

Japan's new Science, Technology, and Innovation Basic Plan

9 March 2021

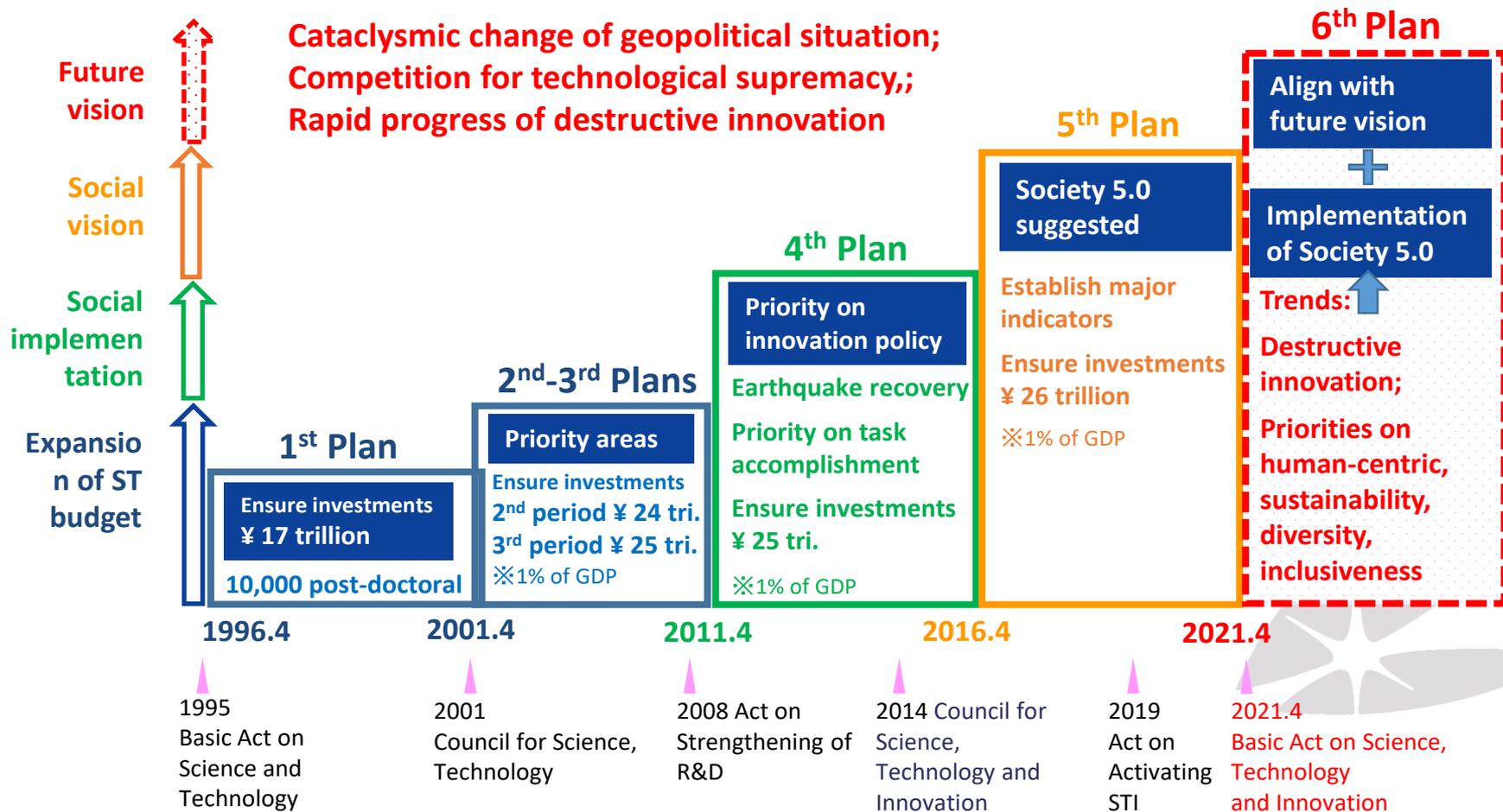
SATO Fumikazu

Councillor for Innovation Promotion, Cabinet Secretariat
Deputy Director General for Science, Technology and Innovation, Cabinet Office
Government of Japan



Transition of Japan's Science, Technology and Innovation Policy

- Formulation of the Science and Technology Basic Plan every 5 years based on the Basic Act on Science and Technology (Advisory to the Prime Minister)
- **Expansion of S&T budget** prioritized in the 1st-3rd Plans; **Social implementation** prioritized in the 4th Plan; **Society 5.0** proposed in the current 5th Plan
- 6th plan will be the 1st **Science, Technology and Innovation Basic Plan** based on the revised of the Basic Act on Science, Technology and Innovation



What is "Society 5.0" ?

"Society 5.0" is a new society coming up after Information Society:

- Produced by **sophisticated integration of cyberspace and physical space**;
- **Reconciles economic growth and resolution of social issues**;
- Realizes **a human-centered and inclusive society**.

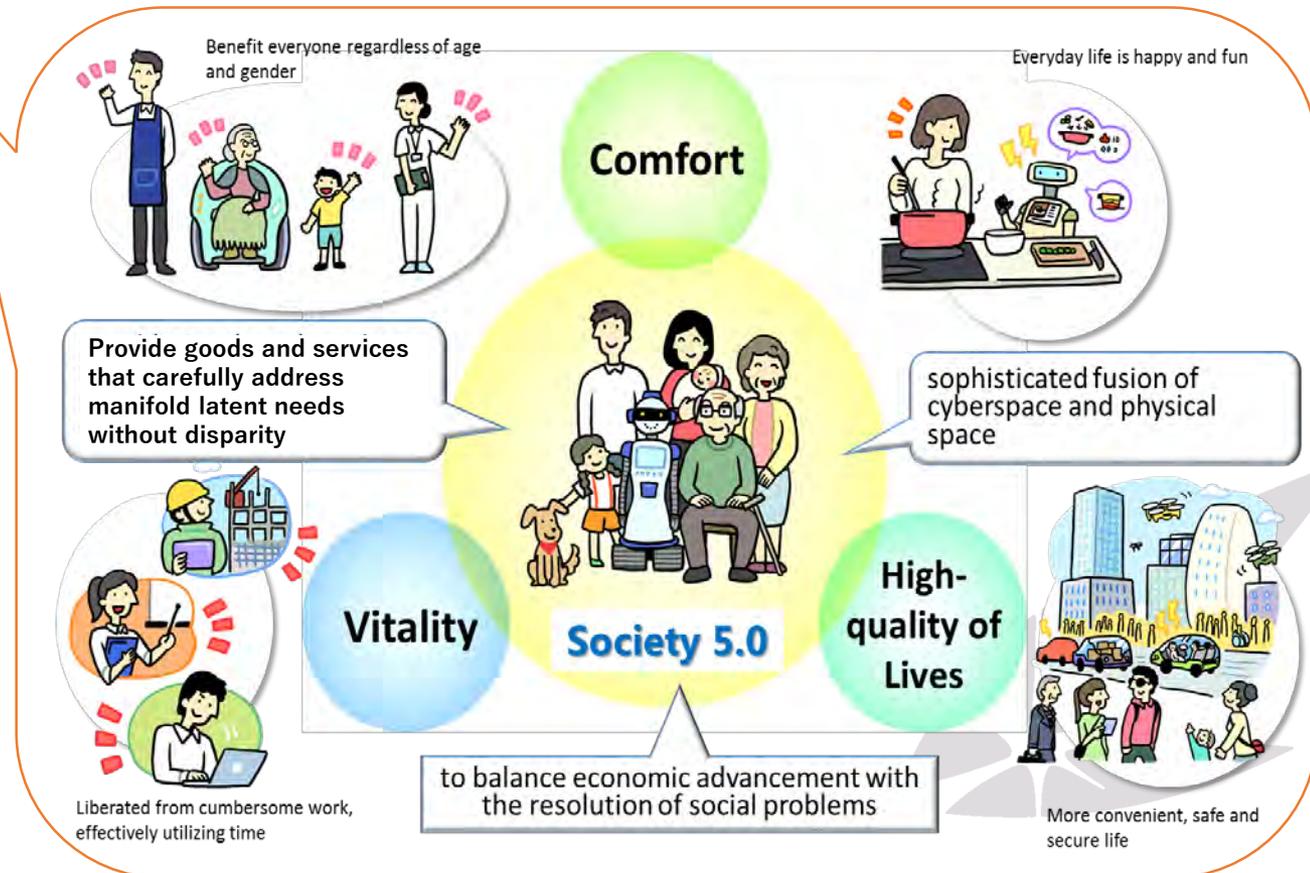
Society 5.0

4. Information Society

3. Industrial Society

2. Agrarian Society

1. Hunter Society



Building "Society 5.0" towards a Sustainable Society even under pandemic of COVID-19 and extreme natural disasters



Online medical care / Tracing /
Robot-supported caregiving



Extending healthy life expectancy/
Reducing the social cost



Energy diversification/
Local production



Stable supply of energy/
GHG emission reduction

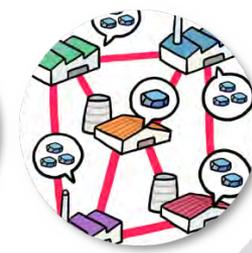
Society 5.0



Remote work / Remote construction/
Remote education



Increasing productivity and resilience



Automatic production and delivery /
Optimal value chain



Promotion of sustainable industrialization/
Eliminate labor shortage

Outline of the 6th Science, Technology, and Innovation Basic Plan (draft)

Recognition of the Current Situation

Changes in the Situation at Home and Abroad

- ✓ The battle for supremacy between countries centered on advanced technologies (AI, quantum, etc.) has become sharper
- ✓ Manifestation of threats such as disasters that are more serious due to climate change
- ✓ Information monopoly by IT platformers and uneven distribution of great wealth

Accelerate

Expansion of the Novel Coronavirus Infection

- ✓ Rapid social changes in order to prevent the spread of the infection and to maintain economic activities
- ✓ Disruption of the supply chain pressing each country to review the sustainability and resilience of its economy
- ✓ Transition to a new lifestyle such as working from home and online education

Review of STI policies

- ✓ Continuous decline in research capacity
- ✓ Revision of the Basic Act on Science and Technology
 - Addition of "promotion of the humanities and social sciences"
 - Addition of "creation of innovation"

Balancing **response to global issues** with the **reform of social structures in Japan** is essential

Society That Japan Aims for (Society 5.0)

Ensuring **the safety and security of the people** by being sustainable and resilient

[Securing Sustainability]

[Securing Resilience]

Each Individual Can Realize Diverse Happiness (Well-Being)

[Realization of Economic Affluence and Qualitative Affluence]

Incorporate **traditional Japanese values** into this vision for society and transmit it to the world as **Society 5.0**

(Such as "Trust" and "Sharing")

Realize the society for the first time in the world, contribute to the international community, and attract global human resources and investment



Outline of the 6th Science, Technology, and Innovation Basic Plan (draft)

- Realization of Society 5.0 requires (1) **social structural reform**, (2) **fundamental strengthening research capacity**, and (3) **development of human resources to support a new society**.
- Draw up policies based on **convergence of knowledge** (the integrating of natural science, social science and humanities) and **evidence**, and flexibly improve them through evaluation.
- Aim for a total government R & D investment of approximately **30 trillion yen** and a total public and private R & D investment of approximately **120 trillion yen** for 5 years.

STI Policy for the Realization of Society 5.0

- (1) Transformation into a **sustainable and resilient society** through the fusion of cyber space and physical space (social structural reform premised on digital utilization).
 - Promotion of digitalization of government through launching the Digital Agency, and implementation of the Public-Private Data Strategy
 - Transition to a circular economy, such as realization of carbon neutral (Green Fund, etc.)
 - Building of a resilient, safe and secure society⇒ Support for startups, development of smart cities, social implementation by the next SIP and Moonshot Research, and promotion of international expansion
- (2) **Creation of "knowledge"** as a source of value creation by designing a new society (strengthening research capacity)
- (3) **Development of human** resources to support a new society (strengthening of "ability to explore" and "attitude to continue learning")



Japan's concrete actions to realize "Society 5.0"

➤ ① Data

- ✓ Cross-Sectional Data Federation System
- ✓ Research Data Infrastructure System (NII Research Data Cloud)

※NII=National Institute of Informatics

➤ ② AI

- ✓ Social Principles of Human-Centric AI
- ✓ AI Strategy

➤ ③ Quantum

- ✓ Quantum Technology Innovation hubs

➤ ④ Smart City - *a showcase of "Society 5.0"*

➤ ⑤ Research and Development for realizing "Society 5.0"

- ✓ Cross-Ministerial Strategic Innovation Promotion Program (SIP)
- ✓ Moonshot Research and Development Program



① “Data” - fuel to the engine for growth

Japan’s Actions for building data infrastructure

➤ **Cross-Sectional Data Federation System**

- is to provide functions in conformity with FAIR data principles (Findable, Accessible, Interoperable and Reusable).
- will be established by 2023 collaborated with Data Society Alliance(DSA).

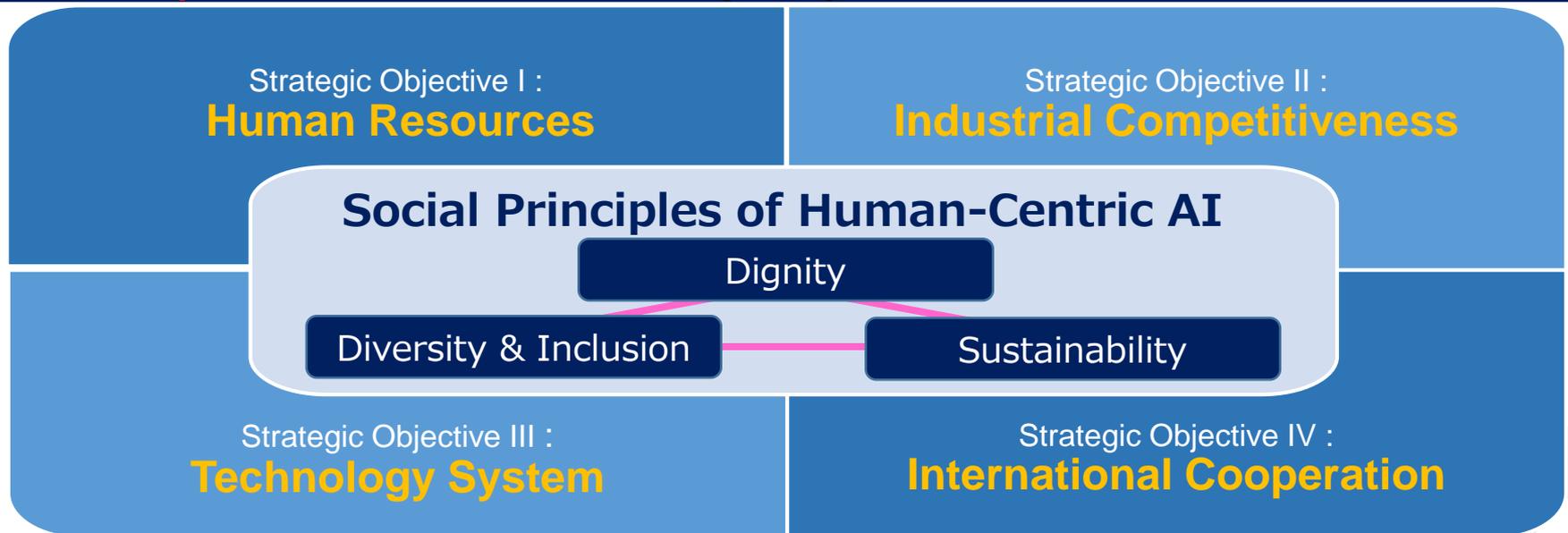
➤ **Research Data Infrastructure System (NII Research Data Cloud)**

- is a system where research data, metadata and other related files can be stored, shared, disclosed and discovered.
- allows advanced research data management since February in 2021.



② AI Strategy 2019 [formulated in June 2019]

- Japan first formulated the “**Social Principles of Human-Centric AI**” which upholds 3 basic philosophies; "Dignity," "Diversity and Inclusion" and "Sustainability" in March 2019.
- Based on the philosophies, Japan sets **4 Strategic Objectives** (Human resources, Deployment to real-world, Technologies for inclusion, International cooperation) towards Society 5.0.
- Identify initiatives for “**Building a foundation for the future**” “**Infrastructure for industry and society**” “**ELSI**” to achieve the Strategic Objectives.



Identify Initiatives

Building a foundation for the future

Education Reform

Research and Development

Infrastructure for industry and society

Social Implementation

Data Related Infrastructure

Digital Government

ELSI (Ethical, Legal and Social Issues)

Ethics

② AI strategy 2019 Follow-up [compiled in June 2020]

- ✓ **As the first year of the implementation of the AI Strategy 2019, which was formulated in June last year, the government ministries and agencies are diligently implementing related initiatives.**
- ✓ **More than 80% of the initiatives have progressed as planned.**
- ✓ **In the face of the spread of the COVID-19, it is essential to further develop the digital society.**
→ **It is necessary to strengthen and enhance R&D and social implementation of AI, and development of the information and communication environment to support them.**

Progress in FY 2019 (Major initiatives with progress)

- Accelerated implementation of GIGA school plan ahead of schedule, and examination of mathematics, data science and AI education program certification system (literacy level)
- “AI Japan R&D Network” established, with 104 organizations participating as of the end of March
- Medical imaging support, smart agriculture, infrastructure data platform construction
- Smart city common architecture construction
- Formulation of the G20 AI Principles and AI Guidelines

Recovery from delays, response to new issues and the COVID-19, etc.

[Reference] Progress of initiatives in FY2019

	Number of measures	As planned	Incomplete / Partially incomplete	Complete Rate
Education reform	31	27	4	87%
Research and development	16	11	5	69%
Social implementation	26	24	2	92%
Data related infrastructure	9	8	1	89%
Digital government and support SMEs	3	3	0	100%
Ethics and others	4	4	0	100%
Total	89	77	12	87%

Main initiatives implemented in FY 2020

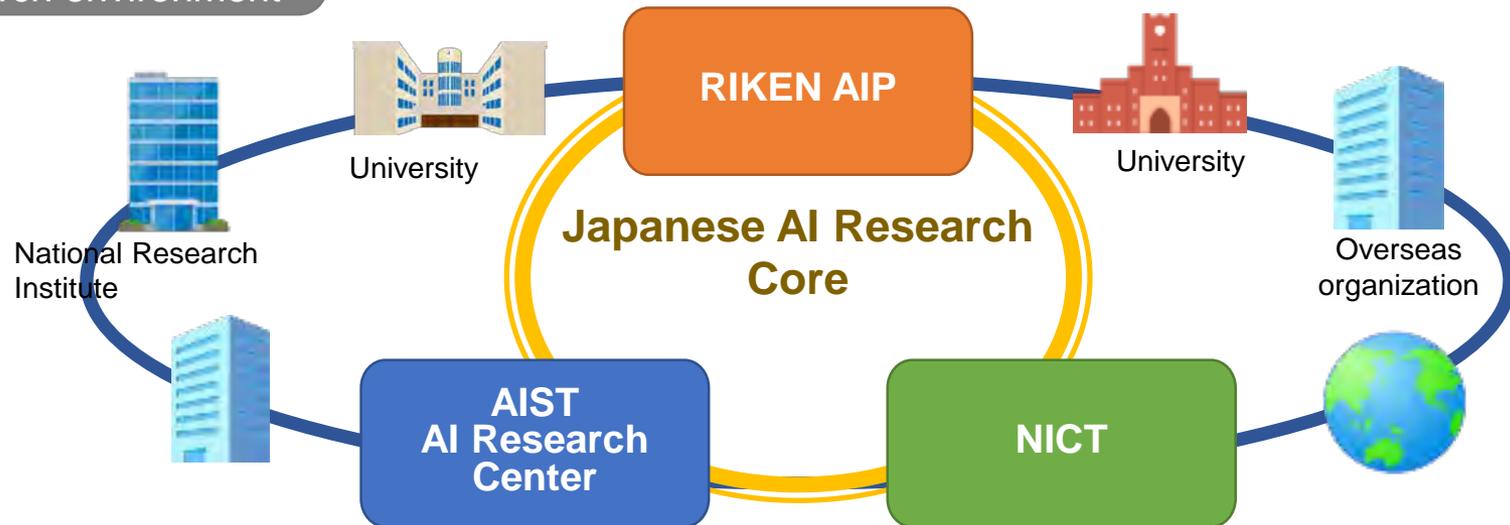
- Acceleration of GIGA school plan, examination of the certification system (applied level), expansion of recurrent education for adults
- Research and development to ensure the reliability of AI and to integrate humanities and social sciences with mathematics and information sciences
- Development of AI technology that supports the transmission and efficient use of tacit knowledge (experience and intuition) at manufacturing sites and improves productivity
- Upgrading network infrastructure and enhancing computing resources for AI applications such as 5G and optical fiber
- Standardization of AI services in local governments and implementation of AI and RPA*1 in local government administration
- Strengthening international cooperation in GPAI*2, etc. to promote responsible AI and innovation, etc.

* 1 RPA : Robotic Process Automation * 2 GPAI : Global Partnership on AI

② AI R&D Environment

- Making Japan an attractive base for researchers from around the world.
- Strategic promotion of next-generation AI technologies and enabling environment for innovative emerging research.

Research environment



AI Japan R&D Network (<https://www.ai-japan.go.jp/en>)

Launch of core R&D

Basic theory

High-quality and trustworthy AI

Computing devices

System components for AI

③ Quantum Technology and Innovation Strategy

- **Quantum technology is an important fundamental technology** in terms of industry and security as well as brings drastic changes to economy and society.
- **To achieve “quantum technology and innovation”** as soon as possible, Japan promotes R&D, industrialization and commercialization of key technologies with taking own advantage

I Priority areas

Accelerate an achievement of innovation



- ✓ **Set “Key Technology Areas” & “Integrated Quantum Innovation Areas” for priority support and investments**
- ✓ **Create “Technology Roadmap” & “Integrated Area Roadmap”**

II Quantum hubs

Make a face-to-face communication



- ✓ **Establish international “Quantum technology Innovation Hubs”**
(e.g. Quantum software hub, Quantum inertial sensor hub)
- ✓ **Hub conducts basic research, demonstration and HR development**

III International collaboration

Collaboration with US & EU for industry and security



- ✓ **Early development of multilateral/bilateral cooperative frameworks**
(e.g. Japan-US-EU multilateral symposium in Dec. 2019)
- ✓ **Ensure and strengthen security trade control**

Five pillars towards an achievement of quantum technology and innovation

(1) Technology development

(2) International collaboration

(3) Industrialization and innovation

(4) Intellectual property and international standardization

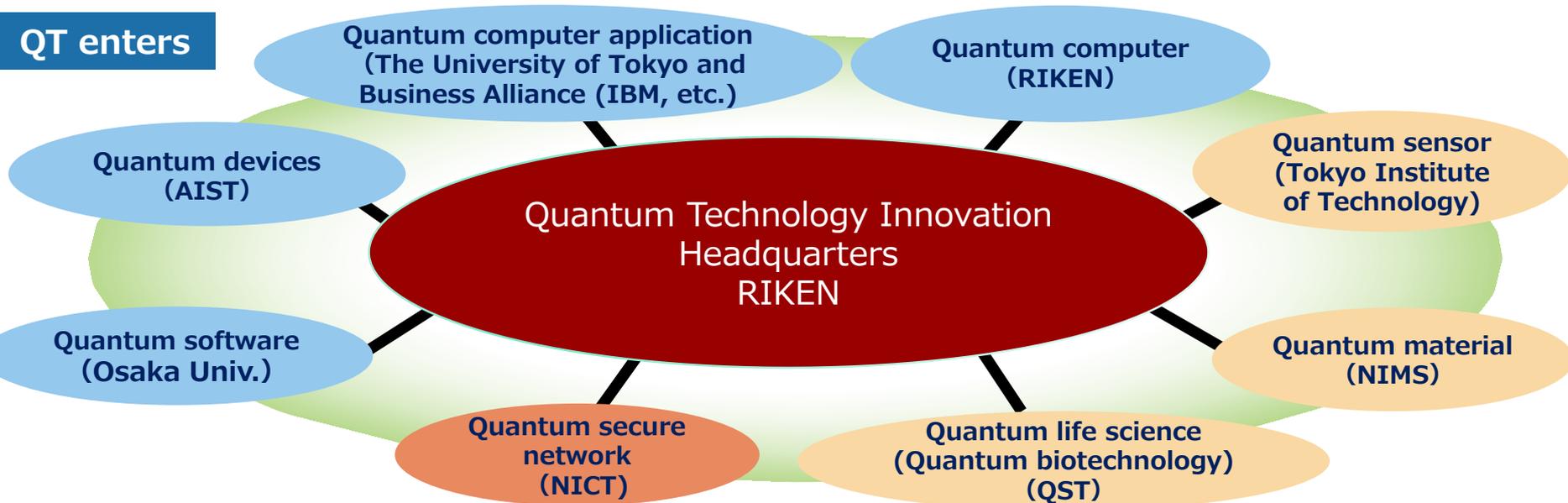
(5) Human resource development

Concept of Quantum Technology Innovation hubs

Aims

- Japan's Quantum Technology Innovation Strategy makes clear that **the Quantum Technology Innovation hubs** will be operated as **hubs for integrated initiatives by industry, academia, and government, ranging from fundamental research to technology demonstration, intellectual property management, and human resources development.**
- These hubs will be sequentially established from FY2020, with necessary funding earmarked in the FY2020 supplementary budget (draft) and the FY2021 main budget (draft).
- In addition to R&D conducted in the various fields at the 8 domestic hubs, a Headquarters will be established to strengthen cross-sectoral initiatives at the hubs. (An opening ceremony and a symposium to launch the QT Innovation hubs are scheduled to be held in February 2021.)

QT enters



Each hub (domain) will be established in an integrated way under the Headquarters.

Examples of activities

- ① **Promoting international collaboration**, such as the holding of international workshops and international joint research.
- ② Sharing strategies among hubs regarding the **management of intellectual property and international standardization.**
- ③ **Promotion of industry-academia-government collaboration** such as joint research through the acceptance of private-sector engineers.
- ④ Participation of young researchers and **strengthening of inter-disciplinary and inter-organizational HRD.**
- ⑤ **Support for R&D** through mutual utilization of research facilities, external sharing of facilities.

④ Smart City - Implementation of “Society 5.0”

1. Smart City is

- An initiative to solve urban & regional problems and create new value by utilizing advanced technology
- A comprehensive showcase of **Society 5.0**

2. Current situation

- Each ministry implements model projects (such as Autodriving, MaaS, Health & Medical Care, Disaster prevention), and provides support for the development of smart city block led by private developers.

3. Measures

- Designing and building **common architecture*** of smart city projects of ministries, and rolling out through **the Public-Private Collaboration Platform****.
 - * The city data and city OS need to be widely opened to local residents and new businesses, on the premise of securing security and proper handling of personal information.
 - ** The national platform with around 200 projects, 400 companies & research Institute, 133 local gov.
- Through the activities of **the Global Smart City Alliance***, promoting mutual learning between smart cities around the world, sharing best practices, and forming a common awareness that contributes to operations.
 - * endorsed by Business 20, Urban 20, Ministerial Meeting on Digital Economy, and G20 Osaka Summit

④ Japan Association for Smart Cities in ASEAN (JASCA)

Outline / Purpose

- **Project Incubator** to enhance development of Smart Cities in ASEAN
- **Single Contact Point** to build public-private relationships among ASEAN countries and Japan
- **Total Solution Coordinator** for cross-cutting and comprehensive solutions in accordance with challenges, needs, and targets which ASEAN cities have with collaboration with Japanese public sectors

Organization / Members (as of Dec, 2020)



- Information exchange
- Promotion
- Business Support
- Meetings
- Matching



JASCA

Ministries (7)



Cities (8)



Public Sectors (16)



Private Companies (208)

Manufacturers, System Integrators, Developers, Civil Contractors, Service Providers, Consultants, Banks etc.

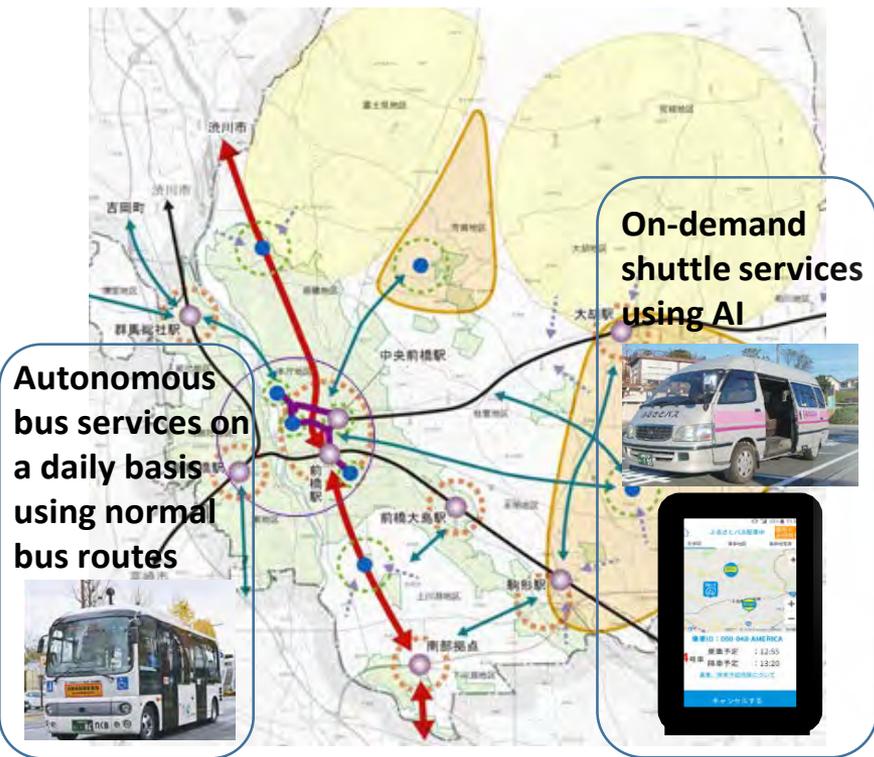
Cooperative Organizations (3)

Smart City Public-Private Partnership Platform
JIPAD, JBP(Disaster Risk Reduction)

④ Examples of Smart Cities in Japan

Maebashi Smart Mobility Vision (Maebashi City, Gunma Prefecture)

Kashiwa-no-ha Smart City (Kashiwa City, Chiba Prefecture)



Future vision of Smart Compact City around the Station supported by cyber space



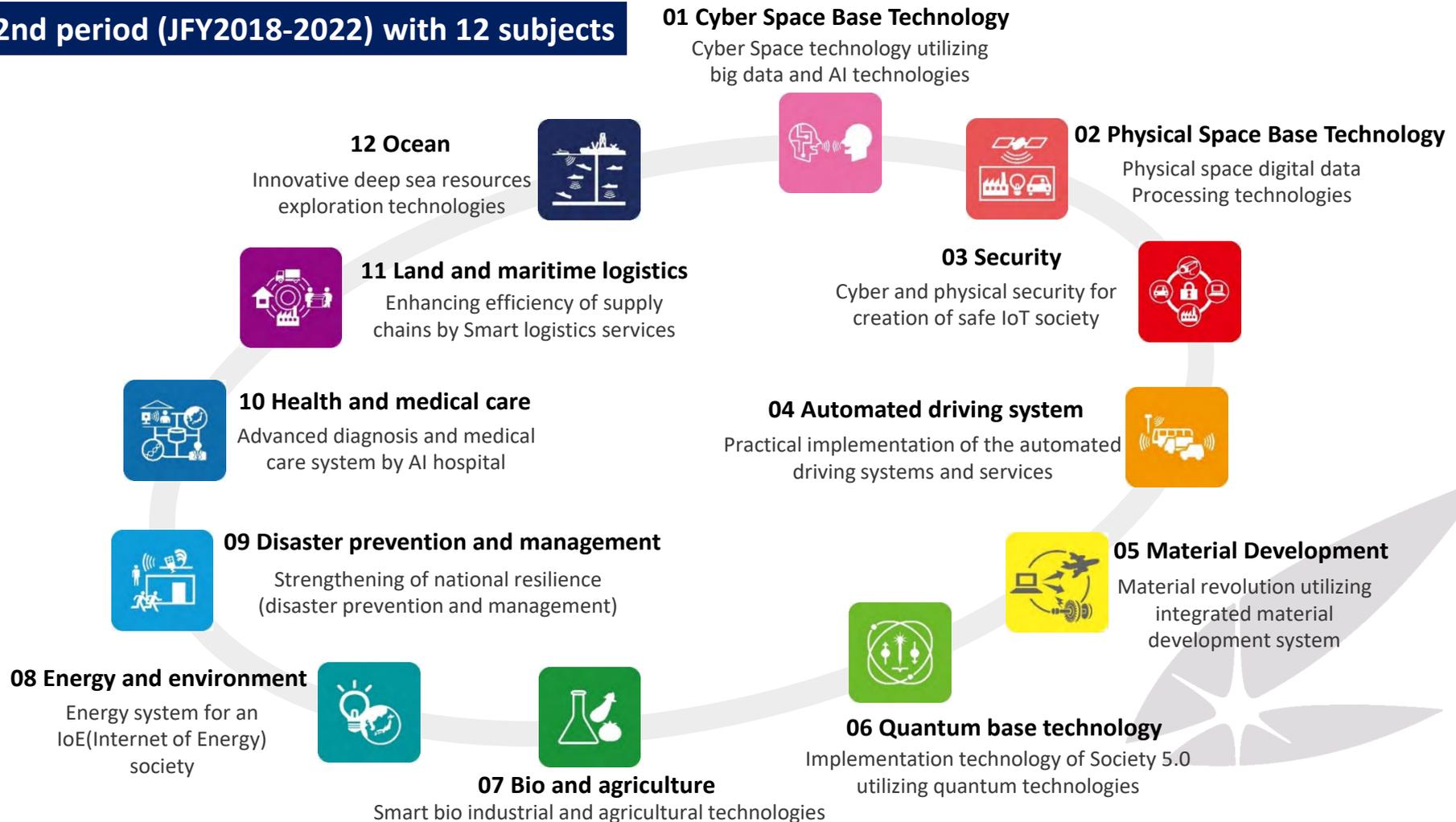
- aims to resolve the problem of **lack of public transportation for elderly** who are no longer able to drive on their own, **by autonomous buses and implementing Maas.**

- intends to **embody smart, compact city life**, with the evolution of **Area Energy Management System**, the **development and management of public space** and **smart health care support**, which is supported **by data platform**

⑤ SIP (Cross-Ministerial Strategic Innovation Promotion Program)

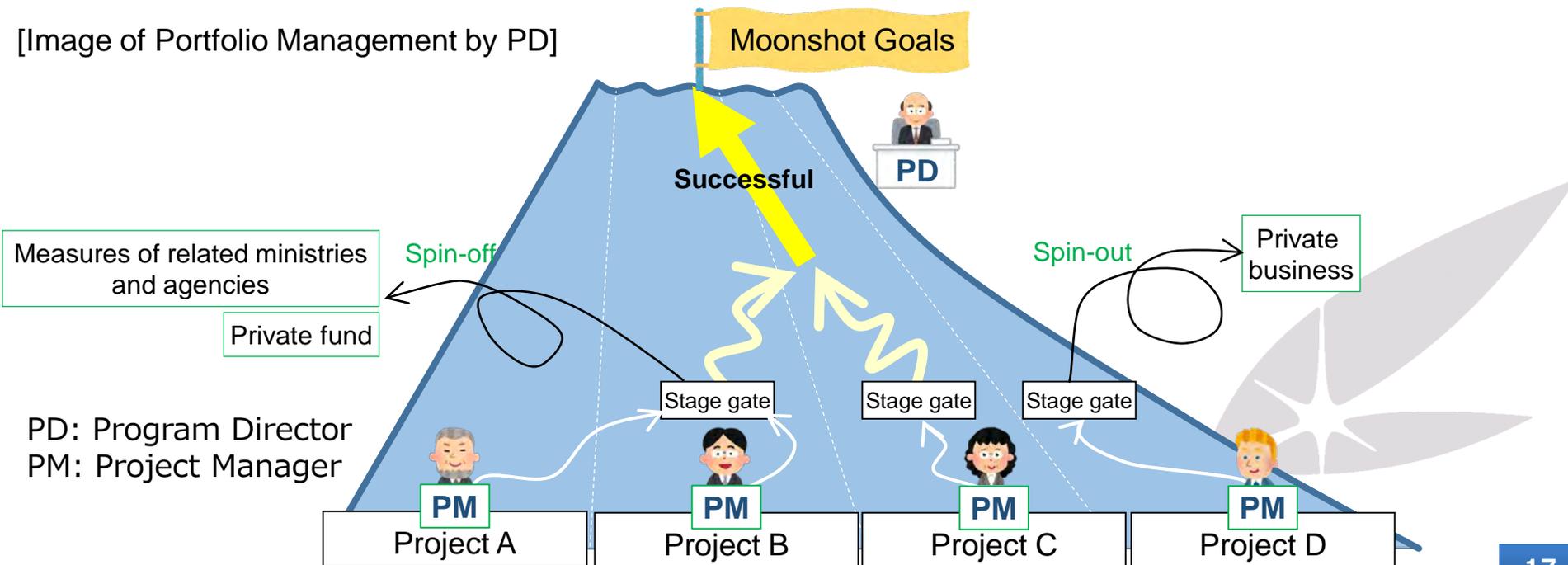
- From [basic research to application and commercialization](#) to solve social issues and achieve economic growth by cross-ministerial cooperation
- 1st period was completed in 11 subjects from JFY2014 to 2018

2nd period (JFY2018-2022) with 12 subjects



- (1) The government sets ambitious goals and concepts for societal issues that are difficult to tackle but will have profound impact once resolved.
- (2) Builds a portfolio overlooking the program and promotes challenging R&D without fear of failure.
- (3) 100 billion yen was appropriated in the supplementary budget for FY2018, and a fund was created. 15 billion yen was appropriated in the supplementary budget for FY2019.
- (4) Supports the program up to 10 years.

[Image of Portfolio Management by PD]



To realize “**Human Well-being**”, seven Moonshot goals (MS goals) were decided in the area of society, environment, and economics.

7 MS goals to be achieved (by 2040 or 2050)

Society

Turning the aging society into the innovative and sustainable society by harnessing diversity through techno-social transformation

Environment

Recovery for global environment and growth of civilization

Economics

Exploring frontiers with science and technology

Goal #1: **A society in which human beings can be free from limitations of body, brain, space, and time.**

Goal #2: **Ultra-early disease prediction and intervention.**

Goal #3: **AI robots that autonomously learn, adapt to their environment, evolve in intelligence and act alongside human beings.**

Goal #4: **Sustainable resource circulation to recover the global environment.**

Goal #5: **The industry that enables sustainable global food supply by exploiting unused biological resources.**

Goal #6: **A fault-tolerant universal quantum computer that will revolutionize economy, industry, and security.**

Goal #7: **Sustainable care systems to overcome major diseases, for enjoying one’s life with relief and release from health concerns until 100 years old”**

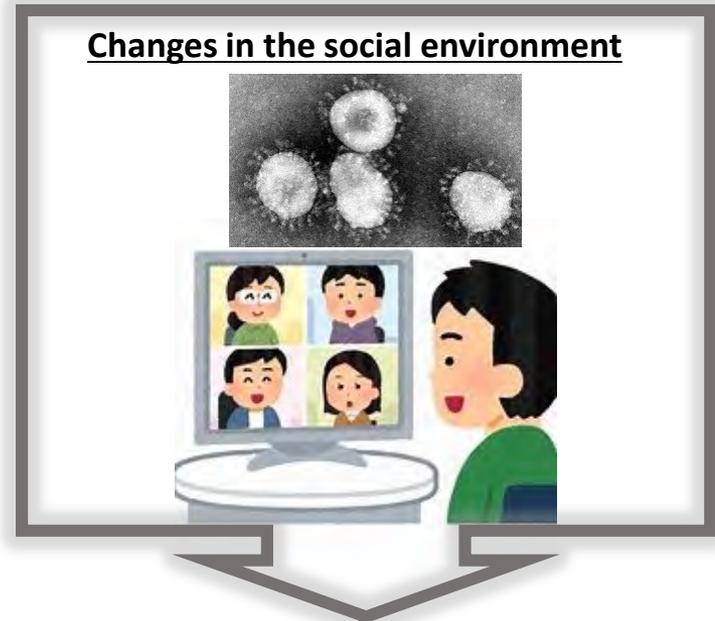
“**Moonshot for Human Well-being**”

- The COVID-19 pandemic and its impacts have forced us to create new Moonshot Goals aimed at tackling the challenges of our post-crisis society and economy.

Moonshot Goals

- Goal #1:
- Goal #2:
- Goal #3:
- Goal #4:
- Goal #5:
- Goal #6:
- Goal #7:
- Goal #X: New Moonshot Goals**

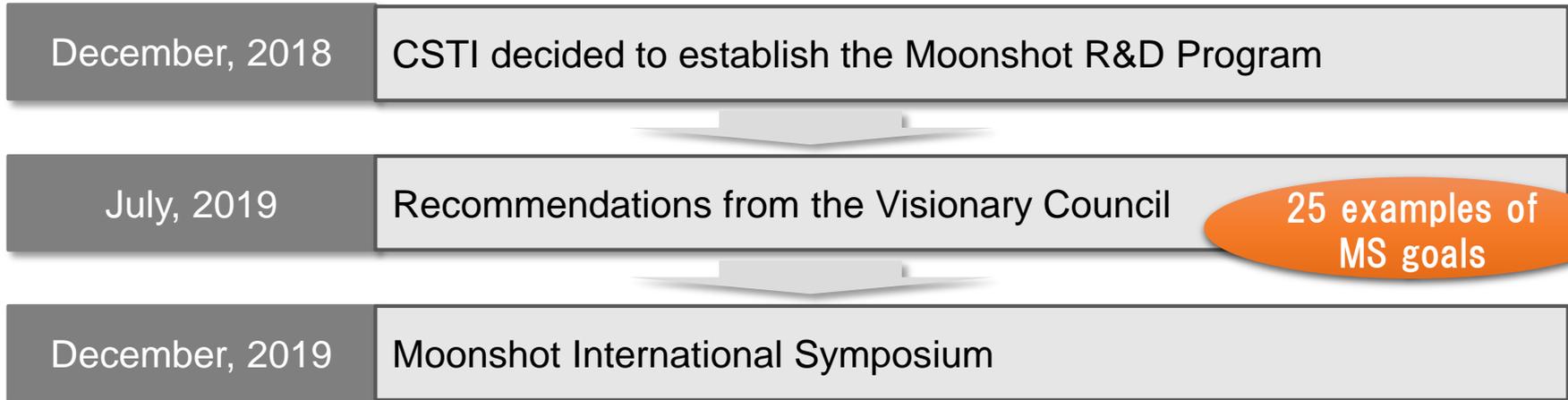
"Moonshot for Human Well-being"



Welcoming youth-focused teams to brainstorm new Moonshot Goal candidate.

“According to changes in the social environment and advances in science and technology, if deemed necessary, CSTI adds and/or changes the MS Goals after evaluating their technical feasibility and listening to domestic and overseas opinions.”

(Guidelines for Operation and Evaluation of the Moonshot R&D Program)



CSTI (Council for Science, Technology and Innovation)

HQ for Healthcare policy



Thank you for your kind attention

