

Japan's STI Policies looking beyond Mid-Long Term

Tentative translation

– Toward the 5th Science and Technology Basic Plan –

(Interim report, proposed by the Council for Science and Technology, under the jurisdiction of MEXT, January, 2015) Overview

Chapter 1: Basic Concept

1. Influences on STI policy due to socio-economic conditions and changes

Socio-economics has been greatly changing. This also has a great influence on STI policies.

- ✓ Due to population decline, it will become more difficult to increase human resource volume. **System reforms on human resources that place importance on improving the quality of human resources** will be necessary going into the future.
- ✓ **In order to react quickly and flexibly with alacrity to new diverse issues in the future, the creation of new systems that enable sustainable open innovation** (※1) will be indispensable.
- ✓ Cyber space has quickly expanded and **“the advanced cyber society”** (※2) **has arrived**. The arrival of this new society continues to have a great effect on society and the shape of science. Further, due to changes in the state of geopolitics and in the security environment, involving Japan, there is a rising importance for **obtaining, maintaining, and accumulating technologies that government should be responsible**. A response to these changes must be made.
- ✓ Sincere initiatives are necessary for **regaining trust from society** in regard to S&T and researchers, etc. since having a drop in reputation due to the Great East Japan Earthquake and dishonest research practices, etc.

※1 Methods that make proactive use of outside knowledge and technology in innovation.

※2 A society where the fast expansion of cyberspace does not merely act as a supplement and substitution for actual society, but rather where a variety of activities that exceed the realm of actual society are autonomously carried out in cyberspace and, through a unification/fusion with actual spaces, come to exert a large influence over actual society.

2. Trends in foreign STI policies

In overseas countries, STI policy is positioned as an important measure in propelling the country's development, and initiatives are strengthened by planning for the expansion of expenditure, etc.

USA: The “Strategy for American Innovation” establishes a target of 3% of GDP for total R&D expenditure (combined total for private and governmental R&D expenditure). In American policy in recent years there has been a common theme of placing importance on successive funding for basic research in order to maintain competitiveness.

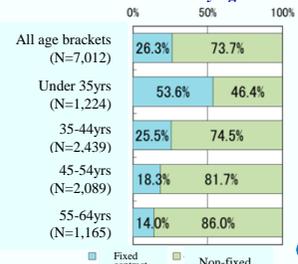
Europe: EU has established a target of 3% of GDP for total R&D expenditure. In Germany, in addition to achieving this in FY2012, an importance has been placed on the promotion of innovation via initiatives such as “Industrie 4.0” and “The New High-Tech Strategy.” In the UK, despite budgetary austerities, funding to scientific research has been maintained.

Asia: China is aiming at becoming a driving force nation for innovation. Budget has been expanded for total R&D expenditure and priority areas have been strengthened. Korea has established initiatives for the expansion of governmental R&D expenditure under its 3rd Science and Technology Basic Plan (at approx 140% of previous plan).

3. Achievements and issues from the 1st Science and Technology Basic Plan

- Due to the initiatives of 20 years from the 1st Plan, **the substantive scope of researchers and patents, etc. and the high international competitiveness of basic research and research infrastructure have been Japan's great strengths on the world stage**. Further strengthening and effective efforts are needed at this.
- On the other hand, Japanese STI faces a vast number of issues. For example, the following are cited:
 - ✓ **The career prospects** for young researchers **are not clear and employment is unstable**. Also, due to the **“a generation gap in mobility,” etc. human resources are not able to perform at their full potential at the right posts**. Because of this, **students are hesitant in proceeding to doctoral courses**.
 - ✓ **The diversity of basic research in Japan is in declining**. Also, in regard to written theses, there is **a downward trend in international rankings for both quality and volume**.
 - ✓ **Systems appropriate for realizing innovation are insufficiently well established**, for example with fewer businesses involved in innovation realization than other countries. One of the reasons are **almost no mobility of human resources across the sectors** of industry, academia, and government.
 - ✓ Since the 2nd Basic Plan, **government of R&D expenditure goals have not been met**. **A decline in basic funds** for universities and R&D agencies has been one cause of many issues such as the decline in stable positions of researchers.

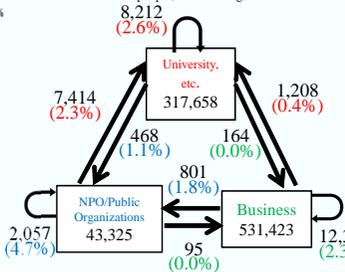
Ratio of fixed-term employment contracts in universities by age bracket



Source: NISTEP's "Survey of Human Resources in Science and Technology" (March, 2009)

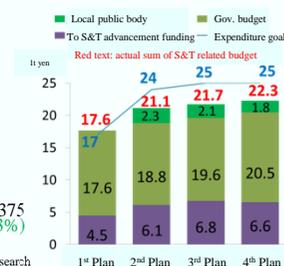
Transfer between sectors

(Unit: people; bracketed figures = transfer ratio)



Source: Compiled by MEXT based on MIC's "Survey of Research and Development"

Trends in governmental R&D expenditure goals and actual S&T-related budget under the S&T Basic Plan



- In order to resolve various issues and realize sustainable development in the world, the promotion of STI will be of continuing importance.
- The maximization of investment returns from the last 20 years will determine the success or failure of a future STI policy, and the 5th Science and Technology Basic Plan will play an extremely important role for Japan.

Chapter 2: Principles for next STI policy

1. Target picture of Japan → “Building nation based on STI”

A nation that realizes sustainable development for Japan and the world, with high level STI skills that, through its innovation activities, finds solutions to problems inside and outside of its borders

STI:

Create intellectual and cultural value based in new knowledge derived from scientific discoveries and invention, etc., and, through the development of that knowledge, **bring about reforms that lead to the creation of financial, social, and public value**.

As concrete examples of the target picture of Japan being “A nation that realizes sustainable development for Japan and the world,” the following 3 ideals will shape that direction.

- ➔ **Ideal 1:** Live together with Earth and contribute to the advancement of mankind
- ➔ **Ideal 2:** Ensure the safety of the country and its people, and realize a comfortable and happy life
- ➔ **Ideal 3:** Preserve world-ranking top-class economic strength and presence

2. Change the shape of STI and raise the importance of the innovation creation basis

If the following changes are made to the shape of STI, **the importance of innovation creation basis increases**.

- ✓ Change from an old “linear” model that propels basic, application, and developing research in a straight line to a research model that moves forward in a “spiral” and interactive manner
- ✓ Switch from a so-called “self-sufficiency” model to one that values “open innovation”
- ✓ Increase the importance placed on integration and cooperation between the all fields of the humanities, the social sciences, and the natural sciences

3. The government's role in STI – important initiatives for the future

Aiming at the realization of the target picture of Japan, government initiatives will place importance on the following 2 points.

(1) Strengthening the innovation creation basis

- In order to respond with alacrity to diverse issues, strengthen innovation creation basis as the basis for STI potential.
(Reform human resource systems, strengthen and reforms in academic and basic research as the basis for innovation, and strengthen and reform research infrastructure, create new innovation systems, etc.)

(2) Leading society through STI

- Develop the diverse knowledge and value that comes out of innovation creation basis, resolve various domestic and foreign issues, and drive societal reforms.
(Resolve policy issues, realize the desired “the advanced cyber society,” develop “National Critical Technologies,” S&T diplomacy, and regain trust from society, etc.)

4. Basic stances on the promotion of STI policy

The 6 basic stances that, in particular, concerned parties should be strongly aware of the promotion of STI policy.

- Invigoration of academic research that explores the frontiers of knowledge.
- Promotion of initiatives in global society.
- The basic roles of universities, public R&D agencies, and industries.
- Basic consideration of distribution of budget.
- Unified promotion via cooperation between related policies.
- Cooperation and joint-understanding with all stakeholders.

Chapter 3: Strengthening the innovation creation basis

1. Human resource system reforms

(1) Reforming career systems for young human resources

- ✓ In order to **clarify career paths: introduce, as a rule, a tenure track system** in the employment of young university researchers; plan to **expand the number of stable posts to which young people can aspire** through **promoting the introduction of an annual salary system and changing to fixed-term employment systems for senior researchers**; and, establish the **“System for Distinguished Researchers (provisional name),”** etc.
- ✓ **Diversify career paths** by taking full advantage of matching opportunities provided through mid-to-long term internships, etc.
- ✓ Improve financial support for doctoral students and create environments where young researchers can work and flourish, etc.

(2) Fostering human resources for STI

- ✓ **Reforms to graduate school education** by improving doctoral course education through cooperation with industries; foster human resources related to STI that will bear responsibility for the future by **integrated reforms to high schools, university education, and university entrant selection systems**, etc. ; and, foster and secure technology experts, etc.

(3) Promoting active participation of a diverse range of human resources

- ✓ **Promote the appointment of women as leaders**, create environments for the acceptance of foreign researchers, and support foreign exchange students, etc.

(4) Increasing mobility of human resources beyond organizational, sectorial, and national borders

- ✓ **Proactively introduce new salary and employment systems**, such as annual salary system and cross-appointment schemes, and **improve support for young people working overseas**, etc.

2. Strengthening the basis for innovation

(1) Promoting academic and basic research as the basis for innovation

- ✓ As the government, **place importance on funding academic and basic research** that is not being implemented via the market principle.
- ✓ **Reform and strengthen Grants-in-Aid for Scientific Research (KAKENHI) in order to meet the demands of society**; reform and strengthen joint usage / research system; promote Strategic Basic Research Programs effectively and efficiently through the setting of strategic goals grounded in evidence; and, establish world-level research centers, etc.

(2) Strategically strengthening the common basic technology, institutes/facilities, and information infrastructure that supports R&D activities

- ✓ Promote R&D in common basic technology such as nanotech, photon and quantum, telecommunications, and mathematical sciences; establish shared-use and develop platform of institutes and facilities that are accessible to industry, academia, and government; equip institutes and facilities for universities and strengthen information infrastructure; etc.

3. Creating innovation systems that enable sustainable open innovation

(1) Reforming industry-academia-government collaboration

- ✓ Promote the transfer of people, things, money, and information between industry, academia, and government (**increasing mobility of human resources beyond sector boundaries, clarify research outcomes and needs**, etc.); **create new innovation systems that allow for swift R&D and societal implementation** through, for example, the **building a “collaboration platform”** where it is possible for knowledge, views, and ideas, etc. from industry, academia, and government to stimulate one another and work on strategic outcomes together; and, promote **regional creation through STI**; etc.

(2) Strengthening of support for commercialization and promotion of private businesses’ STI activities

- ✓ Improve support for strong university-originated ventures creation; strengthen support for small and medium enterprises; give favorable tax treatment to private businesses working to implement R&D; etc.

(3) Fostering and securing human resources that support innovation systems (“innovation promoting human resources”)

- ✓ Foster and secure innovation promoting human resources such as program managers, research administrators, and technical support staff, etc.

Chapter 4: Leading society through STI

1. STI through policy setting

(1) Responding to important societal issues

- ✓ **Promote research on the 5 policy issues** (realization of clean and economical energy systems, realization of a healthy, long-living society as a driver of international society, etc.) in the Comprehensive Strategy on STI **effectively as “World-leading Strategies”**, which are recognizing Japan’s strengths and weaknesses and enhancing strengths and overcoming weaknesses.

(2) Reforms toward realizing the desired “the advanced cyber society”

- ✓ **Set responding to the fast development of a cyber society as a new important policy issue.**
- ✓ Promote R&D directed toward the creation of new cyberspace-based services; respond to the influence of cyberspace activities on actual society, such as cyber security; reform STI promotion methods, such as data science; and, foster and secure human resources; etc.

(3) Promoting “National Critical Technologies” that nation should take leadership

- ✓ With consideration to changes in the security environment involving Japan, beginning with its posture in regard to geopolitics; acquire, maintain, and develop **technology as the basis of the nation’s existence (“National Critical Technology”)** and secure Japan’s independence and autonomy **in order to protect the security and safety of Japan and its people or to provide a driving force for the growth of the country.** It is necessary to consider the concretion of technologies and the promotion of strategies.

Example of “National Critical Technologies”

Observation, prediction, and countermeasures for natural disasters; high-performance computing; space exploration; next-generation aircraft; ocean resource surveying; data-driven material design; dynamic living systems science; AI; robotics; cyber security; and, advanced lasers; etc.

2. Strategic deployment of S&T diplomacy

- ✓ Consider **international strategy based on cooperation programs for each different country**; restructure related projects can flexibly respond to international strategies.
- ✓ Build **centers for innovation through international cooperation both within and outside Japan** ; promote large-scale international cooperative R&D activities; etc.

3. Strengthening the relationship between STI and society

(1) Regaining trust from society

- ✓ **Respond to misconduct in research**; response to ethical, legal, and social issues arising from S&T; and, promote risk communication, etc.

(2) Development of S&T created together with society

- ✓ Promotion of involvement of a diverse variety of stakeholders in planning STI policy and carrying out S&T activities; promotion of S&T communication activities; and, promotion of **collaborative initiatives between the humanities, the social sciences, and the natural sciences**; etc.

Chapter 5: Optimization of capabilities for new STI creation

1. Strengthening the functions of universities

- ✓ In regard to national universities, **consider how important funding targets are, that take into account the maximization of universities’ capabilities** with reference to the distribution and evaluation of management expenses grants period for the 3rd Mid-Term target, starting FY2016.
- ✓ **Shape “Excellent Graduate Schools (provisional name)”** with world top-class level educational and research skills.
- ✓ Promote initiatives toward **strengthening IR function** in universities.

2. Strengthening function of the National Research and Development Agency’s function as the “innovation hub”

- ✓ With reference to its unique qualities, **strengthen the functions of the National Research and Development Agency as the “innovation hub” that acts as a driving force for new innovation systems.**
- ✓ In regard to initiatives such as create a **unique researcher evaluation system**; lead reforms in human resources systems; strengthen creation and use of intellectual property; **forming a place for the coming together of people, things, money, and information from industry, academia, and government**; promote initiatives through mid-to-long term goal setting and agency evaluations, through budget; funding allocation and project implementation, etc.

3. Reforming distribution of budget

- ✓ The government’s distribution of budget is **based on the idea of dual support by basic funds and competitive funds**. Plans will be made for the reformation and enhancement of both.
- ✓ Firmly set **indirect costs at 30% against overall funding for competitive research funds.**
- ✓ Reform competitive funds from **the perspective of fostering young human resources.** (**Promote labor expenditure** on principal investigator, and **improve perspectives on cultivating young human resources** through examinations and evaluations, etc.)

Chapter 6: Strengthening structures that promotes STI policies

1. Strengthening policy planning and promotion capabilities

- ✓ While managing its applicable policy areas, the Council for Science, Technology and Innovation will fulfill its leadership role.
- ✓ Promote science for re-designing STI policy and consider structures for giving scientific advice, etc.

2. Practical implementation of PDCA cycles in STI policies

- ✓ Carry out sustainable upgrading and maximization of R&D evaluation systems.
- ✓ Introduce and establish R&D program evaluation new systems, foster evaluation human resources and secure their career paths, etc.

3. Expansion of governmental R&D expenditure

- ✓ Governmental R&D expenditure goals have not been met since the 2nd S&T Basic Plan.
- ✓ **Under the 5th S&T Basic Plan, governmental R&D expenditure should be based on obtaining 1% of GDP, and total amount of the expenditure should be clearly published.**