

NATIONAL INSTITUTE OF SCIENCE AND TECHNOLOGY POLICY

Ministry of Education, Culture, Sports, Science and Technology



NISTEP's mission within MEXT

The National Institute of Science and Technology Policy (NISTEP) is a national research institute under the direct jurisdiction of the Ministry of Education, Culture, Sports, Science and Technology (MEXT). NISTEP was established under the National Government Organization Act to play a role in the Japanese government's process of forming policy aimed at promoting Japan's science and technology (S&T). Through its research on science, technology and innovation (STI) policy, NISTEP contributes to the effective and efficient development of STI policy grounded in evidence-based policymaking (EBPM).

NISTEP's mission encompasses three roles:

To contribute to evidence-based policymaking in order to strengthen Japan's research and innovation capabilities, while responding to changing research activities

To contribute to the advancement of science and technology policy research by being a hub for policy research and for cultivating researchers in the field of policy research

To contribute to deepening the public's understanding of science, technology and innovation by disseminating information such as research findings

Major Research Activities

In accordance with the 6th Science, Technology, and Innovation Basic Plan (approved by the Cabinet in March 2021) and the 5th Medium Term Plan of National Institute of Science and Technology Policy (April 2021), NISTEP engages in research activities mainly in the areas described below.

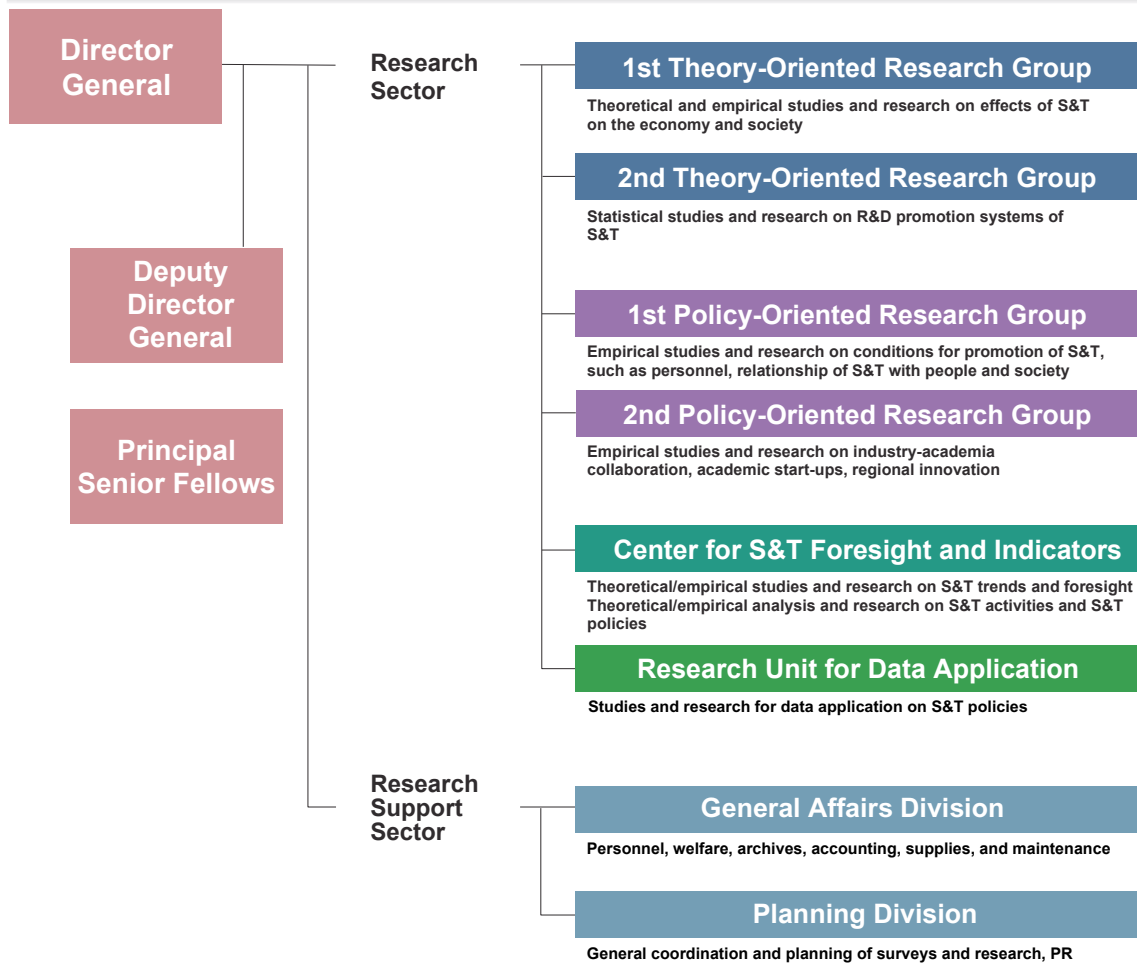
Research results are released through various channels including "NISTEP REPORT" series, "Research Material" series, "Discussion Paper" series, reports to governmental advisory councils as well as lectures and presentations at seminars and international conferences organized by NISTEP, and more.

- ◆ **R&D and Innovation**
- ◆ **Human Resources in Science, Technology, and Innovation**
- ◆ **University-Industry Collaboration and Regional Innovation/Science and Technology and Society**
- ◆ **Science and Technology Indicators and Scientometrics**
- ◆ **Science and Technology Foresight and Trend Analysis**
- ◆ **Data-oriented Research on Promoting Science and Technology and Academia**
- ◆ **Science of Science, Technology and Innovation Policy / Situation Regarding Science and Technology**

*See page 3 onward for details on each area.

Organization, Personnel and Budget

Staff Quota: 44,
Budget: About 800 million Yen (as of April 2021)



* Senior research fellows are appointed because of the institute's need to work across areas.

History

- Jul 1988 National Institute of Science and Technology Policy established (restructured from the National Institute of Resources).
- Jan 2001 Ministry of Education, Culture, Sports, Science and Technology (MEXT) established through administrative reform. NISTEP became an affiliated research institute of MEXT. Science and Technology Foresight Center established as a part of NISTEP.
- Jul 2001 Relocated from the Common Building for Government Offices in Nagata-cho to the Postal Services Agency Building in Kasumigaseki.
- Jan 2004 Relocated to the Ministry of Education, Culture, Science and Technology Building in Marunouchi.
- Apr 2006 Research Unit for Science and Technology Analysis and Indicators established.
- Jan 2008 Relocated to the East Wing of Central Government Building No. 7 in Kasumigaseki (Chiyoda-ku).
- Jul 2013 Reorganized with broader remit.
- Apr 2016 Reorganized with new group structure.
- Apr 2021 Research Unit for Science and Technology Analysis and Indicators and Science and Technology Foresight Center merged to establish the Center for S&T Foresight and Indicators. Research Unit for Data Application established.

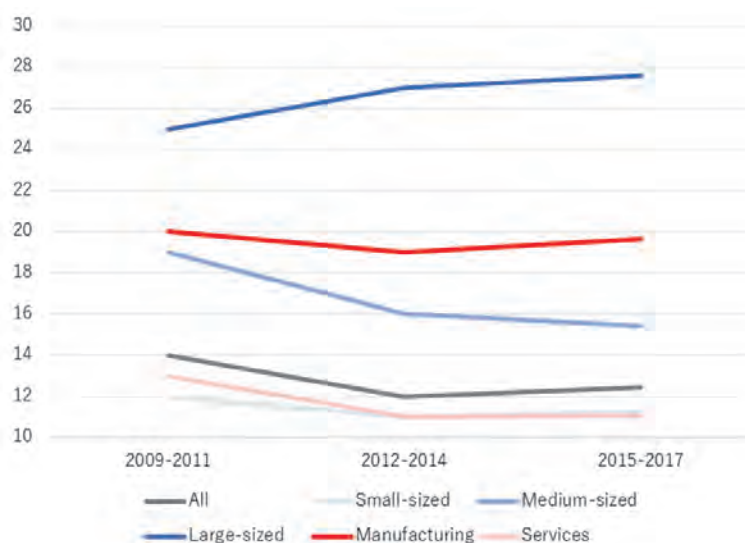
R&D and Innovation

It is essential to create economic and social value by generating demand and improving productivity through innovation to achieve sustainable development. To provide objective evidence that helps advance STI policy, NISTEP researches and analyzes innovation activities at enterprises as well as Japan's innovation system in order to gauge the current situation as well as trends.

◆ Measuring innovation: statistical research and analysis

To aid in the planning, drafting, and advancement of STI policy, NISTEP carries out the Japanese National Innovation Survey, a government statistical survey (specific general statistical survey) in accordance with international standards. This survey is used to assess the state of innovation at Japanese enterprises and innovation activities as well as trends in this area. The survey results are provided to the Organisation for Economic Co-operation and Development (OECD), an international body, to be used internationally as benchmark data on Japan. The economic impact of the knowledge flow from academic research to industry is analyzed by linking enterprise-level and institution-level data to bibliographical information (e.g. patents and academic papers). Through this research NISTEP advances the understanding of the innovation system and the innovation process that are the subject of, and background behind, STI policy. At the same time, NISTEP is also seeking to improve the measurement of innovation.

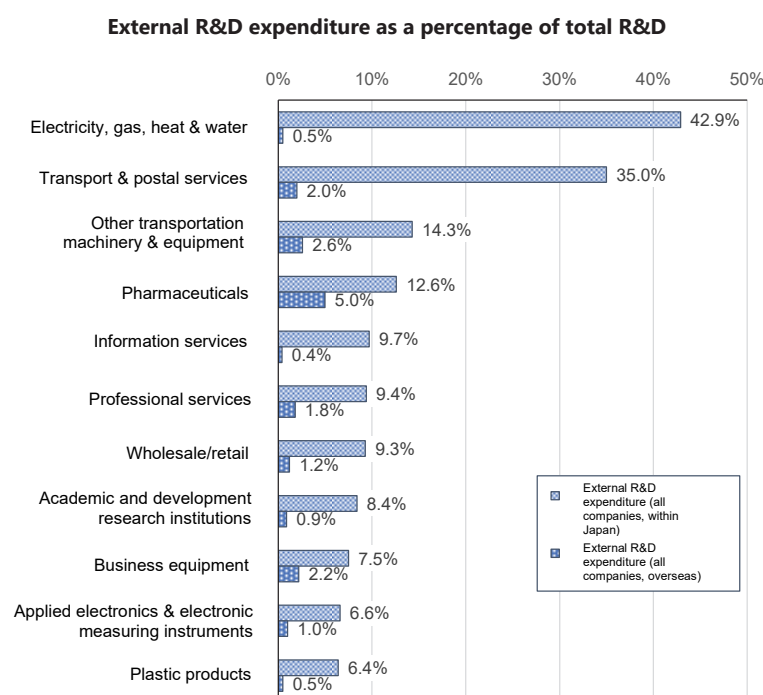
Share of companies realizing product innovation: change over time (unit: %)



(Source: Report on the Japanese National Innovation Survey 2018 (J-NIS 2018), NISTEP Report No. 182, Statistics Table 14 (2019), NISTEP Report No. 170 (2016), NISTEP Report No. 156 (2014).)

◆ R&D in firms

The innovation process is composed of the interaction among companies, governments, universities and public research institutions. From the standpoint of generating innovation, in formulating and advancing STI policy it is important to properly understand R&D activity trends not only in government, universities and public research institutes, but also in the private enterprises that shoulder about 70% of the R&D expenditures in Japan. NISTEP conducts the Survey on Research and Development Activities of Firms in the Private Sector. This large ongoing survey collects data on the R&D activities of business enterprises. It is a general statistical survey approved by the Minister for Internal Affairs and Communications pursuant to the Statistics Act. The findings of this highly reliable survey are used in forming Japan's STI policy. NISTEP also conducts research aimed at gauging the effects and influence of interactions between business enterprises and universities as well as STI policy.



(Source: Survey on Research and Development Activities of Firms in the Private Sector 2019, NISTEP Report No. 186 (2020))

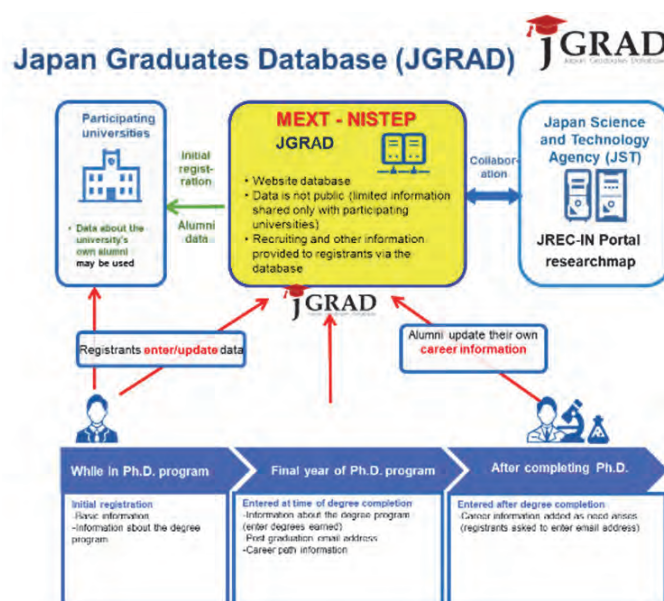
Human Resources in Science, Technology and Innovation

To cultivate and nurture human resources in science, technology and innovation and to ensure that research continues into the future, it is necessary to maintain an understanding of systems and career paths for researchers. Moreover, a clear view of the situation on the ground and of issues that affect career path development is required. To support policy to overcome career path challenges, NISTEP conducts surveys and provides analysis of issues affecting the profiles and career paths of the researchers who represent the future of science, technology and innovation in Japan.

◆ Research on STI career paths, diversity, and mobility

Increasing the flow of personnel (such as the mobility of researchers among institutions), creating environments that foster friendly competition, and ensuring diversity (such as by including female and foreign researchers) will set the stage for Japan's STI researchers to conduct research that yields excellent results. To accomplish this, the postgraduate educational system must cultivate doctoral-level talent that addresses globalization and the needs of industry. However, at present only limited information is collected about the path followed by those who have received a Ph.D., and there is no system for understanding how their abilities are being put to use in society.

NISTEP is responsible for Japan Doctoral Human Resource Profiling (JD-Pro), an ongoing survey that collects information about the employment status and other aspects of the careers of Ph.D. holders. NISTEP also manages the Japan Graduates Database (JGRAD) to collect information from doctoral students and graduates.



◆ Survey on employment and careers for postdoctoral fellows

NISTEP surveys employment and career paths of postdoctoral fellows at universities and public research institutes in Japan. The aim of the Survey of Postdoctoral Fellows Regarding Employment and Careers in Japan is to provide data for policymaking regarding training and encouragement of postdoctoral fellows. Conducted by MEXT every three years and covering universities and public research institutes, this survey is approved by the Minister for Internal Affairs and Communications as a general statistical survey under the Statistics Act, and NISTEP actively participates in collecting and analyzing data. Many governmental committees use the research outputs for purposes such as making science, technology, and innovation policy.

◆ Research on the employment status of faculty members at research universities

Universities are the wellspring of Japan's STI talent, and the number of faculty members without tenure is on the rise, meaning they lack stability. For this reason, NISTEP conducts a survey of major research universities (18 universities in 2019) to collect information about the age breakdown, titles, and treatment of faculty members with and without tenure.

Science and Technology Indicators and Scientometrics

Quantitative data regarding S&T and their analyses are an indispensable foundation for formulating S&T policy, and play an important role for grasping complex and diverse S&T activities, as well as for analyzing the effects and influences of S&T policies. Given that S&T activities are the process of producing knowledge, preparing quantitative data for this intangible process is challenging. In addition to this, the close linkage of S&T activities to various other activities makes the measurement of S&T activities and differentiating S&T activities from other activities technically difficult. NISTEP actively confronts the difficulties in this area, and that is why we are developing S&T indicators and conducting research in scientometrics in order to take application and analysis of quantitative S&T data to deeper levels.

◆ Science and Technology Indicators

“Science and Technology Indicators” is a basic resource for understanding Japanese science and technology activities based on objective and quantitative data. This resource classifies science and technology activities into five categories, such as R&D Expenditure; R&D Personnel; Higher Education and S&T personnel; Output of R&D; and Science, Technology, and Innovation and shows the state of Japanese science and technology activities with approximately 170 indicators. The report is published annually and shows the latest results of the analyses of scientific publications and patent applications conducted by the NISTEP.



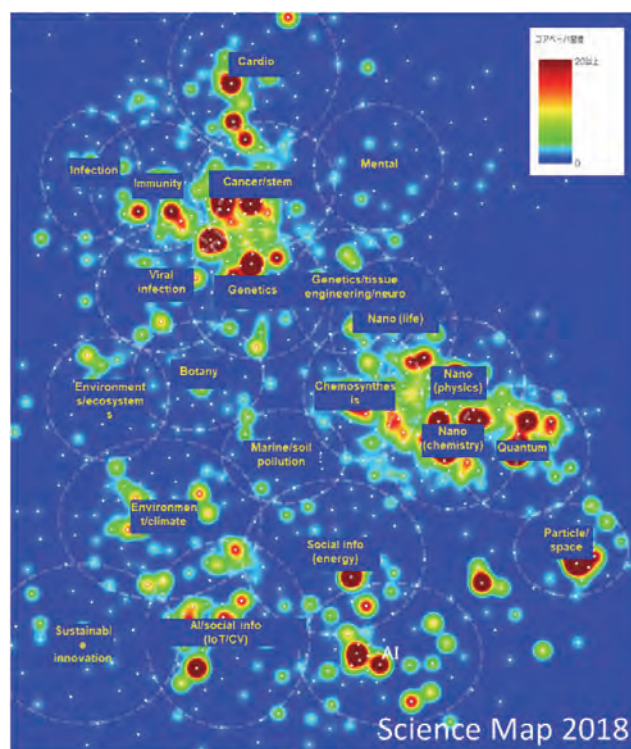
◆ Scientometrics

Aiming to gain a comprehensive and quantitative understanding on sciences and technology trends, NISTEP conducts analyses on R&D trends and the S&T capability of Japan and overseas, by focusing of outputs of research such as scientific papers and patent applications. The analyses include country-level time-series analysis of scientific strengths and weaknesses, and analysis of institution features. In addition, we make a biennial “Science Map” to identify and analyze the characteristics of hot research areas in science.

How to Read the Science Map

White circles indicate positions of research areas. The core-paper density is depicted as color around the circles; Red color show higher density, while blue color signify lower density. This map shows the close relationship between clinical research and basic life science, and explains the position of nano-science between chemistry and physics.

(Source: Science Map 2018, NISTEP Report No. 187 (2020))

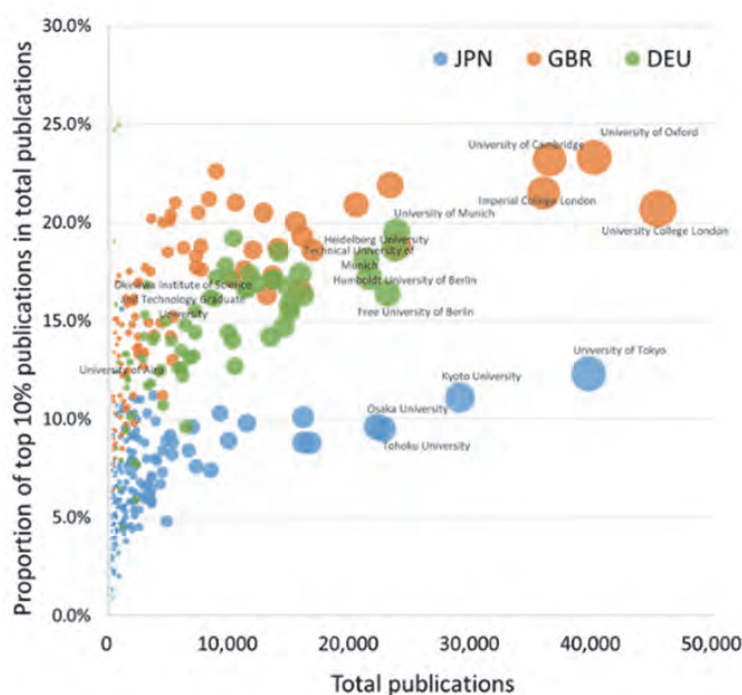


◆ Scientific paper benchmarking

Benchmarking scientific research and Japanese universities

Focusing on scientific papers, NISTEP has been benchmarking scientific research in Japan and major countries, and analyzing the scientific paper production structure at the sector/organization level biannually since 2008. In addition, through benchmarking of individual universities in Japan, NISTEP identified each university's strengths and analyzed the status of paper production of the university to the internal organization level.

The proportion of top 10% highly-cited publications vs. the number of publication in the Japanese, UK, and German universities (2013-2017)



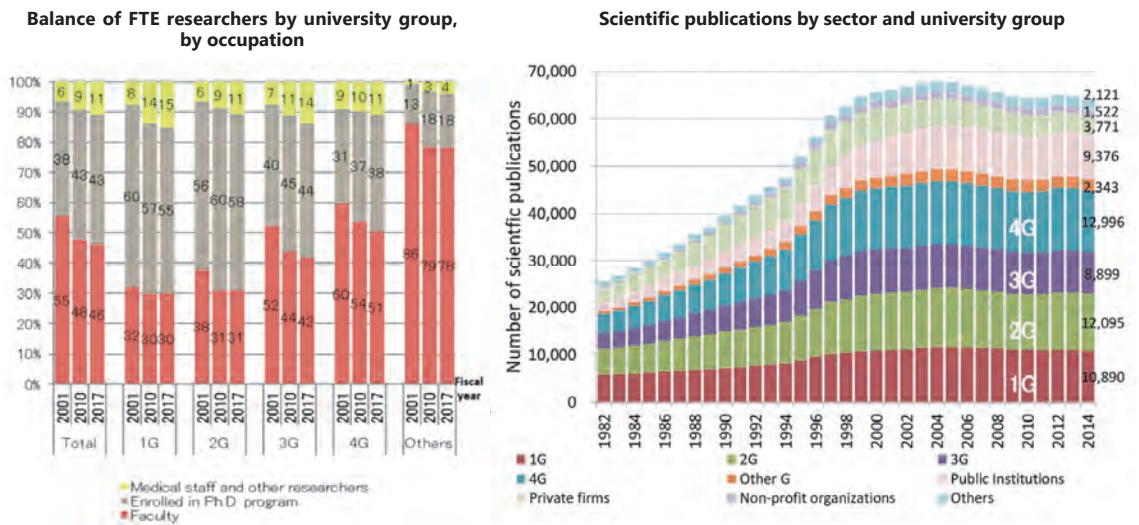
The analysis was made by using publications with 100 or fewer authors in order to exclude the influence of publications of large-scale international joint research.

(Source: Benchmarking Research Capability of Universities in Japan, the United Kingdom and Germany 2019, Research Material-288 (2020))

Input/output structure of the Japanese university system

Universities play a main role in producing scientific knowledge in Japan. To contribute to the formulation of S&T policy, it is necessary to understand the state of scientific research at universities from both input and output perspectives. We therefore consider Japanese universities as a system and analyze the system's input/output structure, treating R&D expenditure and number of researchers as the inputs, and number of publications as the output.

Structure of scientific paper production by field of science and university group in Japan: Japanese universities are categorized into 4 university groups, in accordance with share of scientific papers (natural science).



(Source: Detailed analysis of full-time equivalent R&D expenditure and the number of researchers in Japanese universities, Research Material-297 (2020))

(Source: "Output Structure of the University System in Japan: In-depth Analysis of the Scientific Papers by the University Group," Research Material-271 (2018))

S&T Foresight and Trend Analysis

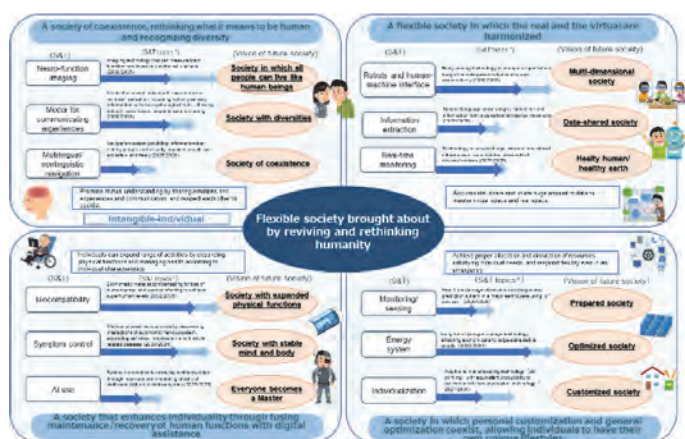
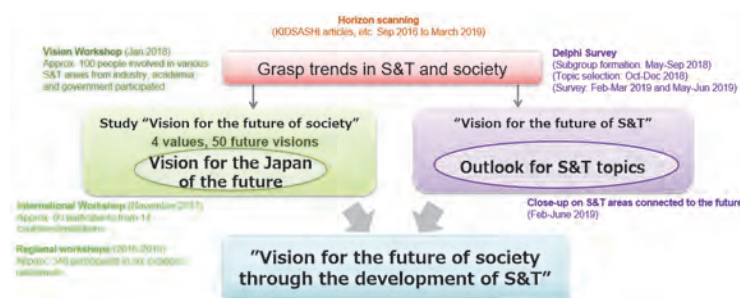
S&T foresight activities that analyzes current trends and looks towards the future of society by constantly measuring and analyzing new developments in S&T are indispensable tools for contributing to STI policy making. To envision the future S&T, its products, and society, along with constantly being engaged in foresight activities, NISTEP is also conducting to develop new foresight methods and information gathering and analysis techniques that take advantage of ICT.

◆ Developing and enhancing S&T foresight

Japan has continued to conduct large scale S&T foresight surveys at five-year intervals since 1971 in order to gain insight into S&T and the future that it will bring about. NISTEP has been the organization that is primarily responsible for these surveys since the fifth study in 1992.

NISTEP's S&T foresight is characterized by a long-term horizon of the next 30 years, and by a wide range of discussions with stakeholders from different fields, such as experts from S&T and those from the demand side and from social sciences and humanities. By combining a number of techniques to envision the future of society, NISTEP attempts to identify the S&T that will help realize this future and the social systems and policies that will be needed. We also use case studies to develop new techniques and to perform in-depth analysis. Furthermore, NISTEP conducts horizon scanning that is a continuous and systematic process to identify emerging trends in new S&T and signs of the resulting social changes. We use quantitative and qualitative approaches to explore and analyze new movements in science and technology and society, and we provide information, in the form of research reports and other materials, on these "signs of change" that allows for some level of uncertainty. Furthermore, we are taking a global lead in this area by strengthening the international network for foresight activities by taking steps such as participating in international projects and conducting international workshops.

S&T Foresight 2019: Framework



(Source: S&T Foresight 2019: Society in 2040 through the Development of S&T -Conceptual scenarios, Research Material-291 (2020))

◆ Expert network supporting foresight activities

To aid in these foresight activities, NISTEP maintains a diverse network of some 2,000 experts, and leverages this expert network to collect the views of numerous experts through questionnaires. The results of these surveys are used not only in foresight activities, but also in creating fundamental data and materials in support of STI policy, such as designing the areas for research grants.

Data-oriented Research on Promoting S&T and Academia

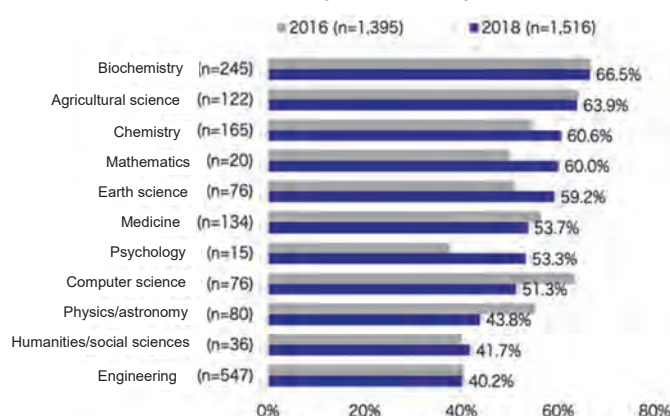
The digital transformation (DX), starting with Japan's Society 5.0 initiative, is bringing about major change in not only the information arena, but also in S&T, academia, and society. Examples of this include the advancement of open data throughout society, open science in the field of scientific research, and EBPM in public administration. It is essential to understand the direction of this change—and in some cases indicate what the future should look like—and then make adjustments to NISTEP's own research to address these developments. Therefore, along with identifying new trends in research—such as open science—and pursuing research that aids in the formulation of policy that address these shifts, NISTEP also works to develop information analytical techniques and systems in the policy area that incorporate artificial intelligence (AI) in collaboration with outside research institutes.

◆ Identifying and addressing new trends, including open science

It is widely thought that open science will transform scientific research and influence new relationships between S&T and society, and NISTEP is carrying out research on the topic of sharing research findings and data.

For example, in connection with preprints—manuscripts made available prior to peer review—NISTEP has surveyed researchers in Japan to understand how they use this material and we have also collected and analyzed data from well-known preprint servers to carry out fact-finding on an international level in certain areas

Data disclosure by field of study



(Source: A Survey on Open Research Data and Open Access 2018, Research Materials-268, 289 (2020))

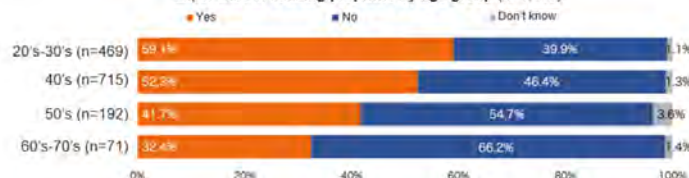
- Survey subjects
 - S&T Expert Network: 1,914 persons
 - Valid responses: 1,448 persons (75.7% response rate)
- Survey period
 - Aug 17, 2020 to Aug 31, 2020 (until Sep 6)

*(n=1,447) one person of unknown age excluded

Experience in utilizing preprints (n=1,448)



Experience in utilizing preprints by age group (n=1,448)



(Source: Survey on Utilization and Perception of Preprints, Research Material-301 (2021))

◆ Developing new analytical techniques and systems incorporating AI

In the context of STI, there are already various sources of open data, and new types of data are starting to be offered. For example, on the input side, data related to competitive funding such as Grants-in-Aid for Scientific Research (Kakenhi), is publicly disclosed. On the output side, new types of data, such as preprints (drafts before official publication) are beginning to make their presence felt. It is necessary to carry out new research to identify trends in the new types of data in the latter category, and it is also necessary to cross-tabulate the various types of published data to carry out unified and multifaceted analysis. In response to the trends in DX and EBPM, in addition to providing conventional analytical results in the form of reports published by policy research institutes, it is also important, for example, to provide “analytical mechanisms”

that facilitate the analysis of data from policymakers’ own perspectives. To accomplish this, along with using AI technologies such as natural language processing and machine learning to collect and analyze various types of data in order to research methods for constantly identifying new trends in S&T from a variety of perspectives, we are also developing, on a trial basis, an analysis/visualization platform using ICT so that some of the research results can be provided as a system service.



How to read this chart

Each point in this chart represents a preprint about the COVID-19, and preprints with similar content are placed closer together. The preprints have been divided into 16 groups based on their proximity and color-coded. Each group has been assigned a name, such as “Infection model,” based on the frequently occurring words for each group.

This makes it possible to envision the main topics of research and their semantic proximity. Furthermore, cross-tabulating this data with the preprint dates and the countries and regions of the authors’ institutions makes it possible to perceive research trends from various angles.

(Source: A Trial of early detection system for research trends through the preprints data — Research status around COVID-19 / SARS-CoV-2, Discussion Paper 186 (2020))



(Source: A Trial of early detection system for research trends through the preprints data — Research status around COVID-19 / SARS-CoV-2, Discussion Paper 186 (2020))

Science of Science, Technology and Innovation Policy

The public has growing expectations for S&T as a means of addressing the various changes in economy and society and resolving today's most pressing social issues. This kind of policy formation requires a highly rational and transparent process based on objective evidence. NISTEP is committed to developing data infrastructure to contribute to Science, Technology, and Innovation (STI) policy.

The United States, Europe, and others are conducting research to scientifically analyze the mechanisms of STI and taking action to build data infrastructure based on their policymaking. For its part, Japan currently advocates "Science of science, technology and innovation policy" as a new field providing a foundation for transition from conventional S&T policy to STI policy that encompasses other related policies.

Based on this background, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) launched the "Science for RE-designing Science, Technology and Innovation Policy (SciREX)" program in FY 2011 to achieve "evidence-based policy formulation" that will create effective policies addressing pertinent issues based on analysis and full understanding of economic and social circumstances from multifaceted perspectives.

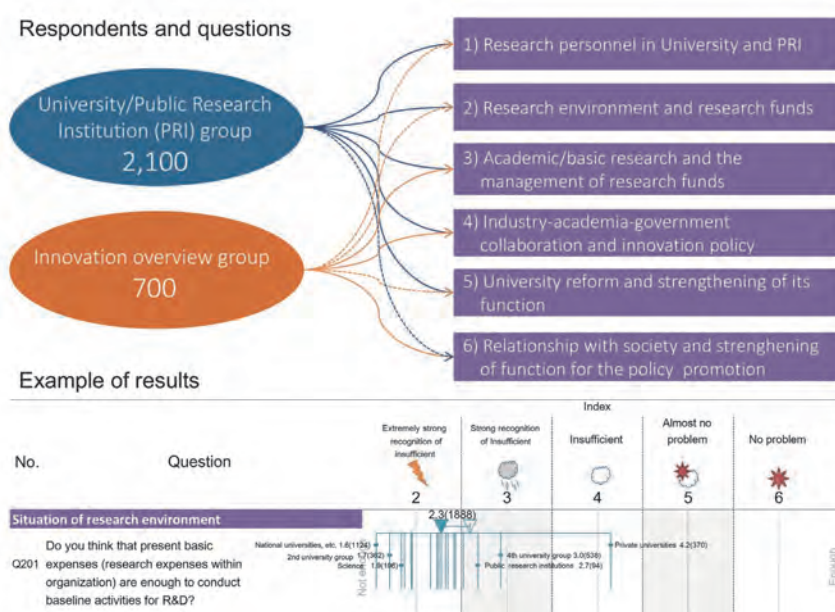
NISTEP takes charge of promoting the development of useful data infrastructure for research or analysis in the area of Science, Technology, and Innovation policy formulation.

Situation Regarding Science and Technology

The NISTEP expert survey on Japanese S&T and innovation system (NISTEP TEITEN survey) aims to track the status of the system by continuously collecting responses to a fixed questionnaire distributed annually to a fixed group of respondents. The respondents consist of about 2,800 Japanese experts and researchers in universities, public research institutions, and private firms. The survey has several features: it asks the respondents to compare the statuses between the targeted year and the previous one by showing them their answers in the survey previous year; it collects information that are usually difficult to be measured through R&D statistics, including descriptive answers by the respondents; and its questionnaire is linked to the issues mentioned in the Japanese fifth S&T basic plan.



NISTEP TEITEN Survey: respondent groups and survey questions



(Source: Analytical Report for NISTEP Expert Survey on Japanese S&T and Innovation System 2020 (NISTEP TEITEN survey 2020), NISTEP Report No. 189 (2020))

Information on research results

NISTEP also provides the following information to the public

◆ **NISTEP Newsletter**

The NISTEP Newsletter (Japanese only), launched in February 2011, introduces our activities at any time by email.

◆ **STI Horizon**

NISTEP's STI Horizon journal, published quarterly, delivers information that contributes to STI policy. The published interviews introduce readers to highly insightful expert views (special interviews) as well as the findings of younger researchers of note (Nice Step researcher interviews). The Horizon and Report sections of the journal present a broad range of forward-looking research.

STI Horizon : <https://www.nistep.go.jp/stih/>

◆ **Review Seminar**

Every year, NISTEP presents its research outputs to the public, including universities, enterprises, and government agencies. The goal of the review seminar is to interest more people in NISTEP's research activities.

NISTEP Selection (Nice Step Researchers)

Since 2005, NISTEP has been selecting researchers who made outstanding contributions to S&T as the "NISTEP Selection" (Nice Step Researchers).

NISTEP also organizes symposia to present their cutting-edge research achievements and initiatives that advance science and technology.



2020 NISTEP researchers meet the Minister of Education, Culture, Sports, Science and Technology, Mr. HAGIUDA Koichi

Collaboration and cooperation with other institutes

NISTEP concludes agreements with policy research institutes and universities in Japan and overseas to conduct joint research and personnel exchanges, and to invite leading researchers for symposia.

In addition, NISTEP promotes international collaboration by participating in Trilateral Science and Technology Policy Seminar that government-affiliated think tanks in Japan, China and South Korea present and discuss their research activities.

[Collaboration partners]

○National Graduate Institute for Policy Studies (GRIPS)

○Japan Science and Technology Agency (JST) and Riken

○Overseas policy research institutes

(USA, EU, Germany, UK, France, China, South Korea, Russia, Finland, Egypt and Turkey)

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Tokyo Metro Ginza Line:
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Tokyo Metro Chiyoda Line/Hibiya Line/Marunouchi Line:
Kasumigaseki Station, Exit A13 (5-minute walk)

WEB <https://www.nistep.go.jp/en/>

