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Korea 2030

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The Third Korean National Foresight Exercise

The Third Korean Foresight Exercise entitled 'Future Perspectives and Technology Foresight for Korea – Identifying Challenges and Opportunities for Korea's Economy and Society' represents the most comprehensive effort to date by the Korean government in the field of S&T foresight. Capitalizing on previous studies conducted in 1994 and 1999 its chief purpose is to chart the future of Korean society and technology and link peoples future needs to innovations in science and in research. Systemic in both character and methodology this Third Korean Foresight Exercise accelerates Korea's evolution towards a knowledge society.

A Leap into the Past

Over the past four decades Korea has gone through distinctive phases in science and technology policy making, starting with the creation of MOST, The Ministry of Science and Technology and the Science and Technology Promotion Law in 1967.

With this basic infrastructure in place the 1970s can be construed as the growth stage of Korean S&T when the focus shifting to capital and technology intensive industries, heavy and chemical industries and the education of qualified scientists and engineers was emphasized at national level.

The 1982 and 1992 National R&D Plans, devised under the central theme of 'select and concentrate', have guided Korea's S&T policies and programs. Major industries of the 1980s in Korea included semiconductors, steel, automobiles and shipbuilding. By the 1990s S&T activity on the government and private levels were greatly expanded as evidenced by the fact that 75% of Korea's cumulative R&D investment was allocated past 1990. Today 75% of R&D investment originates from private sources with government contributing 25%. Total R&D investment (GERD) peaked at 22.2 trillion Korean Won in 2004 ($22 billion or 2.86% of GDP), the highest figure the country has seen since statistics were first compiled in the early 1960s.

Korea's S&T Challenges today

Today, the Korean government is faced with the task of setting priorities in the development of a domestic technological capability and finding ways of launching new high-tech industries that can contribute to world-level competitiveness beyond Korea's traditional strengths in semi-conductors, mobile communications, petrochemicals, shipbuilding and automobiles.

Foresight is regarded as a critical tool for policy-making. While increasing the percentage of R&D funds in the govern-

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ment budget by double digit figures since 2001 ($4.9 billion in 2004), the government has introduced sweeping reforms to its national innovation system, most notably a large-scale reform of the MOST in 2004.

This reform essentially converted a division of the MOST into a secretariat to the NSTC - National Science and Technology Council and elevated the Minister of Science and Technology to the position of Deputy Prime Minister. According to the OECD this was the first such upgrade in the world according to the OECD.

Combining Business and Basic Research

Most government attention is now focused on how best to complement business R&D through the provision of basic research and the crafting of an efficient institutional framework in which different S&T actors collaborate, share knowledge and provide educational opportunities for young scientists. Against this backdrop, and in conformance with Article 13 of the Science and Technology Basic Law of 1999, the Third National Foresight Exercise pursued goals:

- To define strengths and weaknesses of Korean S&T across a range of industrial sectors up to the year 2030, and provide a basis for international benchmarking,
- To identify future societal needs in the broadest sense of the word, matching them to specific technologies that are deemed appropriate to fulfill these needs,
- To assess the attributes of each future technology such as realization time, technology level of Korea compared with other countries, and possible obstacles to be overcome from the viewpoint of policy makers,
- To create forward-looking scenarios as a basis for priority setting in national R&D projects and to provide guidance for private-sector R&D decision-making,
- To foster a broader debate about desirable pathways of S&T in the general public and provide a forum for experts, policy-makers as well as representatives from business and civil society to dialogue about the future.

Methodology: A Mix of Survey Techniques

Reflecting these multi-faceted study objectives, an interactive sophisticated amalgamation of on- and off-line survey techniques was adopted. The overall process is in many ways comparable to the Eighth Japanese Foresight Exercise. In total the Third National Foresight Exercise lasted from June 2003 until December 2004 and was published in an unprecedented public relations drive in May 2005. The areas of consideration were:

- Space & Earth,
- Material & Manufacturing,
- Information & Knowledge,
- Food & Bio-resources,
- Living & Health,
- Energy & the Environment,
- Safety,
- Infra-technology,
- Management & Innovation, as well as
- S&T for Society and Culture.

The exercise consisted of three distinct phases:

- The first phase, from July to December 2003, brought together a distinguished panel of experts from diverse academic fields to **identify future prospects and needs** of Korean society grouped under four called ‘actors’:
    - The World,
    - The Nation,
    - Society and
    - The Individual.
- This effort was supported by a separate survey of 1,000 experts and 1,000 members of the general public. As an additional **Delphi study**, an internet-based questionnaire was sent out from January to July 2004 to 32,411 experts in Korea in the first round, all of whom are Ph.D. degree holders. 16.7% of them (5,414) replied in the first, and 61.4% (3,322 out of 5,414) in the second. The experts answered on average 40-50 questions in one or two of the eight overall fields of technology. In total, the survey entailed 761 subjects grouped in subcategories each consisting of about 20 questions.
- In the third phase during the second half of 2004, **scenario panels** put together and visualized likely scenarios for Korea in the fields of education, labor, health services and safety systems. In addition, cartoons, comic and science books, posters, chronicles of future technology and a short movie were produced to helped spread a foresight culture in Korea.

Societal Issues

The Aging Population

The current Foresight exercise has assessed various aspects of global challenges that the country will face inevitably and will have to deal with in the future. For example, the rapid process of **demographic transition** in Korea has brought about an increase of both the absolute number and the proportion of the elderly in recent years. The proportion of people aged 65 stood at only 3.3 percent in 1966. However it increased to 9.1 percent in 2005 and is projected to increase to 24.3 percent in 2030. The aging speed of the Korean population is apparently faster than that of developed countries. Korea, which has already experienced large declines in fertility and mortality, has a tremendous momentum for further population aging. In 2005, the fertility rate is about 1.2. If this situation persists, it would eventually cause a decline in the population size (over-

all and of working age) presenting various socioeconomic challenges to pension and healthcare services, in particular.

The Lack of Natural Resources

In terms of **energy**, Korea has no domestic oil reserves. Oil makes up for the largest share of Korea's total energy consumption accounting for 54 percent of Korea's primary energy consumption in 2002. Korea is the 7th largest oil consumer and 5th largest net oil importer in the world. Unfortunately this trend will not change very much in coming years.

Responding to Public Needs

Science and Technology policy in Korea, usually devised in a top-down and government driven way, has been quite successful until now. Recently however stakeholders increasingly demand that Science and Technology should respond more directly to public needs. Unfortunately it is not straightforward to connect societal needs to science and technology domains that provide some solutions and only then in indirect ways.

In the first phase of this exercise the four actor groups were selected to reflect relevant viewpoints – that of the individual, the society, the nation and world. These explored 15 main themes and 43 sub- themes. The following diagram provides an example of how the theme of health and living was addressed from the point of view of one of the actors in this case the individual.

INDIVIDUAL - Health and Living	
SUB-THEME	**DETAIL**
Dealing with Disease	The Prevention diagnosis and treatment of: - Hard to sure diseases - Geriatric diseases - Chronic disease - Contagious Disease - Artificial Organs - Applied Biotechnology
Quality Health Service	- High quality health care systems - Alternative medicines - Secondary infection in hospitals
Health in Normal Living	- Convenient normal life - Health Maintenance System
Safe Foods and Products	- Safer Foods - Safer products - Environmentally friendly foods and products

Assessing the Time Horizon

Having identified future topics for Korean S&T policy the Delphi exercise served to assess the time horizon of each technological development. This second phase task revealed that in most cases the 'realization time' was distributed around the year 2015 even though the sectoral panels were asked to put forward technologies that might not be realized until 2030. Such observations have been made in many Delphi surveys, for example in those conducted in the UK, Germany and Japan. Delphi surveys are often biased by optimism due to expert involvement and the tendency of experts to underestimate realization and diffusion problems.

Most of the technology subjects in the field of 'information and knowledge' will be realized around 2010 though some from 'Space and Earth' will be realized later than 2025.

Competitiveness of the ICT Sector

The R&D level of Korea was compared to the technology world leader in the Delphi survey. By comparing Korean status of a field with that of the leader in the field, it was demonstrated that Korea lags far behind the leaders in important areas of future technology. The R&D level of *'Space & Earth'* sector is the lowest and that for '*Information & Knowledge'* is the highest reflecting the characteristics of Korea's current economic competitiveness. Semiconductors, TFT-LCD, digital TV, mobile phones and internet games are domains where Korea enjoys a competitive edge and so ICT is an area where Korea is one of the most advanced countries in the world. By contrast however the field of '*Space and Earth'* really relies on 'big science' and according to the results of the Delphi survey Korea has not yet established a firm technological base in related industries. Overall these results sent a warning signal to the Korean government saying that the future competitiveness of the country is at stake. According to many Korean experts the government should take measures allocating resources to strengthen R&D capability in the area of basic science that will enable it to catch up with advanced countries.

Scenario Building for Future Social System

2004 marked the first time in Korean foresight history that scenario development was tried out. Four subject areas were chosen to develop and visualize future systemic changes - **education, labour, health service and safety.** The scenario panels consisted of experts with various backgrounds. For example the health service panel consisted of an IT specialist and a biochemist, health economists and a population scientist. Their work mainly focused on changes to the health service system change due to a convergence of ICT and biotechnology. The education panel was supported by a group of undergraduate students who contributed through an idea-contest. The students were asked to choose one or two future technologies that might have the greatest impact on systemic change in education and develop scenarios. The findings of the three phases resulted in the formulation of strategic initiatives.

Strategic Initiatives

By the time of the 3rd Korean Delphi study, a 'foresight culture' had already developed in the S&T community. The MOST quickly translated the findings into a strategic plan that referred to '21 future technology areas' and vowed to allocate resources. These technologies are intended to complement the **'Next Generation Engines of Economic Growth'** program which was unveiled in 2003. As most of these technologies will be domestically realized before 2010 an extended perspective was called for to prioritize technologies that would start to emerge in the period 2010-2015.

As a further step three **databases** of technology subjects were developed and used. Out of a total of 761 technologies 189 were selected as priorities by the **Priority Setting Committee**. The database was complemented with new and emerging technology domains where other countries have demonstrated an interest in making investments. Two major Korean companies provided their own perspectives with a view to aligning the government R&D agenda with that of the corporate sector.

Finally 21 technology areas were selected based on their expected impact on quality of life, economic growth and public need. These are:

- Biotechnology-based New Materials and Medicine
- Biodiversity & Natural Resource Conservation
- Biosafety & Defense Technology
- Clean and Renewable Energy
- Climate and Weather Forecasting
- Cognitive Science and Humanoid Robot Technology
- Culture Content Technology for Immersive Entertainment
- Digital Convergence Technology for Augmented Reality
- Drug Discovery, Diagnostics and Personalized Medicine
- Global Observation and National Resource Utilization
- Hazard Disaster Forecast & Management Technology
- Knowledge and Information Security
- Marine Territory Management Technology
- Nano and Functional Material Technology
- Next Generation Nuclear Energy and Safety Technology
- Regenerative Medicine Technology
- Satellite Technology
- Smart Computing for Ultra-high Performance
- Super Efficient Transportation & Management
- Thermonuclear Fusion Technology
- Ubiquitous Civil Infrastructure Management

The Korean government plans to devise a master plan for a relevant R&D program in 2006.

Foresight as a Strategic Instrument for Public Policy

According to the Korean S&T basic law, the foresight exercise is envisaged to be carried out every five years. However, KISTEP and MOST have decided to run foresight exercises every year based on specific and urgent issues.

National foresight studies cutting across the broad field of science and technology will continue to be performed every five years. Another promising sign is that each of the ministries has started to run its own foresight projects.

The next step might entail the establishment of a foresight network in Korea. Additionally, there is momentum to establish a 'strategic futures unit' inside government to face unforeseen future developments.

Sources and References

The Final Report is entitled '**The Future Perspectives and Technology Foresight of Korea. Challenges and Opportunities'** It was published in Korean language in May 2005 by MOST and KISTEP.

MOST - Ministry of Science and Technology is at www.most.go.kr

KISTEP - The Korean Institute for S&T Evaluation and Planning is at www.kistep.re.kr

STEPI - The Science and Technology Policy Institute is at www.stepi.re.kr

The Korean National Statistical Office has a website with an English language section and contains man statistics on S&T issues at www.nso.go.kr

About the EFMN: Policy Professionals dealing with RTD, Innovation and Economic Development increasingly recognize a need to base decisions on broadly based participative processes of deliberation and consultation with stakeholders. One of the most important tools they apply is FORESIGHT. The EFMN or European Foresight Monitoring Network supports policy professionals by monitoring and analyzing Foresight activities in the European Union, its neighbours and the world. The EFMN helps those involved in policy development to stay up to date on current practice in Foresight. It helps them to tap into a network of know-how and experience on issues related to the day to day design, management and execution of Foresight and Foresight related processes.