and inclusion).

◆ Sub-Project C

We will demonstrate applications using existing foundational technologies, fine-tuning them to ensure they meet the needs of users and society. By adjusting design specifications for their implementation, operation, and evaluation, we will create virtual spaces in schools and workplaces that enable interaction, collaboration, management, and evaluation that are as effective as or even more effective than real-world environments. Additionally, we will propose design specifications for the technology, as well as methods for implementation, operation, and evaluation, to support its validation and broader adoption.

◆ Sub-Project D

We will construct a *ba* (platform) to confirm the effectiveness of each demonstration of 'new learning x working styles x virtual spaces' and present it as a showcase, highlighting the future vision of this project. In addition to supporting the development of the R&D themes of Sub-Project D, this *ba* (platform) will also act as a testing ground to evaluate the results of Sub-Projects A through C. Through this approach, we aim to transform people, reshape how they learn and work, promote changes in education and industry, and ultimately drive the transformation of Japan's regional communities.

Research & Development Overview



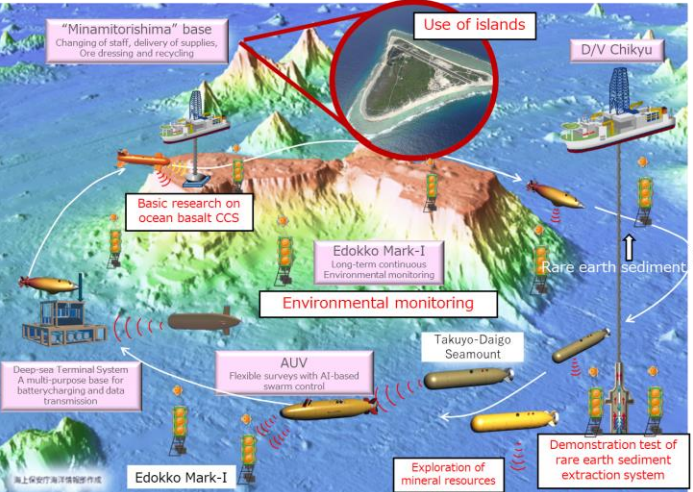
National Platform for Innovative ocean development

■ Future Vision in Society 5.0

The development of new technologies, including a wide-area monitoring system for the marine environment, will promote the utilization of marine mineral resources within Japan's EEZ, and the advancement of large-scale CO2 storage technology will help achieve the goal of carbon neutrality by 2050, along with the development of a new resource supply network that does not depend on specific countries.

■ Summary

The project aims to establish a rare earth mining and production system, as well as to advance marine environmental monitoring technology. In addition, basic research on ocean basalt CCS, which is attracting international attention, will be conducted for large-scale CO2 storage technology, and a conceptual design of a storage system will be developed.



Rare Earths Production Technology

- Conduct high-precision resource surveys to contribute to the establishment of mining areas in accordance with the Mining Law.
- Development and demonstration of deep-water mining technology
- Development and demonstration of production system up to smelting and refining

Establishment of marine environment assessment system

- Implement the best environmental impact monitoring system in society using ISO.
- Aiming to introduce marine environmental monitoring to marine protected areas and to create a database of marine environmental acquisition data.

Marine Robotics Survey Technology

- Long-term ocean monitoring technology, acquisition of ocean environmental data
- Cooperative swarm control technology for AUVs
- Long-term operation of AUVs and acoustic communication technology with ASVs, deep-sea terminals, and Edokko Mark-I

Basic Research on Ocean Basalt CCS

- Basic research on large-scale CO2 storage and fixation technology in oceanic basalt
- Simulation and concept development of ocean basalt CCS, including offshore CO2 transportation

● Mission

Promote research and technology development that contributes to comprehensive national ocean security through the mining of marine rare earth resources, construction of a wide-area monitoring system for marine resources and the environment, and basic research on marine basalt CCS.

● Strategies for Social Implementation

- [Technology Development]** Development of rare earth mining and smelting technologies and marine environmental impact assessment systems, wide-area monitoring systems, etc.; basic research and study of seamounts capable of large-scale CO2 storage and FS for transportation and offshore injection
- [Business]** Rare earth production system efficiency improvement, marine environmental management, low-cost AUVs to the private sector, conceptual design of marine basalt CCS and international joint research
- [System]** Data acquisition, analysis, DB development, etc. that contribute to marine protected areas and the marine environment
- [Social acceptability]** Regular dissemination of information through the media, international conferences, seminars, etc.
- [Human Resources]** International human resource development through training, etc. (development of researchers and engineers)

● Subproject ① : Development of Production Technology for Rea Earth Element (REE)

Regarding the rare earths in the EEZ around Minamitorishima, we will conduct a survey that will contribute to the establishment of a mining area, conduct mining and mud pumping tests from 6,000m, complete the smelting and refining process, and establish a production system for rare earths.

● Subproject ② : System Development of Marine Environment Impact Assessment

Demonstrate marine environment monitoring technology in the field of marine mineral resource development, communicate its effectiveness as a marine environment management system, and promote its widespread use.

● Subproject ③ : Development of marine robotics survey technologies

AUVs, deep-sea terminals, etc., will be upgraded to high functionality, and a wide-area monitoring system will be developed for use in offshore mineral resource development and monitoring systems for offshore CO2 sequestration.

● Subproject ④ : Basic research on large-scale CO2 storage and fixation technology in oceanic basalts

A basic research on large-scale CO2 storage and fixation technology in basaltic rocks of the Takuyo-Daigo Seamount will be conducted in collaboration with the Ministry of Economy, Trade and Industry (METI).

Smart Energy Management Systems

Our Vision for Society 5.0

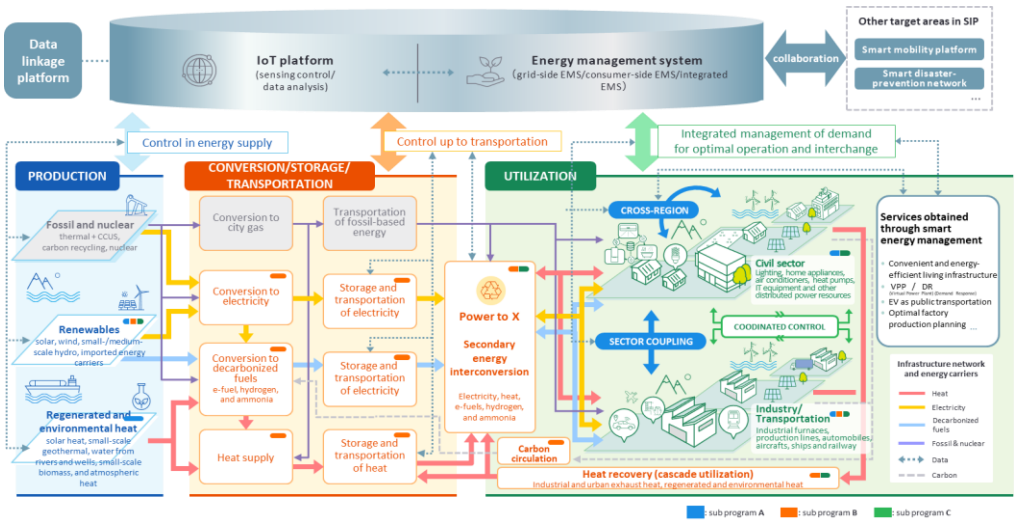
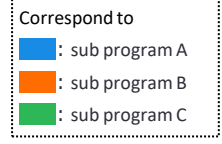
Achieve carbon neutrality, ensure energy security, and create a society where the advanced energy management systems (EMS) are implemented by the digital and green transformation (DX/GX)

Program Overview

Build cross-regional and cross-sectional EMS as the next-generation infrastructure including renewables as its main energy resources such as thermal energy, hydrogen and synthetic fuels based on pilots

Concept Image

- Smart EMS can integrate zero-emission energy resources throughout the energy value chain by synergistic cyber and physical technologies.
- Realizing smart EMS can contribute to decarbonization as well as more convenient and efficient energy use in all consumption sectors through optimization of cross-regional and cross-sectoral energy utilization.



A – Sector coupling between energy and mobility

Build and implement the energy management platform that integrates high-resolution data collection and analysis as well as energy control from production to utilization

B – Efficient energy production, conversion, storage, and transportation

Develop Power to X (P2X) technologies to manage energy carriers such as hydrogen, ammonia and e-fuels so that they complement electrification using renewables

C – Optimized energy utilization

Develop technologies that contribute to the optimal use of renewables-based resources by practicing efficient supply-demand control for residential, commercial, industrial and transportation use

Mission

- Realize decentralized smart EMS as infrastructure across regions and sectors
- Create the basis of smart energy market through public-private partnerships

Strategies for implementation in society

- Technology:** Construct a data integration infrastructure with real-time and cross-regional/sectoral energy management capabilities
- Regulation and rules:** Identify issues and explore measures through active cross-ministerial collaboration
- Business maturity:** Consider business models (efficiency and profitability) with the aim of creating and renewing energy management markets
- Social acceptability and human resources:** Develop human resources playing the key roles in construction and operation of smart EMS; Cooperate with local stakeholders and WISE Program in universities

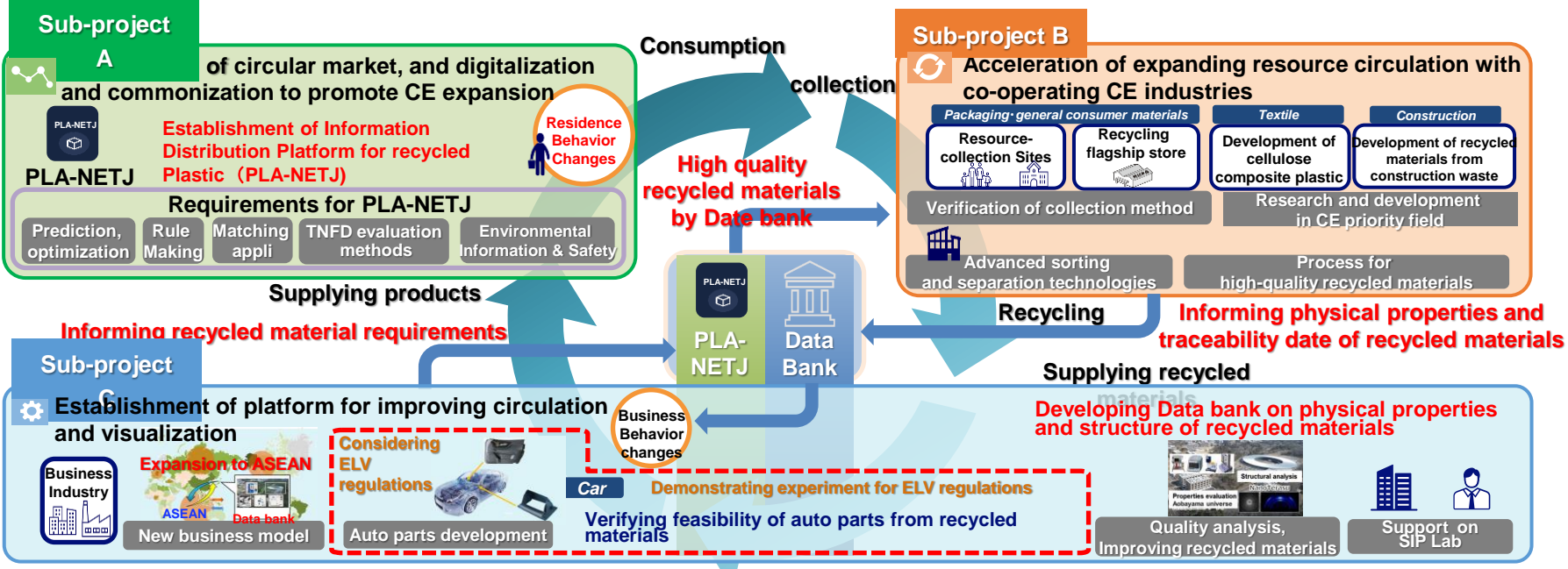
Development of Circular Economy System

Future Vision in Society 5.0

The society of the circular economy (CE) is fully accepted, and the CE value chain and business model on economic rationality are established.

Project outline

Establish plastic CE value chain of industries by collaboration among material, manufacture assembly, sort and recycle in considering environmental circulation.



Mission

Digitally cooperating with material, manufacture, distribution, assembly, sorting and recycling players, and designing for recycling consideration novelly develop an upgradeable plastics CE value chain.

Strategy for Social Implementation

Earlier achievement to each Readiness Level (xRL) to encourage to move on to other programs, etc.

Technology (TRL): Development of digital infrastructure (PLA-NETJ) to support visualization in circular market expansion with cooperated technology and circular-conscious design to promote recyclers to manufactures linkage

Business (BRL): Realization of stable supply for improving recycled raw materials with quality and safety

Governance (GRL): Strong promotion of data & circulation, evaluation of visualization and identification of issues through social experiments to rule and standardize (cooperation with PLA-NETJ)

Social (SRL): Research and verification of the effects and consumer behavior changes under cooperation on linkage with recyclers and manufactures with PLA-NETJ

Human Resource(HRL): Seminars and workshops to foster researchers for CE

Sub-project A : Visualization of circular market, and digitalization and comunization to promote CE expansion

Promote the usage of recycled materials through development of PLA-NETJ that enables visualization of information on the recycling market, and development of rules regarding information

Sub-project B : Acceleration of expanding resource circulation with co-operating CE industries

Develop advanced sorting and supply systems for used plastic in cooperation with local governments to ensure a stable supply of high-grade recycled materials at low cost

Sub-project C : Establishment of advanced platform for accelerating circulation and visualization

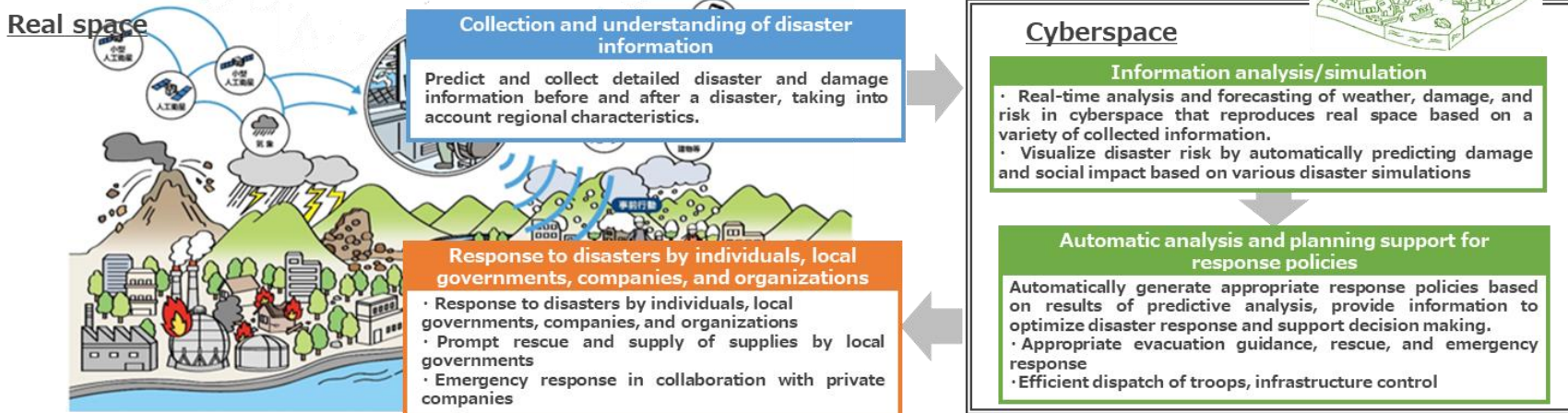
Develop Databank to collect and accumulate data on the physical properties and structures of recycled materials to upgrade, and verify feasibility of prototyping automobile parts manufactured from recycled materials

Development of a Resilient Smart Network System against Natural Disasters

Future Vision in Society 5.0
 In response to massive earthquakes and frequent and severe windstorms and floods, this project aims to strengthen disaster response capabilities of companies and municipalities, to realize disaster prevention actions that protect lives of individual citizens, and to realize prompt and accurate disaster response by related organizations, thereby reducing damage to society as a whole and achieving early recovery.

Outline
 Achieve the "further advance the sophistication of information collection and understanding that supports disaster response," and "strengthening the capabilities of individuals, local governments, and companies respond to disasters based on information analysis results" by highly merging real space and cyberspace.

Conceptual Image



● Mission
 With the increasing frequency and severity of wind and flood damage due to climate change, and the imminent occurrence of a national disaster-level earthquake such as a Nankai Trough and an earthquake directly under the Tokyo metropolitan area, this project aims to strengthen and improve the disaster response capabilities of the national government, local governments, companies, and individuals.

● Strategies for Practical Implementation

- Taking into account the importance of response to unprecedented disasters and the sustainability of society, a comprehensive perspective is important, including not only prevention, observation, and forecasting, but also response.
- Promote the use of digital technology in disaster response in collaboration with related efforts such as satellite technology, IoT networks, sensor device development and dissemination, and data platforms, all of which are important for the promotion of advanced research and development.
- Promote the generation of risk information, information-based risk communication, and actions to make disaster preparedness a personal matter, in order to prevent the spread of damage due to the underestimation of the dangers and threats looming as a result of disaster.

● R&D Themes

(A) Wide-area and rapid detecting and sharing of disaster information
 Ensure prompt and accurate initial response, even at night or in bad weather

(B) Promoting disaster prevention actions using risk information
 Visualize risks for decision-making and actions to make disaster preparedness a personal matter

(C) Cross-organizational information sharing and utilization in disaster response
 Digital transformation of disaster response through the automatic collection and analysis of disaster site information

(D) Damage reduction by maximizing the storage function within the basin
 Maximize flood control effects through the coordination and utilization of existing infrastructure

(E) Development of a Disaster Prevention Digital Twin
 Improve response to increasingly complex and diverse disasters

Smart Infrastructure Management System

■ Enabling Society 5.0

This project aims to realize Society 5.0 by materializing the "smart city" with "smart infrastructure."

● Mission

As society faces a growing number of aged infrastructure and buildings, we utilize digital data for an integrated management system that covers design, construction, inspection, and repair to promote sustainable and attractive national land, cities, and regions.

● Strategies for Social Implementation

[Technological Development] Structuring a digital twin is a core of the project that enables an innovative construction production process, an advanced maintenance cycle, a sustainable, nature-friendly society, and resilient infrastructures that bring comfort to life.

[Business] Considering support measures for early adopters and start-ups of new technologies.

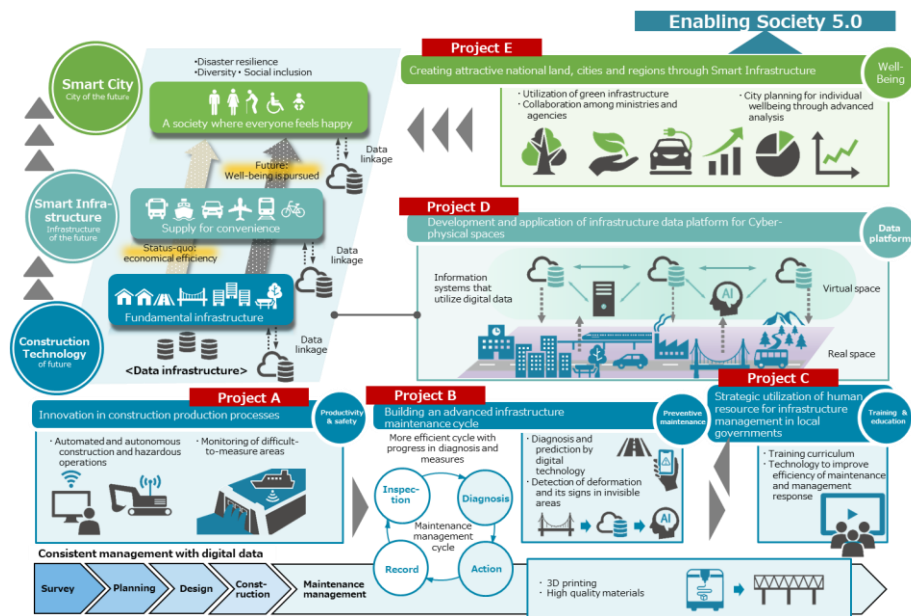
[Sytem] Establishing and reviewing technical standards, guidelines, etc., related to new technologies while developing a recurrent and reskilling education system.

[Social Acceptability] Outreach to the public and users about the usefulness of new technologies.

[Human Resources] We provide advanced technological education to secure human resources in collaboration with universities, technical colleges, and other educational institutions.

■ Summary

We engage in research and technological development that contribute to materializing our targets of "future cities," "future infrastructure," and "future construction technology" to contribute to the goal of Society 5.0.



Infrastructure Management System Enabled with Subprojects

● Subproject A : Innovation in Construction Production Processes

· To rapidly improve productivity and safety at construction sites, we develop technologies for automated and autonomous construction processes with the collaboration of the public and private sectors.

● Subproject B : Building an Advanced Infrastructure Maintenance Cycle

· We accelerate the development of infrastructure maintenance through a "high-cycle process" enabled by the data platform and digital twin, resulting in innovative maintenance management.

● Subproject C : Strategic Utilization of Human Resources for Infrastructure Management in Local Governments

· To mitigate the shortage of skilled personnel and improve their skills, we develop a nationwide platform to accept new ones with various skills and recurrent or reskilling education.

● Subproject D : Development and Application of Infrastructure Data Platform for Cyber-Physical Spaces

· We conduct research and development for data linkage among data platforms, simulation models, data conversion, and integration processes together with its automation to link multiple digital twins.

● Subproject E : Creating Attractive National Land, Cities, and Regions through Smart Infrastructure

· Research and development on green infrastructure and evidence-based policy making (EBPM) in regions are underway. They enable infrastructure to support national, urban, and regional socio-economic activities and achieve individual wellbeing and resilience against disaster.

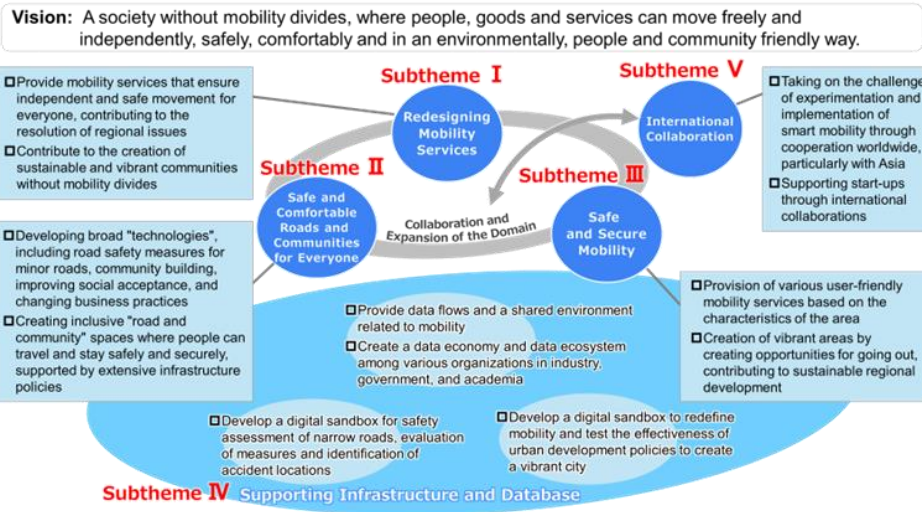
Development of Smart Mobility Platform

Future Vision in Society 5.0
 We aim to realize Smart Mobility 2.0 based on the vision of “a society without mobility divides, where people, goods and services can move freely and independently, safely, comfortably, and in an environmentally, people and community friendly way.”

Summary
 We conceptualize technology as more than “pure technology,” taking a broad definition that encompasses technologies for social systemization, such as support for the assurance of social acceptability, reform of business practices and the legal system, assurance of business profitability, community building, and human resource development.
 In concrete terms, we will redefine “mobility service” and engage in strategic planning for social implementation while also conducting research and development for the redesign of infrastructure to provide safe, comfortable, and dynamic transportation infrastructure technology and data infrastructure to support mobility services. Additionally, to support the implementation of smart mobility services, we will comprehensively promote the utilization of a digital sandbox, community building, and support for human resources development.

- Mission**
 From the perspective of people, goods, and services on the move, we will develop a platform that enables safe, fair, and environmentally friendly mobility that is made seamless by dynamically integrating towns and regions with hard and soft infrastructure to allow the use of new mobilities along with the conventional public transport modes, private vehicles, cargo vehicles, and other extensive regional mobility resources.
- Strategies for Social Implementation**
- Technology development: Development of basic transportation infrastructure technologies for safe, comfortable, flourishing, and vibrant community roads; creation of data infrastructure to support mobility services; and conceptualization of new mobility services utilizing self-driving technology
 - Environmental improvement: Redefinition of mobility service and formulation of strategies for social implementation and promotion of the redesign of infrastructure with reconstruction integrated with urban planning of the road network
 - Business development: Creation of infrastructure for the sharing of mobility data among start-ups and other businesses and conducting studies for convenient, comfortable, and sustainable mobility services for people and goods
 - Social acceptability: Building a framework for social acceptability of regional mobility redesign and engaging in redesign; promotion of community building for the implementation of services involving local mobility resources, and the dissemination of examples of effective utilization
 - Human resource development: Promotion of human resource development through idea contests for discovering start-up companies and a training programs for fostering human resources capable of drawing up regional transport designs

Vision and Issue Structure of the SIP's Smart Mobility Platform



- [Subtheme I] Reshaping Mobility Services**
 For the redesign of mobility services, we will analyze case studies, based upon which we will reorganize and restructure policy implementation framework and planning/evaluation processes, and aim to achieve social implementation and human resource development through adaptive demonstrations and evaluation in various situations.
- [Subtheme II] Safe and Comfortable Roads and Communities for Everyone**
 We aim to contribute to the enhancement of inclusive public spaces and town planning with a focus on bustling community roads and commercial areas by creating and utilizing detailed data platforms based on which actual conditions can be understood and policy recommendations can be made; developing specific methods of evaluating and describing the use of various mobility solutions, roads, frailty prevention methods, and economic support measures for improvement; and formulating and institutionalizing guidebooks.
- [Subtheme III] Safe and Secure Mobility**
 Rather than limiting our approach to the conventional efforts to ensure the safety of vehicles, we aim to develop systems and technologies that also facilitate safe movement of pedestrians, bicyclists, and other diverse mobilities.
- [Subtheme IV] Supporting Infrastructure and Database**
 To support the provision of user-friendly mobility services, we will build a new data platform (JMDS), a digital sandbox that can be used to conduct simulations to support planning and evaluation of mobilities using this data, and SSM (Shared Service For Mobility), which supports the creation and operation of mobility services.
- [Subtheme V] International Collaboration**
 We aim to support the realization of global services beyond Japan by communicating about our efforts at an international level, promoting international research collaboration, and supporting the expansion of Japanese start-ups’ services overseas, such as to ASEAN countries.

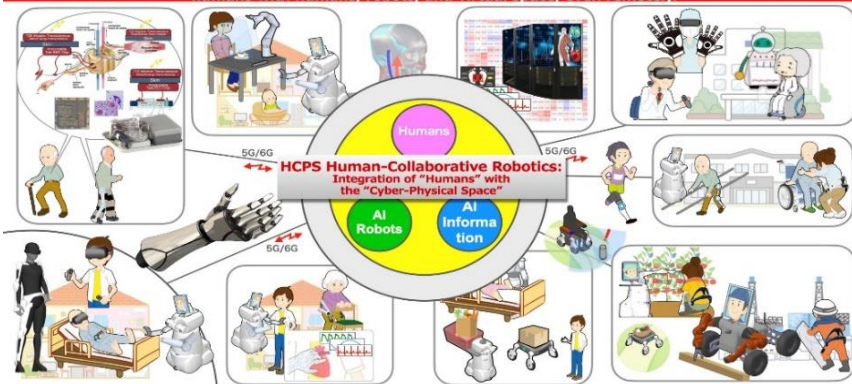
Expansion of fundamental technologies and development of rules promoting social implementation to expand HCPS Human-Collaborative Robotics

■ Future Vision in Society 5.0

HCPS: Human-Cyber-Physical Space

A society where humans and technology coexist and cooperate, mutually supporting each other through the fusion of "Human" and "Cyber-Physical Space" (HCPS*) (techno peer support society).

Solve various social challenges we face in a super-aging society by combining "humans" with the "cyber-physical space." More specifically, through "HCPS, Human-Cyber-Physical Space," which can handle humans, AI robots, and fusion space relating to information systems (Cybernic space), enabling the integration of humans with humans, robots, and virtual space, even remotely.



Future Vision (Expected Outcome)

Significance to government and society (example) :

Increase the degree of independence and freedom of people of all generations in a super-aging society and solve various problems in daily life (including the workplace)

→ **Social transformation through HCPS human-collaborative robotics!**

(1) Improvement of QoL/ADL, well-being of the elderly and disabled, (2) Extension of disposable time, (3) Countermeasures for decreasing working population, (4) Evacuation during disasters, etc.

● Mission

This program will focus on developing foundational and social implementation technologies for HCPS human-collaborative robotics, establishing social rules to promote their introduction, and collaborating with relevant organizations. By FY2027, the program aims to initiate social implementation and real-world operations at more than 10 domestic and international sites, each tailored to specific use cases. As an effort including diverse fields of comprehensive life innovation, the program will address all challenges in an integrated and interlinked manner, leading the creation and development of a "human-collaborative robotics industry" through a virtuous innovation spiral.

● Strategies for Social Implementation

The following strategies will be used to promote social implementation while interlinking all five perspectives:

- 1) Technology Development: Development of foundational and social implementation technologies for "HCPS Human-Collaborative Robotics" that can lead the world in demonstrating our strengths.
- 2) Business Development: Proposing and analyzing business models with sustainable and growth-oriented economic cycles.
- 3) Governance: Establishing social rules and frameworks to promote social implementation.
- 4) Social acceptability: Gaining understanding and cooperation through explanations of convenience and safety and utilizing evaluation fields.
- 5) Human Resources: Establishing human resource development institutions, educational certification systems, and engaging in association activities.

■ Summary

Promote social implementation by coordinating together the development of fundamental technologies for HCPS human-collaborative robotics, the development of social implementation technologies, and the development of rules to promote dissemination.

Objective :

In response to the changes in lifestyle and work that are increasingly forced by challenges such as a super-aging society, child rearing, and labor shortages, aim to create a safe and secure society where people across generations can enhance their independence and freedom, while resolving various issues related to daily life, including those in the workplaces, as well as mental and physical well-being.

Example of Expected Outcome :



Technological Objectives to Achieve :

(The following technologies are divided and organized into fundamental technologies (Sub-Project 1) and social implementation technologies (Sub-Project 2), and will be implemented through eight individual R&D themes.)

1. Highly-functionalised autonomous mobile robot technologies for human and object transport, enabled by automatic map generation and environmental recognition
2. Hand-arm robot technologies designed for use in environments including homes
3. Human information acquisition technologies
4. Living space information acquisition technologies
5. Robot technologies to improve physical and mental independence
6. Cybernic master-remote technologies (including the construction of Cybernic space)
7. Data cooperation and cloud technologies

● Sub-project 1 : Development of fundamental technologies for HCPS Human-Collaborative Robotics centered on the fusion and integration of humans, AI robots and information systems

The development of technologies in Japan, specifically the fusion of humans, AI robots, and information systems, is at a world-leading level. Therefore, this sub-project (1) will focus on the research and development of essential component technologies, base technologies for systemization, and fundamental technologies for human and environmental recognition, mobility system, smartphone applications and data integration. We will promote the development of these foundational technologies while coordinating closely with sub-project (2) to ensure a unified approach.

● Sub-project 2 : Development of social implementation technologies for HCPS Human-Collaborative Robotics centered on the fusion and integration of humans, AI robots and information systems

Sub-project (2) will focus on developing social implementation technologies to address the social challenges faced by people across generations in a super-aging society. This includes developing technologies for creating business models in houses, buildings and any human living spaces, and for the smooth introduction, utilization, and maintenance services in living spaces (including workplaces). In close coordination with Sub-project (1), social implementation will be promoted. Furthermore, the preparing social rules of implementation will facilitate introduction of the achievements of human-collaborative robotics into society.

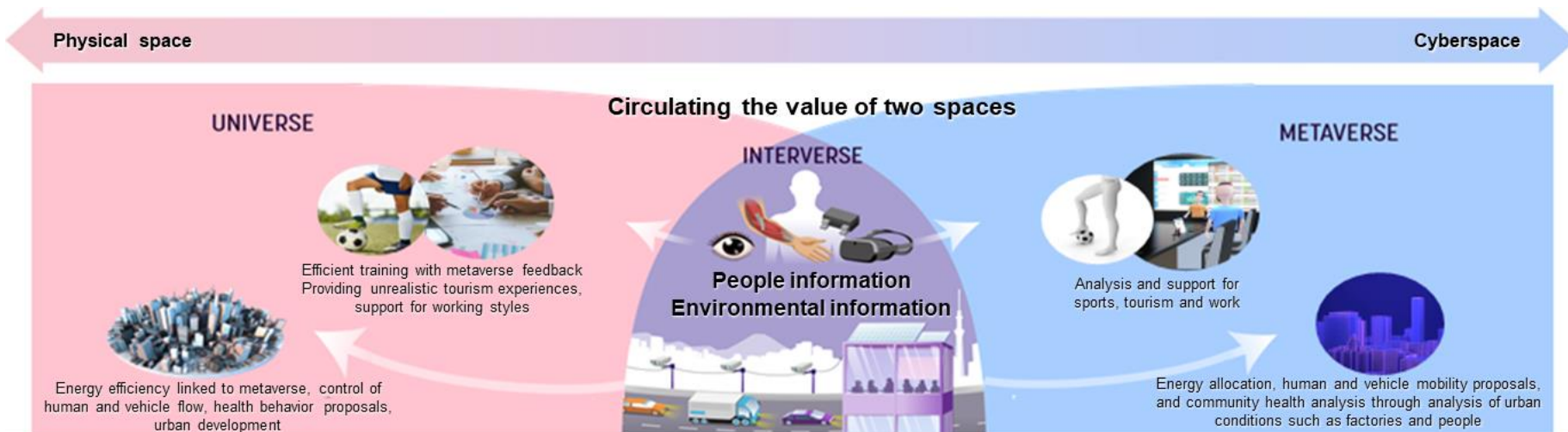
Development of foundational technologies and rules for expansion of the virtual economy

■ Future Vision in Society 5.0

Development of a highly integrated system of cyberspace and physical space could contribute to solve social issues in healthcare, infrastructure, and disaster. Moreover, new services with the cyber-physical system could contribute to expanding virtual economy.

■ Overview

Leveraging Japanese industries' strength such as automobiles, home appliances, and sensor devices as well as promoting interverse development and rule formation, we will take a different touch point from other countries that are ahead of us in the virtual economy sphere.



● Mission

Realize affluent lifestyles through the circulation of the value from cyberspace to physical space and create a 1.6 trillion yen virtual economic sphere in Japan.

● Strategies for Social Implementation

[Technology development] Research and development of interverse technologies for value circulation to physical space, and development of devices and other cross-sectional technologies to realize smart cities utilizing interverse

[Business] Designing market mechanisms to develop the virtual economy and design and implementation of interverse services for individual use cases such as healthcare and urban development.

[Governance] Formation of international standards and rules for interconnectivity, biosafety of interverse, and evaluation criteria for interverse services from the perspective of SDGs and ELSI.

[Social acceptability] Fostering mutual understanding of stakeholders through pioneering implementation cases of interverse services

[Human resources] Developing and securing human resources that contribute to the expansion of the virtual economic sphere

● Subproject A : Physical interverse technology

Regarding interverse technology, which is underdeveloped worldwide and has a chance to secure international competitiveness in R&D, develop technologies for mutual sharing and extension of tactile and body-specific senses other than audiovisual, and conduct activities for international standardization of evaluation scales for interverse services from the perspective of SDGs and ELSI, etc., which will contribute to dissemination of development results

● Subproject B : Smart City utilizing interverse

Aiming at regional revitalization and the creation of new services and businesses through the elimination of spatial constraints on work styles and the development of a city based on people's actions and feelings through an interverse approach

● Subproject C : Interverse service infrastructure

Developing a platform that enables the mutual exchange of experiences and values between cyberspace and physical space

● Subproject D : Human resource development to support the virtual economy

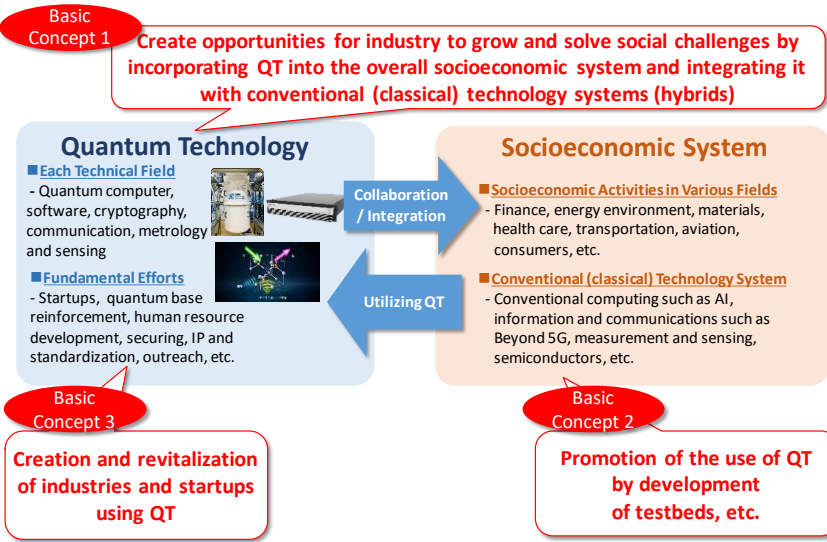
Study and implementation of the overall concept and training standards for human resource development to support the virtual economy, with a focus on service design and management personnel

Promoting Application of Advanced Quantum Technologies to Social Challenges

Future Vision in Society 5.0

The goal is to realize a future society in which the economy, environment, and society are in harmony, and to accelerate the progress of Society 5.0, through the utilization of quantum technology through social implementation by cutting-edge engineers and by broadening the range of users of quantum technology.

Basic Policy for R&D and Social Implementation

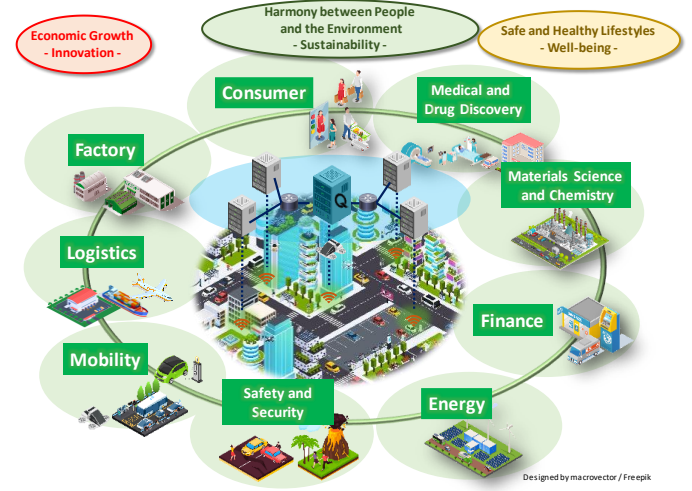


Summary

To attract long-term investment and human resources for quantum technology, which is still in the basic research stage, creating "concrete examples of solutions to real social and industrial issues" through the development of user environments and the development and demonstration of use cases.

Impact of Social Implementation

Many socioeconomic systems related to Society 5.0 have the potential to break through current constraints using of quantum technology.



Mission

Creating "concrete examples of solutions to real social and industrial issues" through social implementation of quantum technology and attracting human resources and investments. The following goals have already been set as targets for 2030 in the "Vision of Quantum Future Society" and we aim to achieve them as our mission in this project. "10 million quantum technology users in Japan", "Through quantum technology, production to 50 trillion JPY", "Fostering quantum unicorn companies to create future markets".

Strategies for Social Implementation

In parallel with research and development of quantum technology, building testbeds and developing use cases. In addition, standardizing methods and standards for performance evaluation of the developed products, and creating a forum to share these, which will lead to new entrants in the industry. Establishing a virtuous cycle of "social implementation ⇔ securing human resources and investments" by promoting and visualizing social implementation and securing human resources and investment with a dual focus.

Quantum Computing

To develop and demonstrate use cases, developing a quantum/classical hybrid testbed, and developing benchmarks for objective evaluation and comparison of performance, etc.

Quantum Security and Network

Constructing and operating an advanced information processing infrastructure using quantum secure cloud, secure computation, etc., and promoting the creation of new use cases and social implementation by users in various fields.

Quantum Sensing

Establishing environments for the use, testing, and evaluation of quantum sensing, etc., and developing and demonstrating use cases that create new value, such as the creation of new industries and improved productivity.

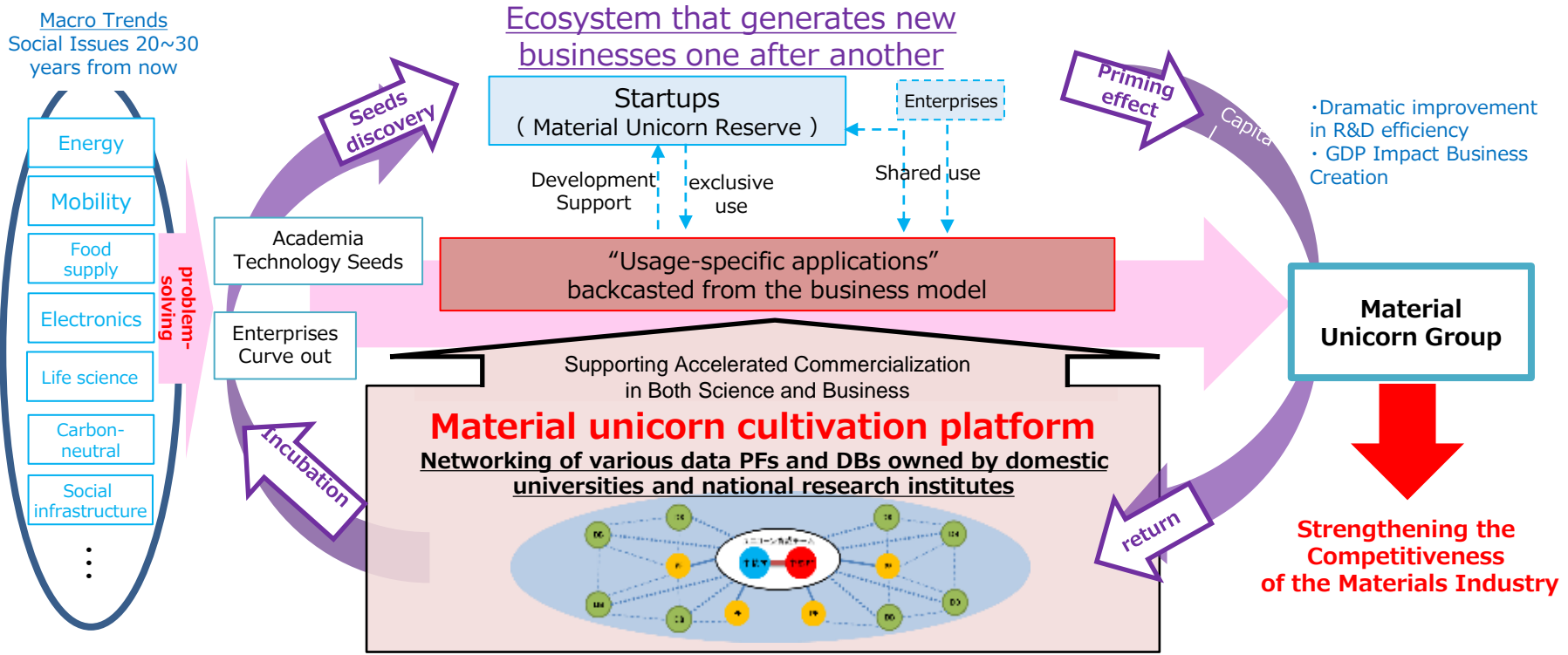
Innovation Creation Platform

To accelerate the creation of innovation through quantum technology, creating and supporting new industries and startups, developing human resources, discovering ideas, and building ecosystems.

Creating a Materials Innovation Ecosystem for Industrialization

Future Vision in Society 5.0
 While Japan has several highly competitive data and evaluation/analysis platforms, networking is an issue... A highly integrated cyber and physical platform that links these platforms will contribute to strengthening the competitiveness of the materials industry.

Summary
 Formation of an ecosystem centered on a platform to realize Society 5.0, which will generate a series of new businesses (from start-ups to unicorns) in the materials field that will lead to solutions to macro trends and social issues 20 to 30 years from now.



● Mission
 Through the creation of unicorns, we will link cyber and physical platforms to create a "material unicorn cultivation platform" that integrates data-driven development and software infrastructure to form an ecosystem where new businesses can be created one after another.

● Strategies for Social Implementation
 Acceleration of wide-area collaboration of each PF, systematization of common rules, establishment of profit model, improvement of social recognition, and development of human resources for PF operation/entrepreneurship

● Development of soft infrastructure for ecosystem formation
 Study of common rules for operation, human resource development for commercialization, and information dissemination

● Establishment of data infrastructure linkage technology
 Development of data linkage technology, human resource development for data linkage, networking of data infrastructure

● Creation of material unicorn reserve
 Support for development of unicorn reserve and application-specific applications