Major Developments and Achievements of Korea's S&T Policy
- Focused on S&T Basic Plans -

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- toward the effective benchmarking of an integrated S&T policy -

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1. Introduction: A brief history of Korea's science and technology (S&T)

A milestone in Korea's science and technology policy was the establishment of the National Science and Technology Council (NSTC) in 1999, the highest decision-making body for Korea's S&T policy. The NSTC is responsible for policy deliberations and decisions, presided over by the President himself.

In the past decade, Korea's S&T policy and research activities have developed and grown at a rapid pace. One significant example is that the national R&D budget has expanded nearly ten-fold over the past 10 years. There are some 20 government ministries and agencies involved, to some extent or another, in national R&D programs.

Such exponential growth of S&T policy and activities has given rise to several significant issues. First, just as the size and scope of S&T activities expanded, so has the public interest in S&T naturally grown, leading people to question whether taxpayers' money is being directed to the right cause. As the number of government ministries engaged in the execution of R&D programs has risen to 20 and the government R&D budget now accounts for more than 5% of the total budget, there has emerged a growing need to monitor how efficiently and effectively the national R&D is being utilized. In addition there should be an ongoing assessment of whether the programs implemented by different ministries are overlapping with one another.

The subsequent efforts made at government-level were to institutionalize the overall evaluation and coordination of national R&D programs. National S&T planning has been strengthened and recommended to be better reflected in the S&T Basic Plan. It has become mandatory to set priorities for R&D at the national level.

Korea's S&T policy environment after 1999 can be basically divided into two periods: from 1999 to 2002; and 2003 to the present. This is because in February 2003 a candidate from a new political party was inaugurated as Korea's President.

2. NSTC, S&T Foundation Law

2-1 National Science and Technology Council (NSTC)

The establishment of the NSTC in 1999 was a landmark in the history of Korea's S&T policy. For Korea, the 1990s was the last period of rapid economic growth. The financial crisis that hit the country in late 1997 necessitated changes to the Korean economy, highlighting the importance of science and technology. The period between 1999 and 2002 was when there was a growing awareness that economic growth should be closely tied to S&T development.

The Special Act on Science and Technology Innovation, which was temporarily in force, served as the basis for the establishment of the NTSC in 1999. The NTSC was the first to conduct evaluation on national R&D programs implemented by the government ministries across the board. In 2001, the Science and Technology Foundation Law was enacted, succeeding the Special Act. The S&T Foundation Law requires the NTSC to establish the S&T Basic Plan every five years. At the end of 2001, the NSTC mapped out and announced the S&T Basic Plan for years 2002-2006.

The new government inaugurated in February 2003 stressed "balanced national development" and "new roles of science and technology," which were different from the past S&T policy direction. In accordance with these new national initiatives, the NTSC revised the Basic Plan and also changed the period over which the plan was to be carried out, to 2003-2006. The new government also created the position of Presidential Advisor for Information, Science and Technology Policy, completing the groundwork for building a "science and technology-driven society."

The year 2004 is marked by efforts to bring about significant changes to Korea's S&T administrative system. The concept of "science and technology" is being expanded and developed into "technological innovation." As part of this strategy, the Minister of Science and Technology has been promoted to the higher rank of Deputy Prime Minister.

In addition, an independent Office of the Ministry for Science and Technology Innovation, headed by a vice-ministerial level official, is to be established within the

Ministry of Science and Technology. The head of the Office will also serve as the secretariat to the NTSC. At the same time, the Science & Engineering Research Society, a group of government-funded research institutes, will be transferred to fall under the umbrella of the NTSC from the Prime Minister's Office.

Korea's S&T policy decision-making system is composed of: the President, who is the head of the NSTC; the NSTC itself, an organization responsible for deliberations and decisions regarding government policy as well as facilitation of the President's decision-making process; and the Presidential Advisory Council on Science and Technology. The Office of the Ministry of Science and Technology serves as the Secretariat of the NSTC. The latter consists, in order of the importance, of the Plenary Committee, the Steering Committee and the Planning Coordination Committee.

2-2 Science and Technology Foundation Law

The S&T Foundation Law, which went into effect as from 2001 and was revised in 2004, regulates the overall development of Korea's S&T. This law contains articles in relation to the NSTC discussed in 2-1 above, and also stipulates the five-year Basic S&T Plan as well as technology foresights and technology level and impact assessments.

According to the Foundation Law, Korea's science and technology innovation policy has to encompass industry, human resources and balanced regional development. It stipulates that while the NSTC is commissioned with evaluation of national R&D programs, pre-allocation of proposed R&D budget and coordination of R&D programs, the final compilation of budget is left to the Ministry of Planning and Budget. Moreover, it aims for efficient implementation of the Basic Plan within the establishment of a national S&T innovation system.

In particular, the Basic Plan is required by the Foundation Law to include the following:

- Expansion of S&T investment
- Dissemination, transfer and utilization of research results
- Promotion of pure science and research
- Promotion of S&T activities in regional areas

- Stronger international and inter-Korean S&T cooperation
- Development and popularization of science culture
- Promotion of R&D activities in the private sector

3. S&T Basic Plan

As was explained in Chapter 2, Korea's S&T Basic Plan was established initially in 2001 and later revised in 2003.

3-1 S&T Basic Plan (2002-2006)

This plan was established before the Roh Moo-hyun administration took office in February 2003. The vision of the plan at the time was to improve people's living standards and raise per capita income to the US$15,000 level by 2006. To this end, Korea's S&T competitiveness was to be enhanced to be in the world's top 10 by 2006.

The basic direction of the S&T policy was as follows:

- Develop six future technologies based on the principles of selection and focus
- Nurture and utilize a creative research workforce
- Liberalize the S&T innovation system through stronger networks
- Enhance people's understanding of S&T
- Boost R&D efficiency and expand investment

The major characteristics of the Basic Plan were as follows:

- Contribute to national economic growth and improve people's quality of life with what S&T can provide
- Adopt a policy approach focusing on enhancing S&T capacity
- Explore six promising future technologies by setting priorities on nationally strategic technologies

3-2 The revised S&T Basic Plan (2003-2007)

3-2-1 Introduction

With the inauguration of the new government in February 2003, the Basic Plan was revised. The vision proposed in terms of the revised plan was the reinstatement of Korea as an S&T nation. Most people agree that Korea initially became an S&T nation in the 1960s and 1970s during the tenure of former President Park Chung-hee. For this vision to be realized, however, Korea's global competitiveness in S&T has to be raised to the 8th place in the world.

Compared with the original Basic Plan established one year previously, the revised plan lays out more broadly the role and status of S&T, both from a national and community perspective. That is, S&T should be a central pillar of society and the future of the nation should be heavily dependent on S&T. The specific goal is essentially the same, except that the aim of enhancing S&T competitiveness has been readjusted upward to become the world's 8th best by 2007, instead of the world's 10th best by 2006, as originally planned.

The basic policy direction of the revised Basic Plan is as follows:

- Advance the national S&T innovation system
- Select and focus on strategic future S&T areas
- Strengthen future growth engines
- Systemize regional innovation capacity
- Create new jobs matching the demands of a knowledge-based society
- Expand people's participation and spread S&T culture

The revised Basic Plan consists of three parts: The first part deals with the national S&T vision, explaining the background and significance of the revision, the changing S&T culture within and outside the country and the vision and basic policy direction. The second part discusses the development of national strategic S&T, derived from the outcome of the National Technology Road Mapping, which was carried out over the course of one year in 2002. There are five major visions, encompassing a total of 99 key technology areas. The third part proposes the nine tasks to be implemented to enhance

S&T capacity and strengthen the role of S&T in society.

3-2-2 Development of Strategic National S&T Field

In accordance with the NTRM, the Strategic National S&T Field consists of the following five areas:

- Knowledge, information, intelligence-oriented society: innovation of communications, content and services that could be used any time, anywhere and application of intelligence in the living environment
- Healthy and life-oriented society: development and commercialization of new medicines, innovation of disease prevention, diagnosis and treatment and scientific approach to life
- Sustainable society: environment innovation that brings about pleasant and healthy life and efficient, stable and environment-friendly energy supply and commercialization
- Industrial structure that creates high value-added: making of future transportation vehicles and system, establishment of high-tech residential facilities and SOC, advancement of the production system and mechatronics technology and development of the new parts and material industry
- Enhanced national security and status: advent of the age of aerospace, food security, resources preservation and stable society, and high-tech national defense

3-2-3 Enhancement of S&T capacity and society's stronger roles

The main tasks of S&T and R&D policy can be summarized under the following five categories:

- Promotion of pure science and research to enhance creative innovation capacity
  · Goal: (1) To be rated in the world's top ten in pure science capacity
  (2) Develop new technologies and enhance creative research capacity by expanding investment in pure science and research

· Strategy: (1) Continue investment in pure research and establish a systematic research support system
(2) Obtain knowledge in new technologies through strategic research in pure science
(3) Pursue balanced development of pure science research work between different regions and academic disciplines and their close connections
(4) Maximize value through the wide dissemination of research results and achievements

- Nurturing of S&T workforce to lead in the knowledge-based society

· Goal: (1) Nurture key S&T workforce for the re-emergence of Korea as an S&T nation
(2) Establish an S&T system matching the demands of the knowledge/information society
(3) Develop an effective human resources utilization system by resolving the imbalance of S&T workforce in terms of quality and quantity

· Strategy: (1) Establish a system to nurture and train creative S&T workers
(2) Obtain knowledge in new technologies through strategic research in pure science
(3) Pursue balanced development of pure science research work between different regions and academic disciplines and their close connections
(4) Maximize value through the wide dissemination of research results and achievements

- S&T globalization and the establishment of a Northeast Asian R&D hub

· Goal: (1) Enhance the national innovation system and strengthen S&T capacity by establishing a global networking R&D system

(2) Contribute to transforming the country into a Northeast Asian business hub by becoming a Northeast Asian R&D hub

· Strategy: (1) Create a foundation for international cooperation to establish a Northeast Asian R&D hub

(2) Efficiently mobilize and utilize overseas S&T resources

(3) Pursue strategic international S&T cooperation

- Regional S&T innovation for balanced national development

· Goal (1) Nurture the key players for regional S&T innovation and expand the technological base

(2) Enhance the regional S&T administrative system and capacity

(3) Strengthen the national innovation system, in preparation for the era of a unified Korea

· Strategy: (1) Strengthen R&D capacity of regional areas

(2) Promote the development of strategic industries by fostering S&T

(3) Reorganize and enhance the S&T innovation system of regional areas

(4) Strengthen inter-Korean S&T cooperation, in preparation for the era of a unified Korea

- Expansion of S&T investment and stronger efficiency

· Goal: (1) Expand the government R&D investment five-fold between 2003 and 2007 compared with the previous years

(2) Enhance the efficiency of R&D budget execution based on the principle of selection and focus

· Strategy: (1) Substantially expand the government’s R&D investment funding, based on sound fiscal control.

(2) Invest first in National Strategic S&T on the basis of selection and focus

(3) Enhance the efficiency of R&D investment by improving the national innovation system

- Supporting technology development of the private sector to enhance technology capacity of industries

  · Goal: Enhancement of technology innovation capacity of private companies to serve as the driving force of the knowledge-based economy / Creation of new industries and advancement of the existing core industries to create higher value-added

  · Strategy: (1) Strengthen support for industrial technology development and induce expanded investment

  (2) Enhance policy initiatives that will facilitate the spread of the research outcome and the commercialization of technologies

  (3) Create the base for stronger technology innovation capacity of the private sector

- Advancement of the infrastructure to enhance S&T productivity

  · Goal: Create an innovation-driven R&D environment matching that of the advanced countries

  · Strategy: (1) Expand research facilities and equipment and put in place a test/analysis/evaluation system matching those of the advanced countries.

  (2) Promote the sharing and joint utilization of S&T information and create an S&T information innovation system

  (3) Reorganize and enhance institutions to strengthen the R&D support infrastructure

- Increase S&T roles to meet the demands of society

  · Goal: (1) Promote public participation in S&T

  (2) Expand science communication channels and S&T capacity

  (3) Strengthen the role of S&T in society

  · Strategy: (1) Promote public participation in S&T

  (2) Strengthen the role of S&T in society

  (3) Strengthen the roles of those working in the fields of S&T

- Spread an S&T culture that the public can share
  · Goal: (1) Enhance public understanding of S&T
  (2) Establish an infrastructure for fostering S&T culture industries
  (3) Expand human resources and the infrastructure to create a unique S&T culture
  · Strategy: (1) Enhance understanding of S&T
  (2) Expand the infrastructure to create a unique S&T culture

What is new about the revised Basic Plan is that the addition of strategic technologies was made on the basis of the outcome of the NTRM, as mentioned previously. It also endeavored to approach the concept of S&T activities as being the foundation of the economy, culture and society

However, the major characteristic in changes of Korea's S&T policy is that the government's efforts to expand the scope of S&T activities thereby bringing changes to the national economy and society became visible only from the second half of 2003 after the revised Basic Plan was established.

3-3 Establishment of an S&T-driven society and exploration of future growth engines

One of the top policy priorities of the new government was the establishment of an S&T-driven society, and the Ministry of Science and Technology and the Presidential Advisory Council on Science and Technology have taken charge of pursuing this policy goal. Another top priority is the exploration of the future growth engines. This involves moving away from the mere strategic technological development proposed in the existing Basic Plan toward fostering of relevant innovative industries that will produce the world's best products in five to ten years' time. That is to say, the aim is to develop technologies necessary for continued national growth rather than simply pursue technological development as an end in itself.

3-1 Establishment of an S&T-driven society

A strategy for establishing an S&T-driven society was completed at the end of 2003. Its concept is to bring about an advanced society in the 21st century with improved quality of life and economic growth by strengthening S&T and innovation systems. Rigorous technology development and close relevance to society is the basis of the concept.

An S&T-driven society means:

(1) It has advanced S&T;
(2) Its industrial and economic development is achieved through S&T;
(3) S&T is the basis of running state affairs;
(4) The S&T sector does its best to fulfill its responsibility toward society; and
(5) Culture and S&T form a close relationship.

To this end:

(1) There should be more public participation and partnerships with the community;
(2) Economic viability and contribution to public interest should be considered and pursued simultaneously;
(3) The roles of the government and private sector should be clearly defined and cooperation across the government ministries promoted; and
(4) Measures and strategies should be implemented according to their importance, urgency and characteristics.

Ten tasks in three sectors have been announced as deemed necessary to establish an S&T-driven society:

(1) Enhanced core S&T capacity
- Expand and advance future growth engines
- Nurture and utilize outstanding human resources in the science and engineering areas
- Efficient S&T system

(2) Stronger connection between S&T and society
- Increase public awareness of S&T
- Establishment of an S&T-friendly social system
- Stronger sense of responsibility and ethics in the S&T area

(3) National development led by S&T

- S&T contributing to public welfare and social security
- S&T contributing to enhancing people's esteem
- S&T contributing to transforming the nation into a Northeast Asian business hub
- S&T contributing to balanced national development

These tasks were revised and updated in the final report to the NSTC in December 2003 and categorized into 30 specific tasks. The policy task of establishing an S&T-driven society was succeeded by and developed into establishing a national technology innovation system in 2004.

3-2 Future growth engines

The major points concerning future growth engines were first proposed in the report to the President in July 2003. After receiving the report the President had instructed that these future growth engines were to be fulfilled through the NSTC. As of 2004, a special committee headed by the Minister of Science and Technology was established under the NSTC to oversee the implementation.

Relevant industries include bio-products and new medicines, display panels, future semi-conductors, future fuel cells, hybrid cars, intelligent robots, digital TV and broadcasting, future mobile communications, intelligent home networks and digital content and software. It is estimated that there are around 100 products and breakthrough technologies involved in these industries. Information-related technologies take up the largest share. Electronics, energy, machines and bio technologies are also included.

High priority has been given to the R&D programs for future growth engines in allocating the R&D budget for this year. As of 2003, 300.7 billion won, equivalent to US$250 million, was set aside for future growth engine-related programs, which accounted for 6.1% of the total R&D budget of 2003. The figures stood at 6.3% and 6.7% for 2004 and 2005 respectively, with a mediocre rate of increase. The budget

coordination process is over at this point and about 500 billion won (US$420 million) has been allocated to future growth engine-related programs.

3-3 National Technology Innovation System

In February 2004, the President issued two directives during the briefing on annual tasks by the Minister of Science and Technology. First, the Ministry of Science and Technology was to come up with a plan to establish a national technology innovation system, based on which the ministry and its functions were to be reorganized. Second, the President hinted that the Minister of Science and Technology was to be promoted to Deputy Prime Minister to oversee both micro-economic aspects of the Korean economy and technology innovation.

The main points of the national technology innovation system reported to the President in July 2004 were as follows:

- Vision: establishment of innovation-driven economic structure and science and technology-driven society

- Goal: creation of the virtuous circle of technology development→diffusion of outcome→re-investment

- Five elements of innovation:

(1) Industry, academia and research institutes: the system will be reorganized to increase the unique innovation capacity and synergy of industry, academia and research institutes.

(2) Elements: R&D investment will be expanded substantially, efficiency enhanced and the mismatch of workforce resolved.

(3) Diffusion of benefits: future growth engines, the key to national development, will be explored, developed and commercialized to contribute to economic and social development

(4) System: · a knowledge-sharing joint research base will be established by strengthening connections and cooperation among industry, academia and research institutes.

· the efficiency of the innovation system will be enhanced by establishing an overall planning/coordination/evaluation

system for the national technology innovation policies and an S&T information system.

(5) Infrastructure: an S&T-friendly social development will be pursued with S&T development and commercialization forming a virtuous cycle, by creating policy, institutional, environmental and cultural to facilitate innovation.

The Korean government has revised the relevant laws and regulations in September 2004 to promote the Minister of Science and Technology to Deputy Prime Minister level and at the same time, commissioned him to supervise not only planning, coordination and evaluation of S&T related policies but also coordinate and allocate national R&D programs. The government-funded science and engineering research institutes currently under the Prime Minister's Office will be transferred to fall under the umbrella of the NSTC by the end of this year. An independent Office of the Ministry of Science and Technology will be established under the Ministry of Science and Technology. The Office will consist of about 100 government officials from relevant ministries and private sector experts and take up the function of the Secretariat of the NSTC. The position of head of the Office will be assumed by a vice minister level official.

4. Concluding remarks

Korea's S&T Basic Plan shares many similarities with that of Japan. The similarity in the essence of the plans is in the two governments' understanding of and approach to science and technology. Japan has already realized an S&T-driven society and established itself as an S&T nation. The reason that Japan was able to pull itself out of the ten-year long economic recession was its strong science and technology base. For example according to the international competitiveness ranking announced by the International Institute for Management Development in Switzerland each year, Japan's international competitiveness in science and technology is always in the top ranks, indirectly but strongly hinting that science and technology is the driving force behind Japan's growth.

However, Korea's science and technology development level and status are different from those of Japan. That is why the revised Basic Plan stressed the importance of both establishing an S&T-driven society and revitalizing Korea as a S&T nation. Science and technology activities should not be pursued for the sake of research and study, but should rather serve as the foundation for national development. The Basic Plan also emphasizes that technologies which could work as the driving force of economic development should be developed.

The weakest part in the Basic Plan is that concerning human resources and workforce. This is probably linked with adopting an education system focusing on creativity, which is one of the most difficult issues facing Korea. Workforce enhancement is therefore the task that is most unlikely to be carried out soon. Korea is very much interested in how Japan is addressing the education issue and nurturing of human resources. The research workforce in Korea is yet to be accurately analyzed and the establishment of corresponding R&D strategies should be worked on further.

As a result, there are many questions regarding whether the level of research or technology development can be attained by the research workforce in Korea alone. Evaluating Korea's science and technology level is still an important task at the national level. But we cannot say with confidence whether concrete ways to utilize the evaluation results have been laid out.

Korea's reorganization of its S&T administrative system contrasts markedly with that of Japan. The Science and Technology Agency has been integrated into relevant industries such as the Ministry of Education and the current MEXT has been formed. On the other hand, Korea's Science and Technology Minister has been promoted to the Deputy Prime Minister level only last week to take charge of Korea's micro-economy and technology innovation. It remains to be seen what impact such reshuffling of the administrative system will have on the future of the Korean economy and S&T development. But the reorganization has certainly laid the foundation for S&T to develop on the basis of the new administrative system and contribute to social and economic development. What has to be observed in the future are the roles to be played by the S&T sector and those regarding the administrative system.