**OECD SCIENCE, TECHNOLOGY AND INDUSTRY OUTLOOK 2004**
**COUNTRY RESPONSE TO POLICY QUESTIONNAIRE**

# KOREA

## 1. General framework and trends in science, technology, and innovation policy

The change of government in February, 2003 has brought about changes in policies in various areas, including science, technology and innovation. The new government placed science and technology on the top policy agenda with a view to transforming the nation into a science- and technology-based society. The policy goal is to make another leap in national development based on science and technology.

Toward this end, the government has established a new framework that will govern science, technology and innovation policies and programs during the tenure of the current government. The major features of the policy framework are:

1. The focus of STI policy shall be placed on strengthening S&T capability to facilitate the transition toward a knowledge-based society, to promote the development of new technology industries, and to meet the challenges, both economic and social, that Korea faces. To strengthen the foundation for S&T development, policy priority shall be placed on the promotion of basic scientific research and the development of creative human resources in science and technology. At the same time, to develop an engine for future growth, R&D resources shall be concentrated on selected technology areas that are considered to be strategically important for Korea's future development.

2. STI policies shall be formulated and implemented in a global context so as to strengthen international linkage of the national innovation system, while at the same time, developing regional bases for science and technology development and innovation. Korea aims to play the role of R&D hub for Northeast Asia.

3. While pursuing a continuous expansion of R&D and S&T resources, greater emphasis shall be given to ensuring efficient and balanced allocation of the resources. In order to enhance the efficiency of R&D investments, the government will reform the public sector R&D system and encourage active interaction and collaboration between public and private sectors.

4. The government shall encourage the participation of the civil society and private industries in the S&T policy-making processes as a measure to fully reflect the demand of the society, and foster a culture that is conducive to scientific and technological innovation.

5. Under the new framework, the government identified ten technologies for development as an engine for economic growth for the next ten or so years, and made an inter-ministerial

arrangements for the development of the technologies. The technologies identified are *1)* digital TV and broadcasting, *2)* displays (LCD, LED, PDP, *etc*), *3)* intelligent robot, *4)* new generation automobiles (intelligent car, clean car, *etc*.), *5)* next generation semiconductors (SoC, nanochips, etc), *6)* next-generation mobile communication, *7)* intelligent home-network, *8)* digital contents and solutions, *9)* next-generation battery, and *10)* bio medicine (bio-chips, artificial organs, etc)

6. The government also set a target to double national R&D investment during the period from 2001 to 2007 when the term of the current government ends. Research manpower will also be increased from 180 000 to 250 000 during the same period.

**2. Public sector research and public research organizations**

The key issue in public sector research in Korea is how to enhance the efficiency and effectiveness of government R&D. The President asked the Minister of Science and Technology to restructure the government R&D system so as to improve the productivity of government-financed R&D. The President's basic guideline is that role of the Ministry of Science and Technology be strengthened as the central agency for inter-ministerial coordination of S&T policy and R&D activities, while reducing its involvement in the actual execution of R&D programs. The President also made it public that the Minister of Science and Technology would be promoted to a Deputy Prime Minister so that he/she can take a full command in allocating government R&D budget. The government is now working on the restructuring of the public sector S&T system. The change in the government S&T system may also result in changes in the government research institutes (GRIs).

Regarding the government R&D activities, there have not been significant changes. The Ministry of Science and Technology, the Ministry of Commerce, Industry and Energy and the Ministry of Communications remain the major funders, financing over 64% of the government R&D programs in 2002. The share of the Ministry of Science and Technology increased from 22.7% in 2001 to 25.3% in 2002, and that of the Ministry of Commerce. Industry and Energy also increased from 19% to 23.2%, while the share of the Ministry of Communications fell from 22.4% to 16.2%. This shows that the importance of IT in national R&D has declined rather drastically over the recent years.

But the structure of R&D activities in the public sector remain largely the same. In 2002, GRIs performed 41.4% of the government-financed R&D, and national labs 9.7%, while universities' share remained at 22.6%. The remaining 16% were awarded to private industries (SMEs, 13% and large enterprises 3.1%). The heavy reliance on GRI for government-funded R&D has not been reduced.

It is also notable that an increasing share of the government R&D expenditures has been spent for industrial technology development, while the share of the expenditures on advancement of knowledge has been declining. Over the period of 1998-2002, the proportion of the government R&D expenditures for industrial technology development increased from 27.8% to 32.5%, but the expenditures on advancement of knowledge decreased from 202% to 17.5%. Expenditures on health research have been increasing steadily over the same period. Of the total government R&D spending in 2002, 52.5% was used for technology development, 28.4% for applied research, and remaining 19% for basic scientific research.

In terms of areas of research, IT took the largest share of the government R&D funds (25.4%) in 2002, followed by electronics (8.1%), mechanical engineering (7.8%), nuclear research (6.3%), transportation (6.3%), and so on. But the concentration on IT and electronics somewhat declined from 36.9% in 2001 to 33.5% in 2002. The shares of other areas have remained almost the same over the past three years.

**3. Government support for private sector R&D and innovation**

Since the 1970s, the Korean has adopted and implemented various policy programs to promote and facilitate private sector R&D and innovation, including tax incentives, financial assistance, R&D subsidies and so on. The existing support programs will be largely maintained, but they will be further strengthened in the following cases:

- Expansion of technical and financial assistance for SMEs and new start-ups:
  - To accept technology (knowledge asset) as a collateral for bank loans.
  - To provide SMEs with subsidies for the employment of R&D personnel.
  - To provide SMEs with technical information and services.
- Promotion of GRI-University-Industry cooperation:
  - Joint R&D.
  - Sharing research facilities, *etc.*
  - Enhancing the effectiveness of the tax incentive programs to promote private R&D.
  - Improving the national system for technical standard and strengthening the protection of intellectual property.

Special efforts are being made to attract foreign R&D investments. The government set a long-term policy goal to develop Korea into an R&D hub serving Northeast Asia, taking advantage of Korea's geo-economic position in the region. To advise the President on this issue and to develop policy programs to transform the nation into a Northeast Asia R&D hub, a special committee has been set up within the Office of the President. The Committee works in cooperation with individual ministries and agencies and private sectors to create social, economic, cultural and physical environments that are required to attract foreign R&D investments.

**4. Enhancing collaboration and networking among innovating organizations**

The Korean government seeks to forge strong linkage between science and society as a whole in an effort to achieve a socio-economic transition toward an advanced society. Of course, a short-term emphasis is on promoting science-industry relationship. However, science-industry interface remains very weak in Korea because of structural problems inherent in the Korean science system which are characterized by the weak reliance of industries on scientific research for innovation and weak responsiveness of universities and GRIs to market changes. The very feature of the system makes it hard for the private and public sectors to collaborate.

To deal with the problems, Korea pursues two policy tracks: As a long-term policy to expand demand for scientific research in industries, the government promotes the development of knowledge-and science-intensive industries. In parallel with this, short- and mid-term policy efforts are being made to make the science system more responsive to changes in demand.

1. First, in order to incorporate the interests of industries into national S&T and R&D policy processes, the government involves leaders from industries as members of the National Science and Technology Council, which governs S&T policy and government R&D resource allocation.

2. Second, industries also participate in the management of GRIs by joining in the boards of the Research Councils which are responsible for the operation of the government R&D organizations.

3. Third, the government encourages industries' participation in national R&D programs. Research proposals involving industries are given preferential treatments in the funding process.

4. Fourth, the government has been reducing institutional block funding to encourage public institutions to go out to seek external funds based on their capability to meet the needs of users. The government also improved regulations governing the operation of pubic institutions so as to promote and facilitate research spin-offs.

**5. Human resources for S&T**

One of the key policy issues in Korea today is the rapidly declining interests in science and engineering among young students. In 1998, about 28% of the top students in the "Scholastic Aptitude Test" chose science and engineering for university education, but the proportion dropped to 19% in 2001, indicating a sharp decline in demand for science and engineering education among young talented students. Young talents will come back to science and engineering, if and when they are sure that human capital investment in science and engineering will bring them greater return. To make this happen, improvements are required on both supply and demand sides of human resource.

On the supply side, the key issues are how to enhance the quality of science and engineering education and how to minimize mismatches between skill demand and supply.

1. To enhance the quality of university education, the government has been encouraging universities to improve curricula so as to reflect the changes in knowledge and skills required in the industrial fields.

2. The government also plans to strengthen supports for university research as a means to upgrade science and engineering education. Expenditures on basic scientific research will be increased up to 25% of the government R&D budget by the year 2008.

3. In addition, the government will launch a "National Research Fellow" program to support research and training of top graduate students selected as cadets to lead the future development of science and technology in Korea.

4. Lastly, the government will strengthen the retraining of scientists and engineers such that they can cope with changing skill demand in the market.

The growth of demand for scientists and engineers depends on industrial growth as well as on the technology-intensity of industrial activities. As we move toward a knowledge-based economy, a long-term anticipation is that demand for scientists and engineers will grow in a massive way. Despite such a long-term anticipation, the current market fails to convince young students about future demand. In order to give young students a convincing signal that the career prospect of science and engineering is bright, government has to intervene and promote demand for scientists and engineers. Under this rationale, the government launched several policy programs to promote demand for scientists and engineers in the public sectors.

1. The government will increase government positions for science and engineering graduates in a significant way. The government plans to fill over 30% of the high-ranking policy-maker positions with officials with science and engineering backgrounds within four years from now. Along with this, the government will increase research jobs in public sector research institutions to absorb new scientists and engineers with advanced degrees.

2. The government will introduce a "Research Officer" program, which will provide young Ph.Ds

with career opportunities as research scientists and engineers in the military sector.

3. The government will set up "Human Resource Incubating Centers" which will retain young unemployed scientists and engineers temporarily for practical training for employment.

In addition, in order to attract more women into science and engineering, the government launched a “Women Into Science and Engineering (WISE)” Program. The government introduced a kind of affirmative action program that requires public research institutes to increase the proportion of woman scientists and engineers to at least 25% of the total employees.

**6. Policies to boost innovation in the service sector**

Despite the increasing importance of the service sector, in particular, knowledge-intensive service activities, there has not been sufficient policy attention targeted at promoting innovation in the service sector. But the past policy practices that focused almost entirely on the manufacturing industries have been rapidly reoriented toward encompassing other sectors, especially, service industries. Therefore, instead of adopting policy programs specifically aimed at the promotion of innovation in the service sector, many of the existing policy programs have been retuned and applied to the service sector.

**7. Policy evaluation**

There has not been any changes in the policies regarding the evaluation of innovation policy programs or institutions. But, as discussed earlier, the changes in science and technology system in the government that are anticipated to take place within the year 2004 will also bring about major changes in the evaluation system for S&T and innovation policy programs. What is certain at this stage is that the role of the National Science and Technology Council in this respect will be further strengthened even after the changes.

Prepared by Sungchul Chung, STEPI (chungsc@stepi.re.kr).