RESEARCH MATERIAL No.276

The 11th S&T Foresight: S&T Foresight 2019
Discussion on Desirable Society 2040

September 2018

Science and Technology Foresight Center
National Institute of Science and Technology Policy

【Contributors】

YANO Sachiko	Visiting Researcher, Science and Technology Foresight Center
GAMO Hidenori	Visiting Researcher, Science and Technology Foresight Center
YOKOO Yoshiko	Director, Science and Technology Foresight Center

)

Please specify reference as the following example
when citing this NISTEP RESEARCH MATERIAL.

Science and Technology Foresight Center, "The 11th S&T Foresight: S&T Foresight 2019, Discussion on Desirable Society 2040 (Workshop Report)," *NISTEP RESEARCH MATERIAL*, No.276, National Institute of Science and Technology Policy, Tokyo.
DOI: https://doi.org/10.15108/rm276

Summary

1. Background and objectives

National Institute of Science and Technology Policy (NISTEP) has been conducting "Science and Technology Foresight" every five years since 1971. Since the Science and Technology Basic Law was established in 1995, the study has been conducted according to the formulation schedule of the Science, Technology, and Innovation Basic Plans. Since around the year 2000, back casting or seeking for solution to social challenges has become the mainstream attitude toward science and technology policymaking. To meet requirements from policymakers, there was a change in the study framework from technology or seeds driven approach, where they consider the future of society based on science and technology developments, to society or needs driven approach, where they discuss the desired society before identifying relevant scientific and technological issues.

"The 11th Science and Technology Foresight: S&T Foresight 2019" (hereinafter referred to as the 11th Foresight) conducted an examination into science and technology development and the desired society in the future, aiming to provide fundamental information that contributes to the discussion of science, technology, and innovation policies including the 6th Science, Technology, and Innovation Basic Plan.

The structure of the 11th Foresight is outlined in Figure 1. In consideration of the increased complexity of the relationship between technology and society, the study is promoted from the dual viewpoints of science and technology, and society. It is configured to examine "future of society" and "future of science and technology" separately before integrated discussion of both futures for "future images of society brought about by the development of science and technology."

The study of "Visioning", the discussion on future of desired society based on social and technological trends and signs of changes, aimed to envision the future through the discussion among a variety of stakeholders. Information from "Horizon Scanning" was provided for the discussion. The literature research attempted to grasp social, technological, and political trends. Experts' insights were prepared to know potential changes in society and technology which had not been widely recognized yet. In addition, future images of the world and local regions in Japan were extracted from the workshops separately held by NISTEP and referred in the discussion (Figure 2).

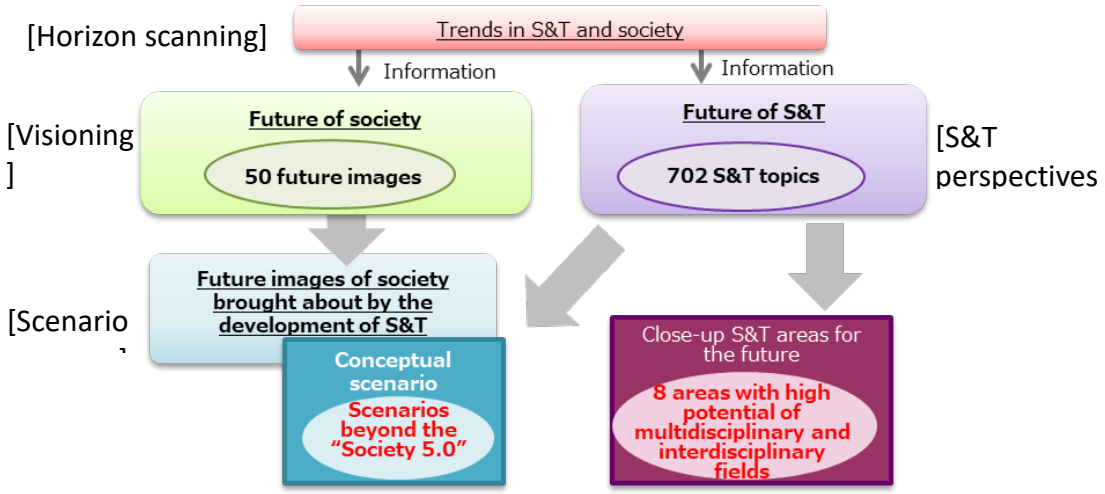

Figure 1. Structure of the 11th S&T Foresight

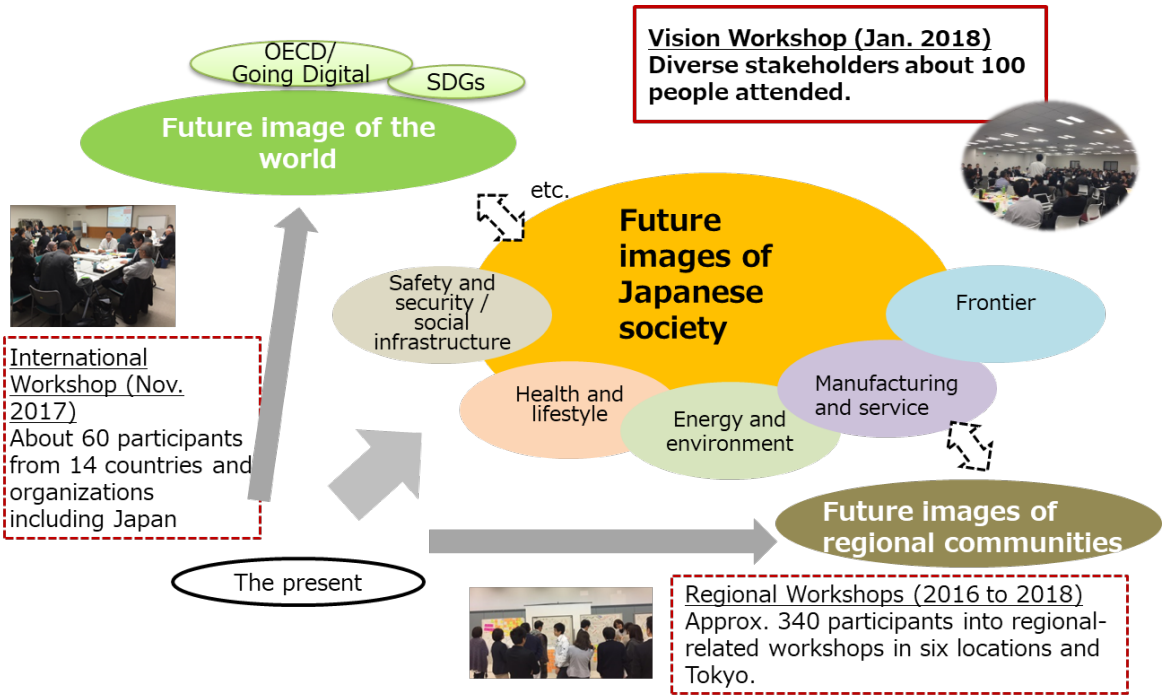

Figure 2. Discussion on future society

2. Method

A vision workshop was held in January 2018 for the discussion on the desired future society in 2040.

(1) Participants

The participants were 96 experts from industry, academia, and government including related ministries and research grant institutions. The workshop was characterized by its variety of participants regarding affiliation, specialty, age, and gender. The background of the participants was not limited to the natural sciences and included those from a diverse range of fields including humanities and social sciences. Young researchers were encouraged to join the discussion with the cooperation from groups of young scientists. The overall ratio of women was 17%. This ratio is virtually equivalent to the ratio of female researchers (14%) in the science and technology fields in Japan.

(2) Preparation of "KIDSASHI Stories"

Prior to holding the workshop, we prepared 140 "KIDSASHI Stories," scanning materials for the group work. They aimed to provide the latest information such as trends on science and technology and their potential impacts on society, and social trends such as social, economic, political and environmental changes in Japan and around the world. They were mainly provided by participants in the workshop and were related to the five fields of "Health/lifestyle," "Environment/energy," "Manufacturing/regional revitalization," "Safety/infrastructure," and "Frontier/science foundation."

(3) Discussion procedure

The workshop was designed to depict society in the year 2040, incorporating a wide range of changes in society, developments in science and technology, and the relationship between society and science and technology. The participants were divided into ten groups. Each group consists of about ten people with various attributes.

The group work procedure is as follows: First, they shared potential changes based on the pre-prepared KIDSASHI stories and social trends/policy trends, and each person proposed images of desired society in one sentence. Next, after grouping the similar ideas of the desired society, they mapped these on a 2-D space: the map axes are achievement potential and relevance of science and technology.

The whole procedure for creating the vision in the workshop is shown in Figure 2.

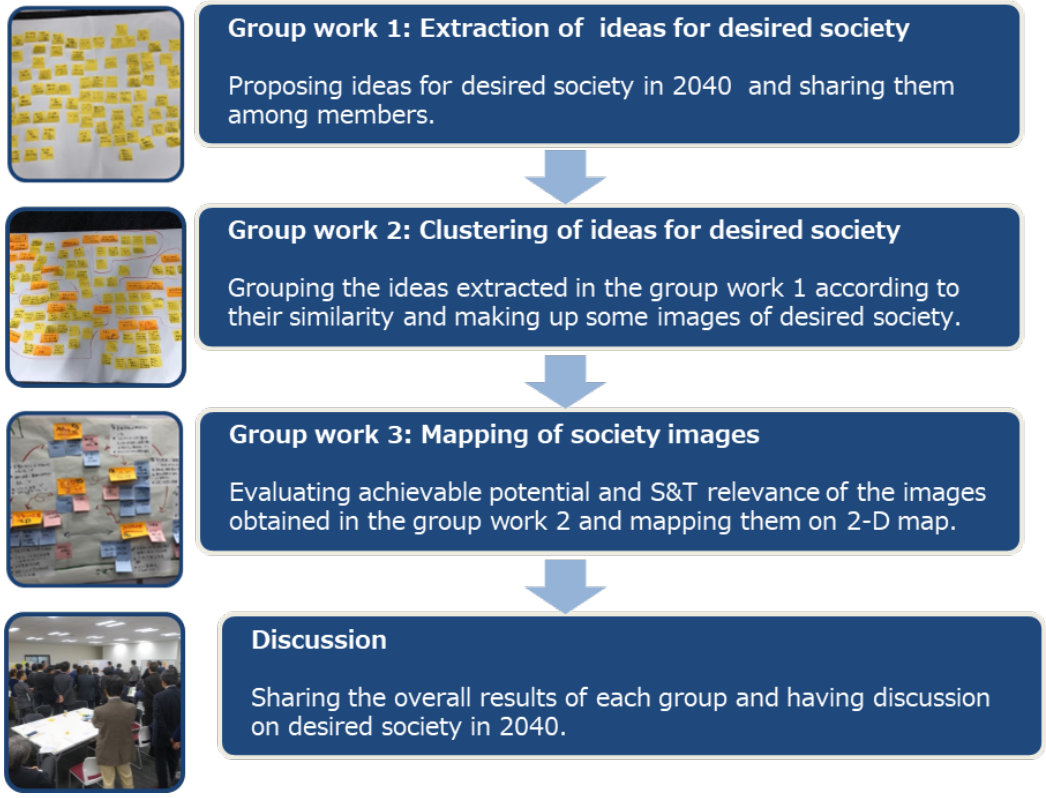

Figure 2. Discussion procedure

3. Results

The images of the desired society in 2040, the results obtained from the workshop, are shown in Figure 3 and Table 1. We have got a total of fifty social images, which could be summarized into four values: humanity, Inclusion, sustainability, and curiosity.

The first item, “Humanity – changing ways of life,” depicts an image of society in which the value of living humanely, society and humans, automation, Japanese-ness, culture, happiness, and communication are valued. The second item, “Inclusion – no one left behind,” depicts an image of society in which progress occurs wherein individual people with different characteristics understand and respect differences each other. In the third item, “Sustainability – a sustainable Japan,” an image of society is depicted in which resources, energy, food, environment, recycling, disaster measures, and civil activities are valued. Finally, in “Curiosity– eternal curiosity,” an image of society is depicted in which intellectually inquiring minds are developed, in addition to deep curiosity, the expansion of the activity space is given priority.

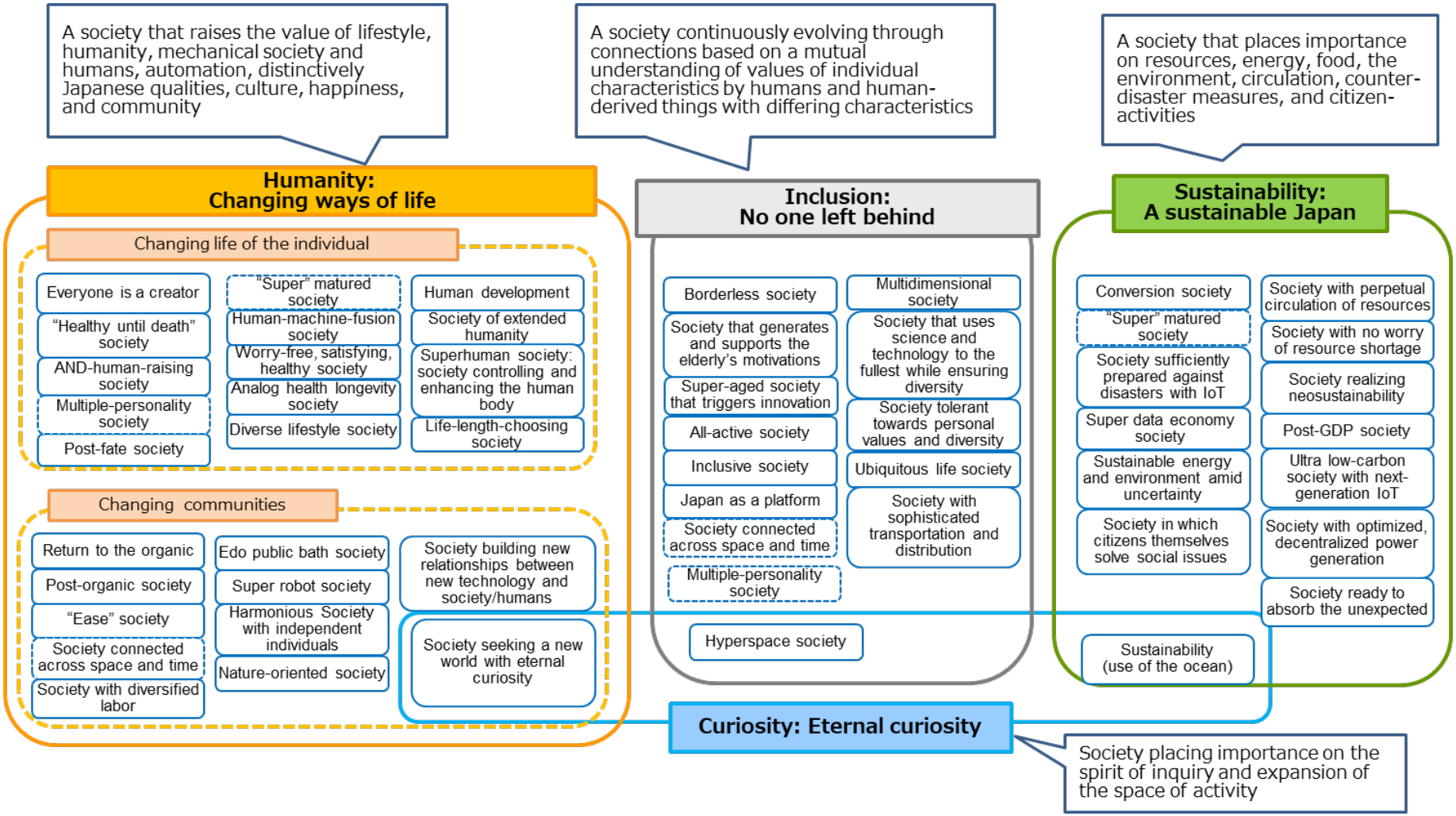

Figure 3. Fifty images of the desired society in 2040 and four values

Table 1. Summary of fifty images of the desired society

Value	Image	Summary
Humanity: the individual	Analog health-longevity society	Society will be formed by small, cross-generational communities. People will perform checkups at home to monitor their health, and there will be incentives for being healthy.
	"AND-human"-raising society	A society raising "AND humans": people with experience in both the real and the virtual.
	Diverse lifestyle society	Professions and living locations will diversify. Life will enter an era of "double-cropping" and society will become "multitrack."
	Everyone is a creator	People have multiple jobs and provide zero-marginal-abatement-cost services while living very frugally. Individuals reasonably produce goods they want through data-exchange, etc.
	"Healthy until death" society	Preventive medicine develops through tailored treatment and the use of wearable health sensors. As a result, health-longevity becomes longer, and hospitalization and death-by-disease become uncommon.
	Human development	People will receive education about coexisting with AI and adapting to various changes. Local colleges will become familiar to everyone as a place of knowledge redistribution.
	Human-machine-fusion society	Humans' abilities will improve drastically through connecting cranial nerves to external data, embedding chips into the brain, etc. Machines will perform humans' roles smoothly in intellectual and emotional matters.
	Life-length-choosing society	Thanks to progress in biological measurement technology and genetic engineering, people will be able to individually choose the lengths of their lives in advance, and they will complete those lives accordingly.
(Inclusion)	Multiple-personality society	A society in which people will use different personalities that were developed through expansion of virtual reality. Individuals will belong to multiple countries and organizations as well.
	Post-fate society	People will overcome handicaps with physical extensions, and they will challenge the notion of predestined life-length.
	Society of extended humanity	People and organizations that can turn data into knowledge will gather wealth. Meanwhile, people will also find value in "the real" and "the state of being independent." A new "purpose of life" society will develop based on VR, AR, and AI, and attainment of freedom will be the top objective.
	Superhuman society: Society controlling and enhancing the human body	Technological fusion will allow people to supersede innate biological functions while also keeping them well-maintained. People will be able to keep track of their conditions, and heavy, physical exertion and changes to living habits will become unnecessary.
	Super matured society	Social mechanisms and humans' behavioral patterns will change significantly. Emancipation from heavy, menial labor; prolongation of health-longevity; and increase of free time will occur.

Value	Image	Summary
	Worry-free, satisfying, healthy society	Approaches in preventive medicine will develop. People will be able to live independently, thanks to elucidation of brain mechanisms, health status monitoring, early diagnosis, and treatment technology.
Humanity: community	"Ease" society	Much heavy labor will be executed by power-efficient robots. A single individual will be able to act as multiple agents in virtual space. Highly human-friendly foods and services will be produced by considering humans' inner feelings or subjectivity.
	Edo public bath society	Public baths—special places combining anonymity with local community—and "relationships in which faces are visible" and "community as family in a broad sense" will form a mutually supportive society.
	Harmonious Society with independent individuals	Society will attain overall harmony, though each individual will pursue a lifestyle according to their own set of values.
	Nature-oriented society	Society will attain harmony with nature, making use of primordial human characteristics. High value will be placed on autonomously walking, thinking, etc.
	Post-organic society	Though AIs will have AI personalities, human > AI relations will be maintained. Time spent living in VR/AR spaces will expand.
	Return to the organic (the real)	As the value of the real rises amid AI development, the autonomy of local communities, review of local resources, and return to nature will regain attention.
	Society building new relationships between new technology and society/humans	New relationships between technology and humans will be built. Information will spread about the conveniences and risks of new technologies, and people will be able to coexist with machines.
(Inclusion)	Society connected across space and time	People located far from each other will connect with a sense of reality through their five senses. Individuals' personal data logs will be used to overcome physical handicaps and to reproduce themselves virtually.
(Curiosity)	Society seeking a new world with eternal curiosity	Resource development/energy generation on the moon and offshore farms on the Pacific Ocean—society will enter a new "age of exploration" involving outer space, deep-sea, and virtual reality.
	Society with diversified labor	Thanks to AI, robots, ICT, etc., people will generally work from home. Video calling and Net/VR conferences will come into wide use, and people will not have to commute.
	Super robot society	As robotic technology becomes highly sophisticated, it will become impossible to distinguish between robots and humans by external appearance or immanent nature, and robots will be granted human rights.
Inclusion	All-active society	The shift from the tangible to the intangible, service design, and the value of local communities will gain new attention, and creative jobs will increase. Results and degrees of contribution will be properly evaluated.

Value	Image	Summary
	Borderless society	Linguistic barriers will dissolve, and borders of nations will become less clear. At the same time, cultural barriers will become clearer. Immigration and the widespread use of robots will significantly remedy the issue of population decline.
	Hyperspace society	People will be freed from the spatial constrictions of workplaces and regions, and the degree of spatial-temporal freedom will rise. Society will become physically borderless, and private organizations will be in charge of public functions. The locus of activity will extend into outer space.
	Inclusive society	Birth-to-present data will replace resumes. In addition, a large number of foreigners will work in Japan, and people will converse using automatic interpretation/translation.
	Japan as a platform	In the form of providing a sense of belonging and user-advantages as contents, Japan's appeal will become its services. There will be a platform system that receives modest investments from global fans.
	Multidimensional society	Many virtual nations will emerge, and people will have multiple personas, identities, and places to belong to.
(Humanity)	Multiple-personality society	Through the expansion of virtual space, people will gain multiple personalities. Society will be a place in which people use different personalities in different situations. Similarly, the countries and organizations to which an individual belongs will multiply.
(Humanity)	Society connected across space and time	People located far from each other will connect with a sense of reality through their five senses. Individuals' personal data logs will be used to overcome physical handicaps and to reproduce themselves virtually.
	Society that generates and supports the elderly's motivations	It will become common for people to have never been ill. The importance of relearning will increase in a society that undergoes rapid changes while its members have long and healthy lives, making use of the elderly's abilities and will to work.
	Society tolerant towards personal values and diversity	Better mutual understanding among countries, regions, communities, religions, etc. will result in the realization of a tolerant and diverse society.
	Society that uses science and technology to the fullest while ensuring diversity	Women and the elderly will be able to work easily. Society will require the management of death. In addition, some things at which humans excel over AI will remain, and the two will coexist.
	Society with sophisticated transportation and distribution	There will be fully established, personal distribution systems. Various divisions, such as the distinction between the city and the countryside, will disappear, and there will be no feeling of inequality or disparity.
	Super-aged society that triggers innovation	The aged society will trigger innovation, perfecting individualized medicine, overcoming cancer through advances of epigenetic engineering, making artificial wombs, and promoting the elderly's entrepreneurship.

Value	Image	Summary
	Ubiquitous life society	Working in a large city while living in the countryside, or studying abroad while living in Japan, people's lives will be borderless. Individuals will be geographically dispersed, and yet the distances among them will lessen.
Sustain-ability	Conversion society	Different parties will compete to efficiently convert resources for production. Moreover, various on-ground activities will expand into other spaces, such as in the ocean and the atmosphere.
	Post-GDP society	Society will no longer see GDP as an index of wealth. It will depart from the cycle of mass-consumption and manage to reduce CO2 emissions. Values derived through the digital that support formation of the sense of happiness will circulate.
	Society in which citizens themselves solve social issues	Citizens will think out the directions to be taken in science and technology, and specialists will assess the usefulness of technologies. People will form multi-stakeholder governance.
	Society ready to absorb the unexpected	With the support of simulation technology, etc. for decision-making, society will devise long-term measures in advance based on the premise that unexpected events will occur.
	Society realizing neo-sustainability	Society will produce energy that does not emit greenhouse gas. Obtainment of all oceanic resources through culturing and consumption of synthetic foods will maintain the balance between nutrition and burdens placed on the environment. Social infrastructures will become movable.
	Society sufficiently prepared against disasters with IoT	Through the application of sophisticated ICT, society will take effective measures against disasters, improving safety and preparation against disasters.
	Society with no worry of resource shortage	Society will be restructured with substance-circulation and infrastructural management as its foundation. It will export integrated structures of water, energy, and cities, and recycling and manufacturing will merge completely. The use of robots for farm work will raise the food self-sufficiency rate.
	Society with optimized decentralized power generation	With mass-scale introduction of renewable energy, etc., environment-minded power generation will take place at individual households, and individual power generation will be optimized.
	Society with perpetual circulation of resources	Technology for the perpetual circulation of resources that could overcome severe, resource/environment constrictions will be called for. Shifts will occur in people’s awareness and senses of value, and these will permeate society.
	Super data economy society	Through the use of low-cost software and data distribution services, society will realize the integration of people, tangible and intangible things, and energy. Regulatory sciences will be well-established, and global, economic relationships will develop.
(Humanity)	Super matured society	Social mechanisms and humans' behavioral patterns will change significantly. Society will manage to improve convenience and productivity while also protecting the environment.

Value	Image	Summary
(Curiosity)	Sustainability (use of the ocean)	As a country facing the Pacific Ocean, Japan will actively and internationally engage cooperatively in the use and application of oceanic resources and ocean space using peaceful means.
	Sustainable energy and environment amid uncertainty	Society will realize general optimization. Inter-sector and inter-industry collaboration will build a resource-circulating society decarbonized with a highly efficient use of resources.
	Ultra-low-carbon society with next-generation IoT	The durability of goods will improve significantly with advanced IoT, reducing the burden on the environment. Users will think out means to prolong products' lives.
Curiosity (Inclusion)	Hyperspace society	People will be freed from the spatial constrictions of workplaces and regions, and the degree of spatial-temporal freedom will rise. Society will become physically borderless, and private organizations will be in charge of public functions. The locus of activity will extend into outer space.
(Humanity)	Society seeking a new world with eternal curiosity	Resource development/energy generation on the moon and offshore farms on the Pacific Ocean—society will enter a new "age of exploration" involving outer space, deep-sea, and virtual reality.
(Sustain-ability)	Sustainability (use of the ocean)	As a country facing the Pacific Ocean, Japan will actively and internationally engage cooperatively in the use and application of oceanic resources and ocean space using peaceful means.

[The 11th S&T Foresight: S&T Foresight 2019 series]

Summary:

Summary Report, NISTEP Report No.183, November 2019, NISTEP
DOI: https://doi.org/10.15108/nr183

Horizon Scanning:

Horizon Scanning Report, Discussion Paper No.183, June 2020, NISTEP
DOI: https://doi.org/10.15108/dp183

Visioning:

Discussion on Desirable Society 2040, Research Material No.276, September 2018, NISTEP
DOI: https://doi.org/10.15108/rm276

S&T Perspectives:

Close-up Science and Technology Areas for the Future in 2050 -Extraction and Analysis through a Combination of AI-related Technologies and Expert Judges-, Research Material No.290, June 2020, NISTEP
DOI: http://doi.org/10.15108/rm290

Delphi Survey, Research Material No.292, June 2020, NISTEP
DOI: https://doi.org/10.15108/rm292

Scenario:

Society in 2040 through the Development of S&T -Conceptual Scenario-, Research Material No. 291, June 2020, NISTEP
DOI: https://doi.org/10.15108/rm291

Research Material No.276

The 11th Science and Technology Foresight: S&T Foresight 2019:
Discussion on Desirable Society 2040 (Workshop Report)

September 2018

Science and Technology Foresight Center
National Institute of Science and Technology Policy (NISTEP)
Ministry of Education, Culture, Sports, Science and Technology (MEXT), Japan

https://doi.org/10.15108/rm276

NATIONAL
INSTITUTE OF
SCIENCE AND
TECHNOLOGY
POLICY

https://www.nistep.go.jp