

# Outline of the Fifth Science and Technology Basic Plan Provisional translation

- The Science and Technology Basic Plan is a comprehensive plan prepared by the Japanese government in accordance with the Science and Technology Basic Law in order to promote science and technology in Japan over a five-year term, based on a 10-year forward outlook.
- The 5<sup>th</sup> Basic Plan (FY2016 to FY2020), **the first plan formulated by the Council for Science, Technology and Innovation (CSTI)**, is focused on **enhancing “science, technology and innovation (STI) measures.”**
- Executing this Basic Plan will require a wide spectrum of parties—including **the government, academia, industry, and citizens—to work together** and lead to transform Japan into **“the most innovation-friendly country in the world.”**

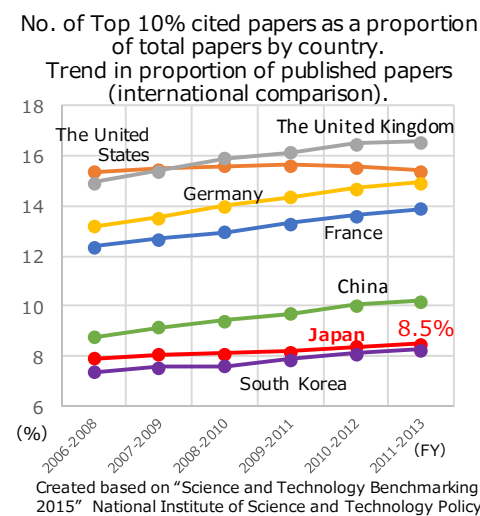
## Chapter 1: Basic Concepts

### (1) Recognition of the Current Situation

- Advances in ICT, etc. have ushered in an **“era of drastic change”** in which the social and economic structures of the nation are significantly changing on a daily basis.
    - Appearance of **markets and businesses that do not fit within existing frameworks**
    - Shift from **the tangible to the intangible** and a **diversification** of values
    - Change in knowledge and value creation processes (emphasis on **open-innovation** and a trend to **open-science**), etc.
  - Increasing scale and complexity of **domestic and global-scale challenges** (such as energy restrictions, the declining national birthrate and aging population, regional impoverishment, natural disasters, changes in security environment, and deepening global-scale challenges, etc.)
- ⇒ In light of this, it is necessary to pursue STI (while considering the multi-faceted nature of S&T, appropriately utilize the fruits).

### (2) Achievements and Challenges in 20 Years of Science and Technology Basic Plans

- **Steady development of Japan’s R&D environment** and enhancement of its international competitiveness, such as by increasing the numbers of researchers and published papers. Advent of new science and technology that **changes people’s lives and the economy**, such as LEDs and iPS cells. The fact that the nation has produced the second highest number of Nobel Prize winners (in the natural sciences) this century proves that Japan’s science and technology has a strong international standing.
- In recent years, however, Japan’s **“fundamental strength” has declined**, as demonstrated by a drop in the quality and quantity of papers by international standards, delays in establishing international research networks, and the difficulty of young researchers to demonstrate their abilities. **Industry–academia partnerships have also failed to develop fully**. These problems can be attributed to **delays in reforming** the administration and human resource systems of **universities** and the **existence of “barriers”** between organizations.
- **Growth in government R&D investment has stalled. Japan’s international standing is on the declining trend.**



### (3) Target National Profile

- A description of the kind of country the Basic Plan envisions

- ① Sustainable growth and self-sustaining regional development
- ② Ensure the safety and security for our nation and its citizens along with a high-quality, prosperous way of life
- ③ Respond to global challenges and contribute to global development
- ④ Sustainable creation of intellectual property

### (4) Basic Principles

- Focus on the ability **to look ahead with vision and strategically take action (foresight and strategy)**, enhance the ability **to respond appropriately to any kind of change (diversity and flexibility)**.
- With the participation of **all fields of humanities, social sciences, and natural sciences**, build a framework that enables all kinds of individuals to compete and cooperate within an **internationally open innovation system** and **to fully demonstrate their abilities**.

#### ① Four pillars of the Fifth Science and Technology Basic Plan

- i) Acting to create new value for the development of future industry and social transformation.
- ii) Addressing economic and social challenges
- iii) Reinforcing the “fundamentals” of STI
- iv) Establishing a systemic virtuous cycle of human resources, knowledge, and capital for innovation

※ In pursuing i to iv, an approach that integrates S&T diplomacy and aims at strategic international implementation is essential.

#### ② Important issues in the promotion of the S&T Basic Plan

- i) Deepening the relationship between STI and society
  - ii) Enhancing capacity to promote STI
- Based on the 5th Basic Plan as general guidelines over a five-year term, a **“comprehensive strategy”** will be formulated each fiscal year, and measures will be undertaken flexibly.
  - **Performance indicators and numerical targets** will be set to assess the progress and outcomes of the plan. (Targets will be set to monitor the achievements of the country as a whole. Care is necessary to avoid that achievement of these numerical targets has become its own goals in each workplace such as university, R&D institutions, etc.)

## Chapter 2: Acting to Create New Value for the Development of Future Industry and Social Transformation

**To enable Japan to instigate major change and to remain a world leader in this “era of drastic change,” we will reinforce R&D that generates discontinuous innovation and will boost efforts to devise mechanisms for realizing the world’s first “super smart society” that creates new value and services in rapid succession.**

### (1) Fostering R&D and Human Resources that Boldly Challenge the Future

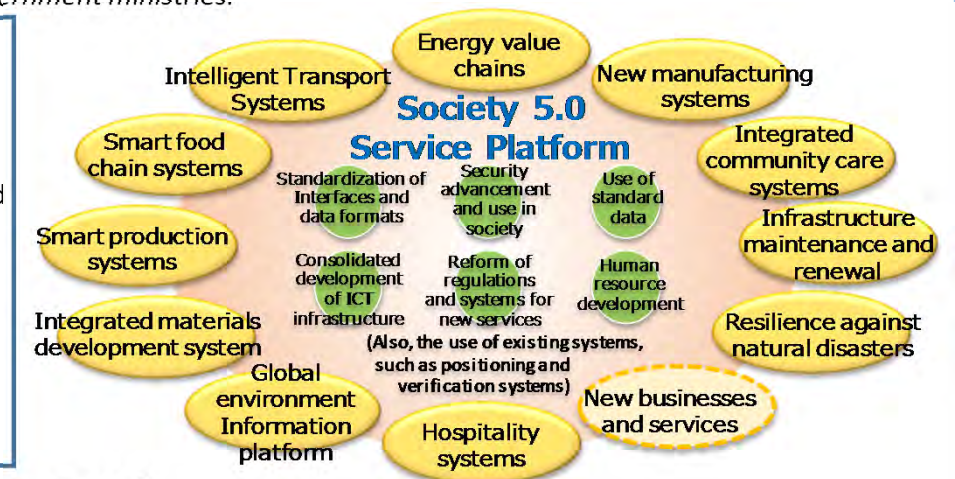
- It is important to try and overcome high hurdles resolutely, without fear of failure, and to engage in generating innovation beyond reach of others. In addition to **encouraging efforts to tackle R&D initiatives focused on novel ideas and on economic and social impact**, we will provide individuals and teams who have **highly creative ideas** and the energy to implement them, with **opportunities to trial their ideas** (such as by promoting measures suited to the promotion of daring R&D challenges in the R&D projects of relevant government ministries, and by further developing and expanding ImPACT etc.).

### (2) Realizing “Society 5.0” (“Super Smart Society”)

- Around the world, initiatives that use networks and the Internet of Things (IoT), centered on manufacturing fields, are now coming out. In Japan, the use of such networking **will not be limited to manufacturing. Instead, it will be extended to various other fields** in order to promote economic growth, the formation of a healthy and long-living society, and **social transformation**. In addition, **it will help the fruits of science and technology to penetrate into all kinds of fields and spheres**, and thereby lead to enhanced business capability and higher quality services.
  - We will **share our vision of the future**, which is characterized by the sophisticated integration of cyberspace with physical space (“the real world”) and **work to enhance it, while further pursuing a series of measures** aimed at its realization, **under the concept of “Society 5.0”**.\*
- \* The history of humankind reveals that the evolution of human society has been fueled by technological advances, with key steps along the way as a hunter-gatherer society, agrarian society, industrial society, and, today, an information society. “Society 5.0” is next, and we’ll achieve it by mobilizing the full power of STI.
- It is necessary to aim at **“systemization”** of services and businesses, system advancement, and **coordination between multiple systems**. Therefore, we will promote the measures needed to **develop a common platform for this goal** (called **“Society 5.0 Service Platform”**), through collaboration between industry, academia, and government and the relevant government ministries.

#### What is Society5.0?

It is a society that can be expected to **facilitate human prosperity**. Such a society is capable of providing the necessary goods and services to the people who need them at the required time and in just the right amount; a society that is able to respond precisely to a wide variety of social needs; a society in which all kinds of people can readily obtain high-quality services, overcome differences of age, gender, region, and language, and live vigorous and comfortable lives.



### (3) Enhancing Competitiveness and

#### Consolidating Fundamental Technologies in Society 5.0

- Enhance IP and international standardization strategies, fundamental technologies, and human resources, in order to maintain and increase competitiveness.
- Create new businesses through the promotion of system package exports and turn the fact that Japan is an advanced economy facing many serious challenges into a strength.
- Focus on the fundamental **technologies needed for the service platform** (such as cybersecurity, IoT system development, “big data” analysis, AI, and devices etc.) and strive to enhance **technologies that represent core strengths for new value creation** (such as robots, sensors, biotechnology, materials and nanotechnology, and Light/quantum technology etc.), by setting ambitious targets from a medium-term perspective.

## Chapter 3: Addressing Economic and Social Challenges

To preemptively address emerging national and global challenges, Japan is identifying important policy issues and pursuing STI in attempts to find solutions.

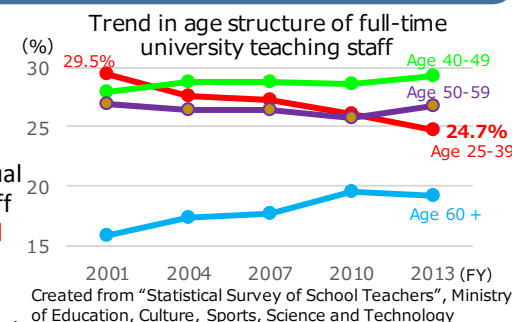
- For each of the 13 important policy issues, we are systematically pursuing measures from R&D to use in society.
  - <Sustainable growth and self-sustaining regional development>
    - Ensuring stable energy and improving energy efficiency
    - Ensuring stable resources and cyclical use;
    - Securing a stable food supply
    - Establishment of a society in which people enjoy long and healthy lives with world-leading medical technology
    - Building infrastructure for sustainable cities and regions;
    - Extending service life for efficient, effective infrastructure
    - Improving competitiveness in manufacturing and value creation
  - <Ensure safety and security for our nation and its citizens and a high-quality, prosperous way of life>
    - Addressing natural disasters
    - Ensuring food safety, living environments, and occupational health
    - Ensuring Cybersecurity
    - Addressing national security issues
  - <Addressing global challenges and contributing to global development>
    - Addressing global climate change; • Responding to biodiversity loss
- In association with responses to a variety of problems, we will continuously enhance the series of science and technology initiatives that support the appropriate development, utilization, and management of “the oceans” and “space” which are strategically important frontiers for Japan, from a long-term perspective.

## Chapter 4: Reinforcing the “Fundamentals” for STI

To flexibly and appropriately respond to the various changes that may occur in the years ahead, we will work at thoroughly consolidating fundamental strengths while focusing on fostering young human resources and improving their career prospects in STI, and on reforming and enhancing the functions of universities.

### (1) Developing High-quality Human Resources

- Clearly defining career paths for young researchers and establishing an environment that enables them to actively demonstrate their abilities and motivation according to the stage of their career (such as by increasing the number of tenure posts for young researchers through the adoption of annual salary schemes and the conversion to fixed-term employment for senior staff at universities; promote introduction of the tenure track system as a general rule; and increasing the number of young full-time teaching staff at universities by 10%; etc.).
- Foster and secure a diverse human resources who engage in STI, and establish career paths for them; reforms of graduate school education through collaboration with universities, industry, and other sectors; and develop human resources that will engage in STI in the next generation.
- Improve women’s career prospects in STI by bringing up and appointing women leaders; increase the number of women researchers as a proportion of new hires (to 30% overall in the natural sciences); and expand the number of women for the next generation.
- Develop international research networks by enhancing support for Japanese researchers going overseas and increasing the level of acceptance and retention of foreigners in Japan; promote greater mobility of personnel across disciplines, organizations, and sectors.



### (2) Promoting Excellence in Knowledge Creation

- Reforms and enhancements aimed at promoting academic and basic research as a source of innovation (This includes the reform and enhancement of Grants-in-Aid for Scientific Research (KAKENHI) in accordance with the public mandate; reform and enhancement of strategic and imperative fundamental research; improvement of interdisciplinary research; pursuit of international joint research; and the formation of research centers that meet the highest international standards etc.)
- Strategic enhancement of common fundamental technologies to support R&D activities, facilities, equipment, and information infrastructure; and the development of a system for implementing open science (such as by expanding the utilization of findings from publicly funded research etc.).
- Increase the number of published papers through such efforts, and increase the number of Top 10% papers as a proportion of total papers (to 10%).

### (3) Strengthening Funding Reform

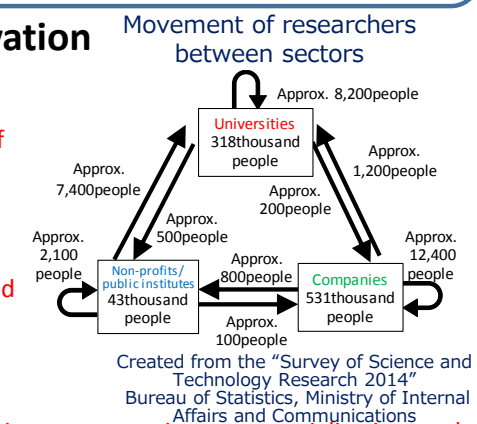
- Reform and definite measure of fundamental expenses in order to enable more efficient and effective management of universities
- Reform of public funding (such as by making competitive funds easier to use, examining the inclusion of overhead expenses into all research funding, and promoting the shared use of research equipment etc.).
- Integrate national university reform with research funding reform (including new allocation and assessment of operating expense grants etc.)

## Chapter 5: Establishing a Systemic Virtuous Cycle of Human Resources, Knowledge and Capital for Innovation

To create new value and rapidly pursue its use in society, using domestic and overseas human resources, knowledge, and capital, we will establish a system that rotates personnel, knowledge, and capital across all kinds of barriers to generate innovation by promoting full-scale collaboration between companies, universities, and public research institutes, and by encouraging entrepreneurship and boosting the creation of startup companies.

### (1) Enhancing Mechanisms for Promoting Open-innovation

- Enhance promotion systems in companies, universities, and public research institutes (such as by engaging in full-scale collaboration with input of human resources, knowledge, and capital from industry; management system reform of universities; and enhancing the “bridging” function of National R&D Institutes).
- Accelerate the mobility of human resources and create “spaces for co-creation” to concentrate personnel, knowledge, and capital.
- Through these initiatives, increase the number of researchers transferring between sectors by 20% and the amount of collaborative research funds received from industry by universities and National R&D institutes by 50%.



### (2) Enhancing the Creation of SMEs and Startup Companies to Tackle New Business Opportunities

- Provide appropriate support at each phase, from nurturing entrepreneurs, starting up companies, commercialization, and business growth (such as by promoting the creation of academic startups, guaranteeing initial demand for new products and services etc.), increase IPOs and M&As.

### (3) Strategic Use of International Intellectual Property and Standardization

- Promote utilization of IP scattered across small and medium-sized companies and universities (increase proportion of domestic patent applications by small and medium-sized companies to 15%, increase the number of license agreements on university patents by 50%), promote international standardization and enhance support systems for this purpose.

### (4) Reviewing and Improving the Regulatory Environment for Innovation

- Review systems in accordance with new products and services, improve IP systems in response to tremendous development in ICT.

### (5) Developing Innovation Systems that Contribute to “Regional Revitalization”

- Drive self-regulating and sustainable innovation systems through regional leadership (such as promote revitalization of regional companies etc.).

### (6) Cultivating Opportunities for Generating Innovation in Anticipation of Global Needs

- Establish mechanisms to promote anticipation of global needs and inclusive innovation\*

\* Socially inclusive and sustainable innovation. In science and technology cooperation with newly emerging and developing countries, aim to shift from the aid-style cooperation of the past.

## Chapter 6: Deepening the Relationship between STI and Society

In pursuing STI, we will work to communicate and cooperate with a variety of stakeholders in society.

- Promote “co-creation” with a variety of stakeholders. Issue scientific advises for policy formation and address ethical, legal, and social issues. In addition, take measures to ensure research integrity.

## Chapter 7: Enhancing Capacity to Promote STI

Reform and enhance the functions of universities and National R&D Institutes that are the main agents of STI; enhance the system for promoting STI policy; and ensure R&D investment.

- Radically reform and enhance the function of universities based on a recognition of their “contribution to society through education and research”, and reform and enhance the function of National R&D Institutes, as a driving force of the innovation system.
- To increase the effectiveness of STI policy, by aiming for a unified implementation of international STI activities and science and technology diplomacy, and by promoting policy based on objective evidences. Also, enhance the “control tower” function of CSTI (such as by constantly improving policy quality through the use of performance indicators, promote SIP etc.).
- To implement the Basic Plan, ensure that combined public and private sector R&D investment is at least 4% of GDP, and that government R&D investment is at least 1% of GDP, maintaining compatibility with “The Plan to Advance Economic and Fiscal Revitalization.” If GDP growth averages 3.3% per year over the term of the Basic Plan, total government R&D investment would be approximately 26 trillion yen.