White Paper on Science and Technology 2020

Introduction (Research and Development on COVID-19)

The rapid spread of COVID-19 across the world has revealed the reality that people's activities are linked across borders and globally and demonstrated that the collective wisdom of science and technology is essential to solving the global problems.

The global spread of the disease is likely to change the shape of society into the future. There has been a rapid change in society, such as remotization and digitization using ICT, including telework, distance education, and telemedicine. The government also needs to promote such efforts and accelerate the realization of Society 5.0 The recent situation also highlighted the important role that the knowledge of the humanities and social sciences can play along with cutting-edge science and technology in solving economic and social challenges. This is a good example to show that it is necessary to comprehensively promote science and technology and innovation creation based on deep insights into the nature of human beings and society as a whole and in line with the amended Basic Act on Science and Technology.

From these perspectives, it is necessary to make further predictions of the future keeping in mind future structural changes and developments in society.

Electron micrograph of a novel coronavirus (Source: NIID)
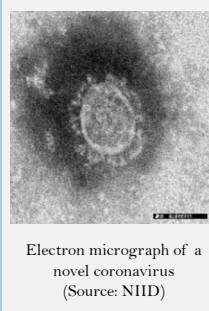
Prediction of the Future Through Science and Technology (Chapter 1)

This chapter introduces the historical transition of the prediction of the future concerning science and technology, which is increasingly being used for government policy formation and corporate strategy development in Japan and abroad, as well as examples of domestic and international efforts.

The Stairway to the 21st Century, compiled by the then Science and Technology Agency in 1960, is one of the most famous predictions of future science and technology in Japan. In addition, since the 1970s, the OECD has been promoting "technology forecasting," which predicts future trends in science and technology. Since the latter half of the 1990s, amidst the high expectations for science and technology to contribute to resolving social issues, "foresight" has come to be used as a means to predict a desirable future society and determine the required state of science and technology to achieve it.

Currently, predictions of the future are being made in various countries and institutions. Looking over different predictions, the following can be listed as the common features of the future societies that these predictions envision keeping in mind digitalization and response to global challenges: extension of healthy life expectancy by improving medical and health care services; diversification of lifestyles through expansion of activities in virtual spaces; industrial automation and unmanned operation driven by advancements in ICT, and creation of new industries such as data and service industries; transition to a sustainable society through decarbonization and progress in resource recycling.

Columns: Introducing some of the achievements and initiatives of science and technology in an easy-to-understand manner

Research on infectious diseases using overseas research centers

Under the Japan Initiative for Global Research Network on Infectious Diseases (J-GRID), nine universities are conducting basic research at overseas research centers, including genetic analysis of viruses that have spread in various regions. As for COVID-19, R&D of preventive, diagnostic and therapeutic methods is being promoted, including the collection and analysis of specimens and the establishment of rapid diagnostic techniques.

Working with viruses in a safety cabinet (Source: AMED)

Approval of Japan's first GSSP and the name of the geological era "Chibanian"

The Chiba Section, a section of the stratum exposed on the banks of the Yoro River in Ichihara City, Chiba Prefecture, was named "Chibanian" for the Middle Pleistocene (774,000-129,000 years ago) geological time period (774,000-129,000 years ago), because the Chiba Section is the easiest section to detect magnetic field inversions on the Earth.

Location of the Chiba section (Source: NiPR)

Optical mice that freed people from maintenance

Many people use a mouse to operate a computer. When mice first came out, most of them were ball-type mice, which were prone to malfunctions and required regular maintenance. Later, these shortcomings were overcome with the development of surface-emitting lasers and commercialization of optical mice.


Looking Toward the Future in 2040: A Future Society Expanded by Science and Technology (Society 5.0) (Chapter 2)

This chapter introduces the Science and Technology Foresight Survey, an initiative to predict the future conducted by the NISTEP, which engages in the national science and technology policy-making process.

The report on the 11th Survey published in FY2019 discussed the future images of society (the desired future images) and the future images of science and technology (the medium- and long-term perspective of science and technology development). Combining these two, the report presents "a flexible society brought about by reviving and rethinking humanity" with an emphasis on the four values: (1) Humanity (changing ways of life), (2) Inclusion (no one left behind), (3) Sustainability (sustainable Japan), and (4) Curiosity (eternal curiosity).

With this in mind, the images of the future society in 2040 (the advanced version of Society 5.0) are categorized in terms of "tangible (body, objects, etc.)" or "intangible (mind, data, etc.)," and "individual" or "social" and are presented graphically along with some specific science and technology topics (see reverse side).

S&T Foresight Survey
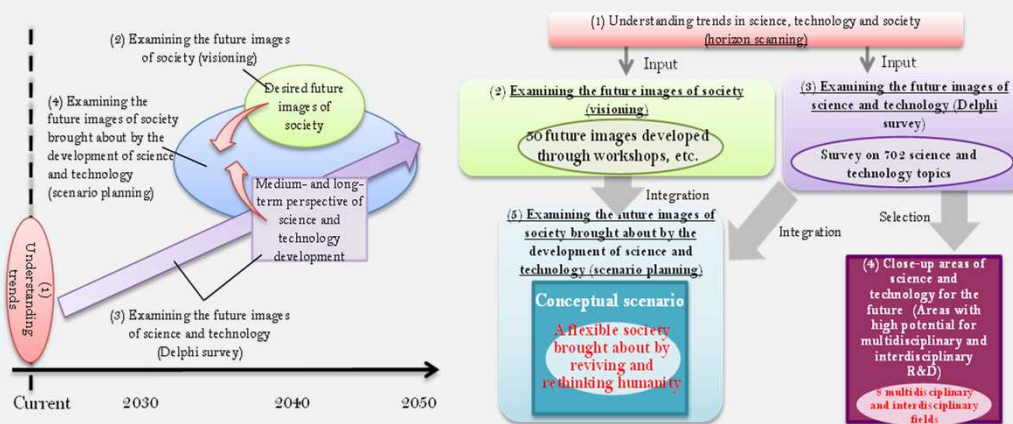
Research and Development for the Future Society (Chapter 3)

This chapter introduces the government initiatives for the future society.

Based on the current situation where the state of human beings and society is closely linked with science, technology, and innovation due to the rapid development of AI, IoT, and other technologies, the government has submitted a bill to partially amend the Basic Act on Science and Technology, etc. to the 201st ordinary session of the Diet with a view to promoting science and technology (including the humanities) and innovation creation in an integrated manner. The government is also currently discussing the next Science and Technology Basic Plan starting in FY2021

This chapter also covers the Moonshot R&D Program, a government initiative that sets a vision for the future society and conducts R&D toward that vision, the Center of Innovation Program, a program that supports vision-driven, challenging, and high-risk R&D, Miraikan's initiatives to create opportunities for visitors and researchers to think together about the future of society, the World Exposition 2025 (Osaka/Kansai Expo), which is expected to serve as a testing ground for future society, and the Smart City initiative, which aims to solve urban and regional problems through the use of advanced technologies such as IoT and big data. In addition, it introduces environmental and energy technologies for the creation of a hydrogen-based society as an example of R&D efforts for resolving issues that have been promoted with an eye to the Tokyo 2020 Games.

Environmental and Energy Technologies Toward the Creation of a Hydrogen Society (Source: Tokyo Metropolitan Bureau of Transportation)

Image of Society in 2040: "A flexible society brought about by reviving and rethinking humanity"

Society of coexistence, rethinking what it means to be human and recognizing diversity

Flexible society in which the real and the virtual are harmonized

Intangible-individual

Intangible-social

Tangible-individual

Tangible-social

Society in which each individual's scope of activity is expanded by extending their physical functions and providing health care tailored to their personal characteristics

Society in which personal customization and general optimization coexist, allowing individuals to have unique lifestyles