

## About the White Paper on Science, Technology and Innovations

- The White Paper reports the measures taken by the government for science, technology and innovation creation based on the Basic Act on Science, Technology and Innovation enforced in April this year.
- It consists of two parts: **Part 1 featuring topics and Part 2 for the annual report (as per every year).**

- Part 1 for features **introduces Society 5.0 sought by the 6th Science, Technology and Innovation Basic Plan in an easy-to-understand way for people** by using illustrations.
- An approachable white paper** for everyone from adults to children is aimed for by using illustrations, photos and QR codes.

## Composition of Part 1: Toward Society 5.0

### Initiatives necessary for realization of Society 5.0

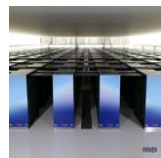
- Society 5.0: A human-centered society** in which economic development and the resolution of social issues are compatible with each other **through a highly integrated system of cyberspace and physical space**
- Vision of future society for which Japan aims:** A society that **is sustainable and resilient** against threats and unpredictable and uncertain situations, that ensures **the safety and security of the people**, and that enables **each and every one of them to realize well-being**

- R&D that enables the **"fusion of cyberspace and physical space"** (supercomputer, AI, etc.)
- R&D for **decarbonization, disaster prevention/mitigation and response to COVID-19** in order to **"ensure the safety and security of the people"**
- In addition to the above, **utilization of "Convergence of Knowledge"** that is the fusion of knowledge in the humanities and social sciences and knowledge in the natural sciences in order to ensure that **"each and every one of them to realize well-being"**
- Strengthening of the basic research capacity** that leads to creating knowledge

### Chapter 1 State-of-the-art Initiatives toward Digitalized and Decarbonized Society

#### (1) Fundamental Technologies for Constructing Cyberspace

- Supercomputer**
- Artificial Intelligence (AI)**
  - Advanced analysis and simulations using data accumulated in cyberspace
- Quantum technology**
  - Quantum computer enabling ultra-high-speed computation; quantum cryptographic communication contributing to safe and secure data utilization



Supercomputer Fugaku RIKEN  
Computer processing image  
Above: conventional computer  
Below: quantum computer

#### (2) Technologies Connecting Cyberspace and Physical Space

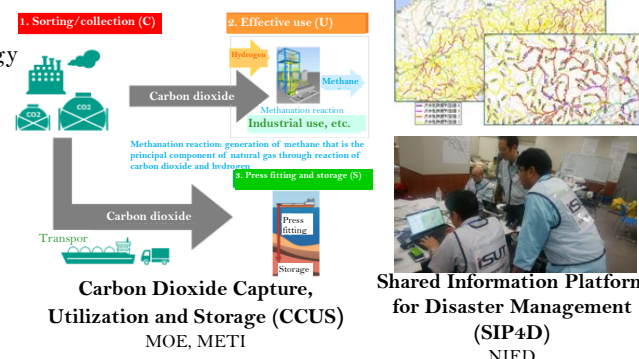
- Machines substituting physical functions**
  - Read brain signals and substitute or support human motions/communication
- Ensuring means of transport – automated driving**
  - Automated driving ensures smooth mobility in an aging society
- Robot Operations in Dangerous Environments**
  - Hayabusa 2 using remote control and advanced robotics



Cyborg HAL CYBERDYNE  
Automated driving Cabinet Office

#### (3) Efforts to Ensure Safety and Security Including Decarbonization

- Realization of sustainable decarbonized society**
  - Green Growth Strategy, Green Innovation Fund and Strategy for Sustainable Food Systems, MeaDRI
  - Innovative technology to realize decarbonization (high-accuracy prediction of climate change using supercomputer, fusion, next-generation storage battery, power electronics, improvement of energy use efficiency and CCUS)
- Disaster prevention/Mitigation to enhance resilience against large-scale disasters**
  - Improving forecast accuracy of earthquake/ water-related disasters through AI, simulations, etc.; disaster study based on old documents



### Chapter 2 Creation and Use of Convergence of Knowledge to Address Social Challenges

#### (1) Fusion of Knowledge in the Humanities and Social Sciences and Knowledge in the Natural Sciences

##### Reasons for the need for "Convergence of Knowledge"

- In order to address social challenges such as spread of infections and realization of an inclusive society, it is necessary to use "Convergence of Knowledge" based on the understanding of diverse aspects of human beings and society in addition to state-of-the-art natural science R&D.
- Research methods of natural science are increasingly used in humanities and social sciences (e.g., study on social justice by using functional brain imaging).
- It is necessary to make an image of a desirable future for human beings and society and promote science, technology and innovation policies under the vision. In addition, use of AI, genome editing and other state-of-the-art technologies requires addressing ethical, legal and social problems.

#### (2) Examples of Initiatives to Address Social Challenges through Fusion of Knowledge

##### Introduction of initiatives to realize the well-being of each and every person by using Convergence of Knowledge

- Initiative toward dementia-friendly society through co-creative art activities
- Project across the medical, educational and social fields to support people with neurodevelopmental disorders
- Project toward development and social implementation of automated driving system accommodating cultural values of Japanese society
- Project toward a spiritually rich society through integration of art and science and technologies



Explaining the cloned cultural property technology to heads of states at the G7 Ise-shima Summit  
Tokyo University of the Arts



Experiencing "Daredemo Piano"  
Tokyo University of the Arts

### Chapter 3 Strengthening Basic Research Capacity as Foundation of Society 5.0

#### (1) Research Capacity of Japan

- The number of Japanese Nobel laureates in the natural sciences this century is No.2 in the world.
- Regarding the number of papers attracting attention, Japan's international status has declined from 4th 20 years ago to 9th today.

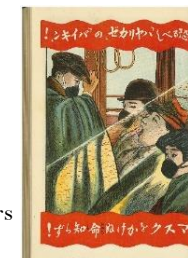
#### (2) New Projects to Strengthen Research Capacity

- It is necessary to improve the current state where excellent young people give up enrolling in doctoral courses for economic insecurity and other reasons.
  - It is also necessary to create an environment where young researchers can concentrate on ambitious research based on their own intellectual curiosity.
- Establishing the university Endowment Fund with \$100 billion**
  - Improving Treatment of Doctoral Course Students (supporting about 15,000 students)**
  - Program to support challenges of young researchers (Fusion Oriented REsearch for disruptive Science and Technology)**

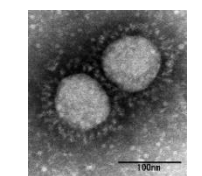
### Chapter 4 Response to COVID-19

- History of Infection and Humankind and Lessons to learn from History**  
Japanese people contributing to the development of infection study (e.g., KITASATO Shibasaburo)
- The Government's response to COVID-19**  
Promoting R&D including therapy, vaccines and medical equipment
- Impact on research sites and initiatives to establish new research styles**  
Remote research, automation of experiments by using robots, etc.
- Initiatives to spread correct understanding on COVID-19**  
Providing scientific and objective information in expressions that consider receivers
- Future of science and technology in the light of the impact of COVID-19**  
According to the additional survey, realization of technology that will enable flexible employment configurations is predicted to arrive earlier.

#### Poster of Taisho Period "Daredevil who doesn't wear mask!"



National Institute of Public Health



Separated COVID-19 variants  
National Institute of Public Health

➤ Additionally, individual chapters cover "Realization of GIGA School Vision" (Chapter 1), "Space Physics Discovery through Analysis of Classical Documents" (Chapter 2), "2020 NISTEP Selection (The Researchers with Nice Step)" (Chapter 3) and other topics.