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Measures for Promoting Knowledge-based Economies in the APEC Region

Yoo Soo Hong

KOREA INSTITUTE FOR INTERNATIONAL ECONOMIC POLICY

KOREA NATIONAL COMMITTEE FOR PACIFIC ECONOMIC COOPERATION

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Preface

Since the acceptance of the promotion of knowledge-based economies (KBEs), proposed by President Kim Dae Jung, in the APEC Economic Leaders Meeting in Kuala Lumpur in 1998, Apec has actively pursued the best way to promote KBEs in the region. This study reviews APEC's efforts for the promotion of KBEs in the region and to derive policy implications for the future action by APEC as a whole and for individual member economies.

In the 2000 Seoul Symposium on KBE promotion four areas for KBE promotion were identified. These are: ① business environment, ② innovation system, ③ human resource development, and ④ ICT infrastructure. Also, four groups of economies in APEC were identified: ① the Most Developed Economies, ② High-Performing Asian Economies, ③ the Asian Fast Followers and ④ the Latin American Economies. The present study added the fifth area including institution and culture, enterpreneurship, etc. to the four areas for action.

The differences among member economies in terms of stage of development, endowments, industrial structure and culture implies that there can be substantial benefits from coordinated efforts for KBE realization in APEC. However, it also implies that there can be barriers and impediments to the implementation of policies and strategies. In fact, one of the most serious challenges facing APEC is the wide digital divide or knowledge gaps among member economies. APEC economies are faced with different challenges for KBEs according to their level of development. Although it is natural that developed economies focus on their own agenda for KBEs, they are encouraged to play a leading role in KBE promotion by contributing to ECOCT since they are in a better position to share their experiences and resources with developing economies.

In this study, the author emphasizes: ① information sharing on best practices, ② reorganizing WGs in line with KBE promotion and strengthening ECOTECH, ③ joint business development in KBIs, ④ infrastructure development for KBEs, and ⑤ HRD for knowledge workers. These are somewhat different from the projects adopted by the APEC EC in 2000, but the ultimate goal is the same. It is expected that this report will contribute to further development of APEC activities for KBE by supplementing current discussions.

Executive Summary

For the promotion of KBEs in the APEC region, several new ideas and projects have been proposed: ① information sharing on best practices, ② reorganizing WGs in line with KBE promotion and strengthening ECOTECH, ③ joint business development in KBIs, ④ infrastructure development for KBEs, and ⑤ HRD for knowledge workers.

APEC's role is to assist all member economies to actively move toward KBEs. In this direction, APEC may consider several actions: ① Disseminating case study results and best practices for KBE promotion; ② Establishing a policy consultation group for KBE promotion for member economies; and ③ Inducing some existing or new ECOTECH programs towards KBE promotion for member economies. Sometimes the distinction between the specific programs for individual economies by APEC and joint programs at APEC level is blurred.

Although all APEC activities are directly or indirectly related to the promotion of KBEs, ECOTECH is more so. Considering the increasing criticism of developed economies, which more emphasized trade and investment liberalization and less contributed to ECOTECH, greater efforts by developed economies for the joint promotion of KBEs in APEC are encouraged.

Dr. Yoo Soo Hong, Seoul National University graduate, is currently the research director and a senior research fellow of the Northeast Asian Team of Korea Institute for International Economic Policy (KIEP) where he has worked for over 10 years. He earned his Ph.D in economics at Northwestern University which he served as a visiting assistant professor after graduation in 1983. He then taught at Oklahoma State University as an assistant professor in economics since 1984. He published various books and papers including: "Internet Business Cooperation in Northeast Asia and APEC" in 2001, "Technology-Related FDI Climate in Korea" in 1998, "Basic Framework of the North Pacific Technological Community" in 1995, and "Japan's Technology Transfer Strategy to Asia and Korea's Policy Response" in 1993.

Contents

I. Introduction

In a knowledge-based economy (KBE), knowledge plays the role of the engine for economic development. The promotion of a knowledge-based economy is one of the key national strategies of developed countries as well as developing countries in today's world. Like the case of the age of industrialization, if the world economy is due to transform itself to a knowledge-based economy, we can say that every economy in the world today is in the transition to a knowledge-based one. APEC member economies are no exception.

If we can choose a proper index for the level of knowledge of an economy, it may show a strong positive correlation with GDP per capita. This implies that a knowledge gap between economies may reflect the difference in economic levels or standards of living. APEC member economies are characterized by enormous differences in endowments, economic performance, development level, standards of living, etc. From this simple point of view, we can say the main challenge now facing APEC is how to reduce the knowledge gaps among member economies, or how to enhance the level and role of knowledge in economies lagging behind.

APEC has been actively exploring how to promote KBEs in the region since 1998 when President Kim Dae Jung proposed it as a new agenda in the APEC leaders' meeting in Kuala Lumpur. Korea hosted two international symposiums on the KBE in 1999 and 2000. In the latter symposium, almost all issues and measures for the promotion of KBEs in APEC were exhaustively discussed. Instead of repeating discussions similar to those presented at the symposium, only the key points of the discussions are reviewed here. Although the present paper heavily draws upon the proceedings of the symposium, it tries to supplement the main points of the proceedings with the discussion of priorities and the focus on implementation.

The purpose of this study is to critically review APEC's efforts for the promotion of KBEs in the region and to derive policy implications for the future action by APEC as a whole and for individual member economies. For the purpose, the study reviewed existing literature and documents, especially major APEC documents related to the issue and the literature on the KBE published by OECD and the World Bank. In addition, interviews were conducted with experts on the subjects in some selected countries such as Korea, Japan, Singapore, etc. Although agreeable and acceptable points are repeated, supplementary points or different views of the present author are also added in this study.

In Section II, the implications of the KBE for APEC are discussed. Transformation

of the world economy into a KBE is not confined to developed economies; it is a global and regional issue today. The discussion focuses on the regional dimension of the KBE in the context of APEC. The next section reviews and assesses APEC activities in relation to the promotion of KBEs. Based on this, the role of APEC in the promotion of KBEs in the region and policy measures are discussed in Section IV.

II. Concepts and Issues

1. Concepts

A KBE may be defined in one's own way, according to one's emphasis. Among the various definitions, a knowledge-based economy is most commonly defined as one in which the production, distribution and use of knowledge is the main driver of growth, wealth creation and employment across all industries. This definition implies that not only the knowledge-intensive sectors but also all existing traditional sectors may need to exploit and use knowledge.[1]

Knowledge is primarily personal - the totality of what a person knows - and comprises many forms, including "knowledge of," "knowledge about," "knowledge how to," "knowledge in words," and "knowledge without words." These categories are often distinguished as codified knowledge, which is formally recorded in writing, and as tacit knowledge, which is only in someone's head. However, knowledge can be organizational. An organization's knowledge constitutes its capability of integrating information with experience and expertise to take action. Information communicated to a person or organization becomes part of their stock of useable knowledge.

One of the most important conceptual aspects of a KBE is the process of knowledge, which implies the relationship between the creation, distribution and utilization of knowledge. This is analogous to the production, distribution and consumption of a good or a service. However, knowledge does not exactly share the same characteristics but behaves differently. We can consider two models or views of the knowledge process as shown in Figure 1 and Figure 2. In Figure 1, the knowledge process is viewed as following the same process as a good or a service in the order of production, distribution and utilization. However, in Figure 2, these three phases are interactive in the sense that there is feedback among them.

[1] These and following definitions and concepts are borrowed from McKeon, R. and T. Weir (2000), p. 26.

Figure 1 around here

Figure 2 around here

If carefully examined, a service may exhibit a similar interactive process to knowledge. In this sense, the behavior of knowledge is very similar to that of a service. If the interactive model is a right view, then cooperation among developed economies and developing economies is meaningful since both parties can benefit from cooperation in promoting KBEs.

Knowledge is subject to increasing returns to scale and positive externalities. This characteristic contributes to productivity increases, but it makes it difficult for the ordinary market to solve socially optional production of knowledge. Intellectual property rights issues originate from this phenomenon.

Another conceptual aspect of a KBE is the structure of the economy : main actors, organizations, resources, industries and institutions. In addition, the spatial aspects of knowledge are also important since there is a fundamental conflict between the nature of knowledge, which can easily cross natural or artificial boundaries, and the national or other forms of geographical identities. A solution to this conflict is a compromise in the form of networking. Also, the inputs and outputs of knowledge are conceptually and practically important. All these properties of knowledge have significant implications for the promotion of KBEs in the APEC region.

2. Implications for Economic Development

OECD has documented mounting evidence of the strong correlation between knowledge and economic development and the ever increasing contribution of knowledge to economic growth and national welfare. More than half of the GDP in the major OECD countries is now based on knowledge. In order to understand the implications of knowledge for economic development, it is necessary to understand the characteristics of a KBE in more detail.

Although McKeon and Weir (2000) characterized an idealized KBE by four dimensions-innovation system, human resource development (HRD), ICT infrastructure, and business environment[2] - in this study a KBE is characterized by five dimensions including the four (see Table 1 for details). They are as follows.

1) National innovation system: Innovation and technological change are pervasive and supported by an effective national innovation system, a network of institutions in the public and private sector whose activities and interactions initiate, import, modify and diffuse new technologies and practices.
2) HR: Human resources are pervasive: education and training are of high standard, widespread and continue throughout a person's working life and even beyond.
3) IT infrastructure: An efficient infrastructure operates, particularly in information technology (IT), which allows citizens and businesses to readily and affordably access pertinent information from around the world.
4) Entrepreneurship: Firms are the main carriers and actors utilizing knowledge, information and technology for production and sales. Entrepreneurs are innovators exploiting opportunities from knowledge utilization. For this, knowledge management is crucially important for the firm.
5) Institutions and culture: Institutions and culture set the rules for human and social behavior. Laws, regulations and government policies affect the business environment. Education-oriented culture is most favorable for the development of a KBE.

Table 1 around here

It is becoming ever more the case that the most successful economies are those that are closest to being KBEs. In this context, being a KBE means more than simply having a thriving "new economy" or "information economy" different from a stagnant "old economy." In a KBE, all sectors have become knowledge-intensive, not just those usually called "high technology."

In this context, an economy should be concerned with all of the five dimensions above, if it is to transform itself into a KBE. One should also understand that these five dimensions are interactive like the three aspects of the knowledge process in Figure 2. In addition, other conceptual factors such as main carriers, spatial boundaries and networks, inputs and outputs, etc., which have been pointed out above, should also be incorporated.

3. Issues for APEC

Since APEC is a multilateral organization for regional economic cooperation, it is

[2] Op. cit., p. 28-9.

natural to expect its main goal is to promote development of member economies. The issues related to promotion of knowledge are, thus, directly related to the main goal of APEC. In other words, the issues should be treated seriously. These issues may be classified into four groups: measuring the level of knowledge in each member economy, identifying the causes for development or underdevelopment of a member economy in terms of knowledge basis, assisting individual member economies' efforts to enhance their own knowledge basis, and undertaking joint programs or projects for knowledge development of all member economies. The first two are related to fact-finding and latter two are related to action.

There is a close correlation between the level of income and knowledge in an economy. As shown by Table 2, there are wide differences in national income(and therefore, development level) and knowledge level in APEC economies. A study undertaken by the APEC Economic Committee (2000), groups APEC economies into four clusters:

① Most Developed Economies(MDEs)
② High Performing Asian Economies(HPAEs)
③ Asian Fast Followers(AFFs)
④ Latin American Economies(LAEs)

These four clusters are based primarily on levels of GDP per capita, geographic location, economic history, etc. Important features of a KBE that are highlighted include: openness to trade, new ideas and new enterprises; sound macroeconomic policy; importance attached to education and lifelong learning; and the enabling role of information and telecommunications infrastructure. In fact, the knowledge required by a knowledge-based society is wider than purely technological knowledge; for example, it includes also cultural, social and managerial knowledge.[3]

Considering APEC's objective and activities, we can list the following issues for the promotion of KBEs.

- Digital divide and knowledge gap
- IT infrastructure
- R&D and innovation systems and activities
- Institutional arrangements and improvements
- Trade and FDI
- New industrial structure and knowledge-based industries
- Improving existing APEC programs for KBE promotion
- Efficient mobilization and allocation of available resources for supporting both

[3] Op. cit., p. 29.

joint and individual action programs for KBE promotion.

This list is inexhaustible and presented to illustrate later discussion. Since the aforementioned reports prepared by the Republic of Korea and APEC EC have already well summarized almost all important issues for KBE promotion, it is unnecessary to repeat all of them here.

4. Status of KBEs in the APEC Region

Figure 3 shows the knowledge level of some APEC economies compared to the OECD average. OECD defines industries with high tech and medium-high tech manufactures, together with community, social and personal services, financial and other business services, and communications services as knowledge-based industries (KBIs). Using this definition, the contribution of "knowledge-based industries" to GDP is over 40 percent for the MDEs of Australia and Canada, and HPAEs of Korea and Singapore.

Figure 3 around here

The proportion of "knowledge workers" in the labor force is over 30 percent for all the MDEs. For the LAEs and the AFFs, the proportion of "knowledge workers" lies between 10 percent and 20 percent of the labor force. This suggests that all APEC economies are already to some degree knowledge-based. The HPAEs and the AFFs are significantly further away from being fully developed KBEs than are the MDEs.

Figure 4 shows the primary conventional indicator of economic development status (GDP per capita) against the, age of knowledge workers. There is a broad correlation between economic status and knowledge intensity. The figure shows three distinguished groups: The MDEs, the LAEs and the AFFs.

Figure 4 around here

There has been no consensus about the proper indicators to measure or assess the level of knowledge basis in an economy or the developmental level of a KBE. Some indicators related to each or some of the five dimensions of a KBE in Table 1 can be used as indicators. Although Table 2 shows only a few of these, it shows wide differences and gaps among the four groups of economies in APEC. Overall, the MDEs exhibit higher level in almost all indicators. However, the HPAEs are comparable with these economies. In contrast, the performance of the AFFs and the LAEs is less

impressive. In fact, they lag behind. The table shows an indicator for education level. Basic education is a long-term investment without which a KBE is unsustainable. In a fully developed KBE, high quality education services that are both widely available and widely used are a major priority for the economy and society. Without a strong education base, it is almost impossible to build the other elements of the national knowledge basis such as R&D or HR for a KBE. It is very interesting to observe that there is a high correlation between levels of GDP, education and IT. The problem is that it takes a rather long time to realize the positive effects of education. Thus, focusing on training is a good starting point.

Table 2 around here

The table also shows some IT-related indicators and science and technology indicators. IT is the backbone of a KBE. Advanced information systems decrease the cost of information and facilitate access to wider pools of information and ideas. A fully developed KBE has a well-developed communications network and institutional arrangements for freer and active utilization of IT. TheAFFs and the LAEs show most disadvantages in IT. Thus, it is an urgent task for APEC to concentrate on the development of IT in member economies. Continuing substantial investment in IT is also needed in the MDFs, the AFFs and the HPAEs.

Even the above glance at the knowledge status of APEC economies indicates that there are wide gap and differences among the member economies in terms of knowledge basis. This implies that there are various constraints, impediments and bottlenecks in the promotion of KBEs in APEC. Fortunately, however, it implies that there will be opportunities and complementary factors since the knowledge process is interactive and subject to increasing returns to scale, which, in turn, implies that the synergy effects and benefits from interactions for knowledge development of APEC economies will be substantial.

III. Review of APEC Activities Related to KBEs

1. Goals and Organization of APEC

APEC was established in 1989 as an informal dialogue group for promoting open trade and economic cooperation with the vision of Asia-Pacific economic dynamism

and sense of community. Its 21 member economies have a combined GDP of over $18 trillion as of 1999 and 44 percent of global trade.

In order to achieve its goal of common prosperity for member economies, APEC has focused on trade and investment liberalization and facilitation (TILF), and economic and technological cooperation (ECOTECH), keeping the spirit of open regionalism. Its organizational structure is characterized by several layers: Economic Leaders' Meeting on top, Ministerial Meeting at the highest level of agenda setting, SOM and four committees. These are EC, BMC, ECOTECH Sub Committee and CTI. Under the EC, there are three taskforces, including one for KBE. Under the ECOTECH Sub Committee there are 11 working groups (WGs) including IST, TEL and HRD. CTI operates several fora. Decisions are made by consensus rule and implementation is voluntary. There is no coercion but peer pressure.

One can easily understand that the operation of multilateral or international organizations per se can contribute to the development of KBEs in the world and APEC is not an exception. Through APEC and its activities, knowledge and information are generated, disseminated and utilized. Thus, the development of APEC as an organization already contributes to the promotion of KBEs in the APEC region.

However, it is equally important that specific programs, activities and units of APEC can directly and more effectively promote KBEs in the region. APEC has taken a number of actions for moving forward on the New Economy, including the E-commerce Readiness Assessment, paperless trading, electronic Individual Action Plans, and capacity building of institutions and human capital in areas related to e-commerce. A more detailed review will be made below.

2. Economic and Technical Cooperation (ECOTECH)

Almost all activities of APEC can be regarded as related to KBE promotion. However, ECOTECH is more directly related. Science and technology, and HRD are two leading areas in ECOTECH.

In 1995, the Osaka Action Agenda identified 13 areas for economic and technical cooperation.[4] A declaration on an APEC framework for strengthening economic cooperation and development, adopted at the 4th Leaders' Meeting in Subic, the

[4] The 13 areas for ECOTECH are: Human Resource Development, Industrial Science and Technology, Small and Medium Enterprises, Economic Infrastructure, Energy, Transportation, Telecommunication, Tourism, Trade and Investment Data, Trade Promotion, Marine Resource Conservation, Fisheries, and Agricultural Technology.

Philippines, set six priority areas for APEC ECOTECH activities. These were: developing human capital, fostering safe and efficient capital markets, strengthening economic infrastructure, harnessing technologies for the future, promoting environmentally sustainable development, and encouraging the growth of small and medium enterprises. As of 1999, a total of 250 activities had been implemented, supporting the six ECOTECH priorities, as shown in Table 3. The HRD and IST Working Groups have been the most active in terms of the number of projects underway. The Fisheries, Marine Resource Conservation, Trade Promotion and Tourism Working Groups have been among the least active. In terms of the six priorities, the development of human capital has had the most projects, and the fostering of safe, efficient capital markets has had the least.

Table 3 around here

With 250 activities underway, there exists a high possibility of duplication of efforts. All of the priority areas include activities already being conducted elsewhere in APEC. This indicates the need for improved coordination at the priority level.

The unsatisfactory ECOTECH record partly results from the developed economies' unwillingness to push the agenda actively in APEC. The developed economies tend to emphasize the role of the private sector in ECOTECH activities. They have shown more interest in the trade liberalization agenda and aim at taking advantage of APEC for the purpose of further liberalization beyond the UR Agreement. However, the developing economies have considered APEC more as a forum for economic and technical cooperation, where they can attain equitable growth and sustainable development through active cooperation among the developed and developing economies in various areas. The different views on and goals for APEC by the developed and developing economies became a source of friction for APEC and contributed to the forum's unsatisfactory performance in ECOTECH activities.

3. Science and Technology

APEC initiatives and goals regarding industrial science and technology are well stated in the "APEC Agenda for Science and Technology Industry Cooperation into the 21st Century," approved in 1998 at the Leaders' Meeting in Kuala Lumpur. It presents a

vision of "a dynamic and prosperous Asia-Pacific region built on the development and application of industrial science and technology which supports economic growth and improves quality of life while safeguarding the environment and the natural resources necessary for economic sustainability. The successful development, application and commercialization of industrial science and technology will depend upon the ability of APEC economies to create a strong open innovation system and to work cooperatively to catalyze the development of strong sustainable regional S&T networks and partnership." This vision is to be promoted through five mechanisms: ① improved availability and access to information, ② improved human resource development, ③ improved business climate, ④ enhanced policy dialogue and review, and ⑤ facilitation of networks and partnerships.

The Industrial Science and Technology Working Group (ISTWG) is the operational forum of APEC dealing with this sector, and as such it is responsible for developing activities that substantiate the vision spelled out in the APEC Agenda for Science and Technology Industry Cooperation. The most useful action taken by ISTWG was the creation of the APEC Science and Technology Web (AST Web) that provides tools for the flow of information about member economies. It includes a database of current projects in this area with Internet links to most of them.

4. IT

APEC has several sub-organizations for IT development in the Asia-Pacific region. The APEC Telecommunications Working Group(TELWG) is one of them. It was formed in 1990, focusing on HRD, technology transfer and regional cooperation, information exchanges, standardization, etc. Recently, its agenda added various issues that arise from the development of the Internet and IT industry as the forefront of the digital economy.

The Asia-Pacific Information Infrastructure (APII) project, which was proposed at the first Telecommunications Ministerial Meeting in Seoul, Korea in 1995 is a unique example. Recently it emphasized ① bridging the digital divide, ② infrastructure investment to upgrade access to networks, ③ HRD in the Digital Economy, and ④ encouraging competition in communications services and improving regulatory environments for e-commerce.

5. HRD

Human resources development (HRD) in APEC aims at developing the potential of human resources and increasing their contribution to the APEC regional economic growth and the KBE. In order to strengthen the development of human resources, HRD has been regarded as the first priority area in the ECOTECH agenda, and numerous activities related to HRD have been undertaken since the foundation of APEC in 1989. HRD has been identified by APEC Leaders as a priority issue for APEC since 1989. In the 1991 Seoul Declaration, HRD was identified as an important area for the economic and social well-being of people in the region. As the first priority area in APEC ECOTECH activities, HRD has received a good deal of attention from APEC and its member governments, which is proven in Leader's Declarations, Joint Ministerial Statements, HRD Ministerial Statement and other Ministerial Meetings, as well as HRD policy adjustments by member governments.

At present, HRDWG has finished and endorsed with other APEC fora over one hundred projects. Some have been going on for several years and progress reports have been provided at almost every HRDWG meeting. Such projects include: University Mobility in Asia and the Pacific (UMAP) by Australia, Japan-APEC Partnership for Education and Training, (JAPET) by Japan, APEC Vocational Training Program and APEC Youth Skills Camp Program by Korea, Education Hubs by Singapore, and APEC Business Volunteer Program (APEC BVP) by Thailand.

Since HRD is a kind of public good, investment in HRD does not strongly appeal to the private sector, even though the potential of human resources cannot be fully utilized without adequate private participation. APEC developing economies need to develop human resources and increase their productivity more than developed economies, especially to meet the challenges of KBE promotion.

6. EC

The Economic Committee (EC) of APEC was established in 1994 as an innovative extension of the Ad Hoc Group on Economic Trends and Issues. The EC is a coordinator for economic policy research in cooperation with APEC Study Centers. It works to identify priority economic issues for Leaders and Ministers, and for the TILF and ECOTECH agendas.

The Economic Committee of APEC started a program to examine the implications for APEC members of the trend towards a KBE, including examining the extent of knowledge promotion of member economies and individual on collective measures for the promotion. In support of these efforts, Korea hosted two international symposiums

on KBE promotion in APEC in 1999 and 2000.

7. Leaders' Meeting

APEC Leaders' Meeting started in 1993 in Seattle, which adopted the vision of the Asia-Pacific community. Since then, the meeting has been held every year and has set the basic themes of APEC activities and initiatives such as the Bogor Declaration's TILF (trade and investment liberalization) and ECOTECH, the Osaka Action Agenda, MAPA, etc. The Sixth Leaders' Meeting in Kuala Lumpur adopted Korea's proposal for KBE promotion, which was re-emphasized in the Seventh Leaders' Meeting in Aukland, New Zealand.

The recent declaration of the APEC Leaders in Brunei Darrussalam in 2000 includes an important action agenda for facilitating the New Economy in the region including the IT and Internet industry. The "Action Agenda for the New Economy" includes: creating an environment for strengthening market structures and institutions; creating an environment for infrastructure investment, technology development for entrepreneurship; building human capacity; and entrepreneurship development. APEC's approach to achieve these goals is cooperation and partnership among business, government and the widest spectrum of the community.

The APEC Leaders' Declaration also lists the following as an action agenda: the development of a conducive policy environment for investment in infrastructure and the development of technology; inducement of innovation and entrepreneurship and building human capacity and knowledge through comprehensive and high-quality education, training and skills development programs; pro-competitive and market-based policy frameworks for liberalization in trade in telecommunications and IT services; cooperation between governments and business sectors to work towards affordable quality access to telecommunications services and the Internet for all APEC economies. The Declaration is expected to exert a great influence on the future development of KBEs in the Asia-Pacific region.

IV. Directions and Policies for the Promotion of KBEs in APEC

1. Directions

Recall the interactive model of knowledge process (Figure 2) and the five dimensions of a KBE (Table 1). These are the bases for the discussion of directions, strategies, measures and policies for the promotion of KBEs in the APEC region. The interactive model implies, on an empirical basis, that the KBE promotion at the APEC level is beneficial to all member economies and that all economies can contribute to the promotion. The characteristics of the five dimensions imply that the relative strength and time perspective of each dimension should be considered when strategies and policies are made.

As pointed out earlier, APEC can assist each member economy's own efforts to promote a KBE and undertake joint programs. The 2000 Seoul Symposium identified these according to the categorization of four dimensions of the KBE and groups of APEC economies. These are summarized in Table 4, which shows that these economies share similar tasks in general but there are different tasks specific to each economy. Another table included in the symposium proceedings (not shown here) also confirms that almost all economies have some programs or projects for KBE promotion. In other words, almost all APEC economies, developed or developing, are already involved in KBE promotion. This fact has at least two implications. First, each individual APEC economy has its own challenges and policy programs for KBE promotion. Second, there must be some collective actions and measures for promoting KBEs through APEC.

Table 4 around here

As reviewed, APEC has already worked for the promotion of KBEs in many aspects. However, most APEC activities related to KBE promotion are fragmented and it is only two years ago that APEC started to explore a consolidated and better focused approach to the vision. As indicated by the newly published report on KBE promotion by the APEC EC, the endeavor is in the earlier stages of preparation at the APEC level. Some individual economies are far ahead of APEC.

Considering all these factors, APEC's direction for KBE promotion can be summarized as follows.

1) Transforming member economies into KBEs (incorporating the concepts of the New Economy and the Digital Economy) should be regarded as and incorporated into the vision of APEC rather than as an agenda.
2) ECOTECH should be redefined in terms of KBE.
3) The MDEs can and should do more for following economies and they can benefit from this assistance since promoting KBEs is a positive game.

4) APEC should disseminate the best practices for a KBE effectively among member economies.
5) Starting with short-term effective projects, gradually more long-term projects should be launched. Eventually, a grand scale regional framework like the EU Framework for S&T development should be adopted.

2. APEC for Individual Economies

Not all APEC member economies have been actively launching KBEs. At present, less than half of APEC member economies explicitly work for such plans or strategies.

Singapore's drive for a KBE is manifested in its "Industry 21" which emphasizes the role of Singapore as the hub of the world for KBIs. Industry 21 is a blueprint for the development of electronics, chemicals, life sciences, engineering, education, health care, logistics, communications and media and MNEs. Also, Singapore has implemented the strategy of "IT 2000: A Vision of an Intelligent Island" since 1991, which placed Singapore far ahead of other Asian economies in terms of a KBE.

Although Malaysia has not explicitly formulated a plan for a KBE, it has been implementing the second Industrial Master Plan (1996-2005) which aims at transforming the industrial structure into one of high value-added. The ambitious long-term plan, Vision 2020, and the strategy of the Multimedia Super Corridor (MSC) also are related to KBE promotion.

Korea is one of the economies most actively promoting a KBE, for which it has drawn much attention. Recently the World Bank undertook a case study of Korea's strategy for a KBE (World Bank, 2000). Korea's strategy consists of several plans. One is the plan which was adopted as a conceptual framework for a KBE in 1998 after the economic crisis. The essence of the framework consists of four parts: ① educational reform and cultural development, ② establishment of information infrastructure, ③ improvement of S&T environment, and ④ structural transformation into knowledge-intensive high value-added industries. The other is the "Cyber Korea 21 Vision," which was adopted in 1997 and emphasize the role of IT in a KBE.

In addition to these economies, several others also adopted plans directly or indirectly aimed at the promotion of a KBE. U.S., Canada, Japan and other developed economies are already ahead of other economies. However, many other economics are lagging behind. APEC's role is to assist all member economies to actively move toward KBEs. In this direction, APEC may consider several actions:

1) Disseminating case study results and best practices for KBE promotion

2) Establishing a policy consultation group for KBE promotion for member economies
3) Inducing some existing or new ECOTECH programs towards KBE promotion for member economies

Sometimes the distinction between the specific programs for individual economies by APEC and joint programs at APEC level is blurred. Programs for individual economies may be characterized by the resource flows from developed member economies to lagging economies mainly for the purpose of reducing the knowledge or digital gap.

3. APEC for Joint Programs

It seems that one of the most thorough review of potential areas of APEC cooperation is the paper by Moon[5], which was presented at the 2000 Seoul Symposium. For the dimension of business environment, he considered the macro-legal area, which was further broken down into trade, investment, e-commerce, policy coordination and harmonization of legal systems. In Table 1 in his paper, which is not reprinted here due to space constraints, he identifies "potential areas of cooperation," "related existing APEC activities," "impediments to cooperation," and "directing APEC's actions." In the conclusion, he recommended the following three actions:

1) Establishment of a "Knowledge Clearing House"
2) Generation of "Igniting Policies" for triggering the transition to the KBE
3) Inclusion of "KBE Status Indicators" in the APEC EC's "Economic Outlook"

These recommendations were adopted by APEC as an official action plan for the next stage for KBE promotion (APEC EC, 2000). While acknowledging the motivation, only the third recommendation seems realistic or necessary. The Knowledge Clearing House (KCH) is an information network to facilitate the exchange of various types of knowledge pertaining to the development of KBE among member economies. Although the idea is ambitious, the implementation of such a grand scheme is almost impossible. At best, a data base using the Internet may do the job. However, the amount of information of this kind exceeds the scale of the Internet. It is almost impossible to trace all the types of knowledge in relation with KBE promotion. The generation or provision of information on igniting policies at the level of APEC is also difficult due to the differences among APEC economies.

[5] Moon (2000), p. 130-3, Table 1.

Considering these drawbacks, the following five areas for joint action are proposed in this paper.

1) Sharing information on the best practices, indicators and research outputs on KBEs among APEC economies
2) Strengthening and trimming ECOTECH and reorganizing WGs in line with KBE promotion
3) Joint business development in KBIs- strategic alliances, joint R&D, investments and trade in IT, e-commerce, etc.
4) Provision of physical and intangible infrastructure for KBE promotion- laboratories, schools, the Internet and IT networks, standards, IPRs, etc.
5) HRD, especially for knowledge workers.

Already there are various programs, actions, projects and organizations in APEC which are related to these recommended areas. For example, Table 3 summarizes ECOTECH activities and programs, which indicate a close relationship with KBE promotion. The point is to strengthen, induce and harmonize these programs in terms of KBE promotion. Instead of such a mechanism as the Knowledge Clearing House, it is better to utilize all kinds of mechanisms and means to create, disseminate and use knowledge and information on KBEs and related issues in APEC.

Some of the five areas include joint projects for assisting activities of individual economies. In the short run, two projects are strongly recommended: an APEC program for training software programmers and the establishment of a forum of university presidents from member economies. The necessity and importance of these projects do not need to be emphasized. Most member economies are experiencing a shortage of software programmers, but some economies can supply these engineers with a few years' training. Although the market can solve the shortage problem, it is not necessarily the perfect answer. At the level of APEC, economies can do better by training these programmers, at least in the sense of assistance and coordination. The proposed forum of university presidents can be established in coordination with the existing APEC Education Foundation, which mainly aims at promoting scholarly research and allocation of scholarships. The Foundation has been suffering from the lack of enthusiasm of member economies. Combining the activities of the proposed forum and the Foundation is expected to result in synergy and enthusiasm. To establish the forum, the existing relationship between APEC and APRU (Association of Pacific Rim Universities[6]) can be further developed.

In the medium and longer term, APEC needs to launch a grand scale program such

as an "APEC Framework for KBE Promotion" which plans, coordinates and operates major projects for KBEs. The idea and operational scheme are similar to the EU Framework, which is mainly for S&T development in the EU. Obviously the proposed framework should be a major part of ECOTECH.

Although almost all activities of APEC, whether they are TILF-related or ECOTECH- related, can contribute to the endeavor, ECOTECH is more important for knowledge related issues. ECOTECH should be coordinated by the ECOTECH Sub-Committee (ESC) and the role of KBE Task Force should be linked to the ESC. Like the IAP for TILF, the IAP for ECOTECH is also needed for this purpose. Already there have been several mechanisms and programs for the involvement of the private sector in APEC. Since the forerunners in KBEs are private enterprises, APEC should encourage and facilitate strategic alliances, joint R&D, investment and trade in IT, e-commerce, etc., among enterprises in APEC economies on the basis of the KBE concept.

Several leading economies can contribute to APEC promotion of KBEs by sharing their experiences with following economies and by more actively participating in ECOTECH. An agreement on a KBE and IT Initiative by APEC can give momentum to KBE promotion. Needless to say, APEC cooperation in solving the problem of the digital divide or the digital disparity is the most urgent and difficult task. The digital divide refers to the gap between people, organizations and geographic area in terms of access to IT and the Internet. Thus it is closely linked to the knowledge gap or knowledge disparity. Recently it has been revealed that Japan is considering a special program for overcoming the digital divide in Asia with a focus on ASEAN. This is a good example that more advanced countries can make significant contributions to this task.[7] Last but not least, continuous efforts to improve NISs by sharing experiences and exchange experts, scientists and engineers should be emphasized, since NISs are the backbone of KBEs.

V. Concluding Remarks

The official discussion on the KBE at the level of APEC was initiated by President Kim Dae Jung, who emphasized the implications of the KBE promotion in APEC in

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[6] Regarding APRU, see http://www.usc.edu/apru.

[7] A more detailed discussion on the issue is beyond the scope of this paper. For related discussions and facts, see OECD (2001b) and ITU (2000).

preparation for the 21st century during the Leaders' Meeting in Kuala Lumpur, Malaysia in 1998. Korea hosted the first APEC Symposium on the KBE in June 1999 and the second symposium with the theme of "Preconditions, Policies and Cooperative Potential for Promoting KBEs in APEC" in June 2000, which discussed various issues for promoting KBEs in APEC.

The differences among member economies in terms of stage of development, endowments, industrial structure and culture implies that there are benefits from coordinated efforts for KBE realization in APEC. However, it also implies that there are substantial barriers and impediments to the implementation of policies and strategies. Eeconomies are faced with different challenges for KBEs according to their level of developement. Developed economies have their own agenda for KBEs, but they are in a better position to share their experiences and resources with developing economies. Developing economies encounter more difficult tasks. They have to introduce new knowledge-based industries and elevate the knowledge level in existing industries at the same time.

Four areas for KBE promotion for four groups of economies in APEC were identified in the 2000 Seoul Symposium on KBE promotion. Namely, ① business environment, ② innovation system, ③ human resource development, and ④ ICT infrastructure are the four areas. The four clusters of economies are : ① the Most Developed Economies, ② the High-Performing Asian Economies, ③ the Asian Fast Followers and ④ the Latin American Economies. In the present study, the fifth area including institution and culture, enterpreneurship, etc. was added.

The main points of the Seoul Symposium may be summarized as follows, First, the promotion of KBEs will benefit all economies, developed or developing, in APEC. Second, although individual economies are responsible for realizing KBEs, cooperation among member economies is equally important and desirable. Third, although the market and the private sector should be the main initiator of KBEs, government should take the role of facilitator since market failures and extenalities may prevail in a KBE. Fourth, the promotion of KBEs should aim not only at filling the "knowledge divide" between economies but also at filling the gap within each country. Fifth, a new institutional arrangement in APEC is needed for the overall coordination of the promotion of KBEs.

Although all APEC activities are directly or indirectly related to the promotion of KBEs, ECOTECH is more so. APEC established the KBE Task Force under the EC in February 2000 in order to facilitate the discussion and implementation of KBE promotion due to the importance of the subject and the broad and duplicative activities

of ECOTECH. Considering the increasing criticism of developed economies, which more emphasized trade and investment liberalization and less contributed to ECOTECH, greater efforts by developed economies for the joint promotion of KBEs in APEC are encouraged. For this, a measure to link TILF and ECOTECH is a must.

In this study, several new ideas and projects have been proposed. Namely, ① information sharing on best practices, ② reorganizing WGs in line with KBE promotion and strengthening ECOTECH, ③ joint business development in KBIs, ④ infrastructure development for KBEs, and ⑤ HRD for knowledge workers. These are somewhat different from the three projects adopted by the APEC EC, but the ultimate goal is the same.

Korea has initiated and led several programs aimed at KBE promotion. The task of Korea, which has been actively pursuing a KBE and IT development, is twofold: it should induce developed economies' cooperation with the entire region, and Korea itself should continuously make contributions to developing economies, especially by proposing a strategic model of KBE which is applicable to developing economies. Considering Korea's limited resources and incomplete industrial restructuring, these may not be easy challenges. However, if Korea moves in the right direction and is successful in current economic reforms, it can make a significant contribution to the development of KBEs in the Asia-Pacific region.

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국문초록

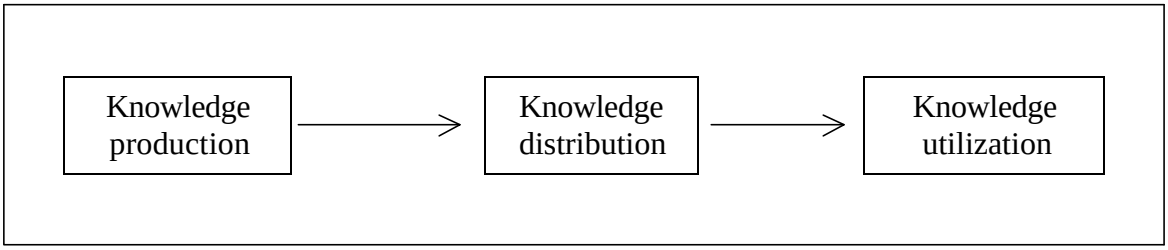
본 연구는 APEC 지역의 지식기반 경제화 증진을 위해 모범사례에 대한 정보 공유, 지식기반 경제 증진을 위한 APEC 작업반(WG)의 재조직 및 ECOTECH, 지식기반산업 발전을 위한 공동사업개발, 지식기반경제를 위한 인프라 구축, 지식근로자를 위한 인적자본개발 등을 제안하였다.

이와 같은 맥락에서 APEC은 회원국의 지식기반경제화를 위해 지식개반경제화를 위한 모범사례 연구결과의 보급, 회원국의 지식기반경제정책을 위해 자문그룹의 설치, ECOTECH 프로그램의 강화에 집중할 것이 강조되었다. 특히 ECOTECH의 핵심적인 역할과 이를 뒷받침하기 위한 역내 선진경제들의 보다 적극적인 기여의 중요성이 지적되었다.

洪裕洙

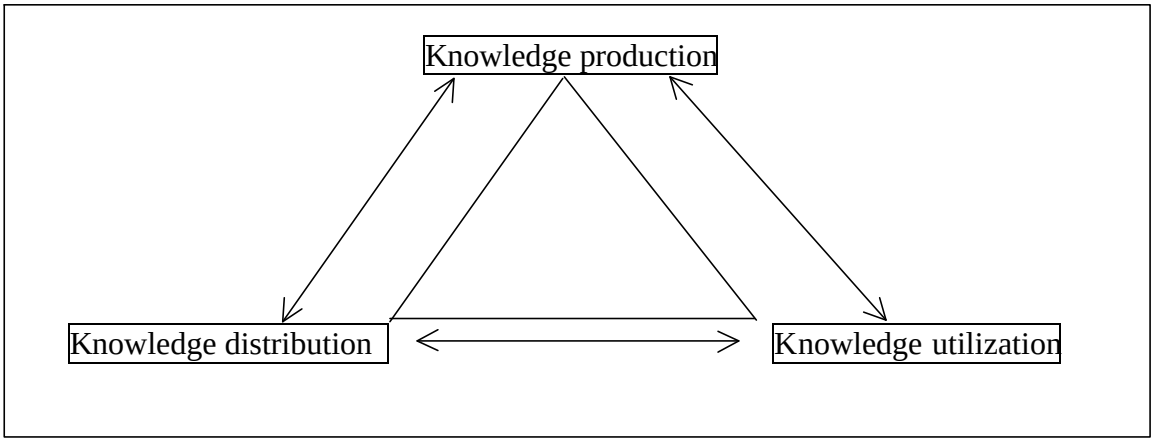
서울대학교 무역학과 졸업(1969)
미국 Northwestern大 경제학 박사(1983)
한국과학기술연구원(KIST) 해양경제실장(1976)
Oklahoma 주립대 경제학과 조교수(1984)
대외경제정책연구원 연구본부장 겸 동북아팀 선임연구원
(現, E-mail: yshong.kiep.go.kr)
저서 및 논문
"Technology-Related FDI Climate in Korea"(1998)
『한일 인터넷산업 경쟁력 비교』(2001) 외

Figure 1. Linear Model



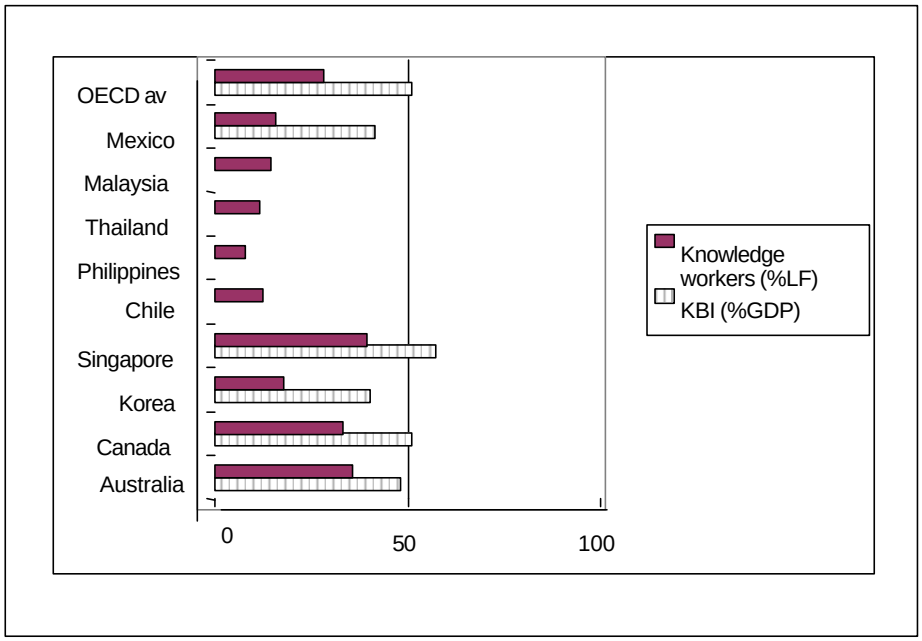
Source: Adapted from OECD. 2000a, *Knowledge Management in the Learning Society*.

Figure 2. Interactive Model



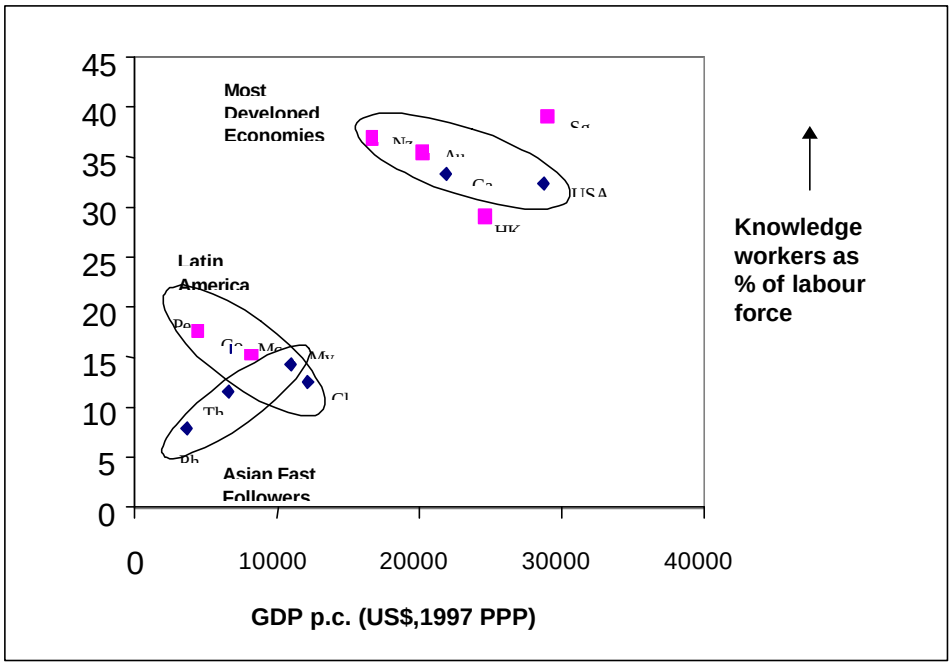
Source: Adapted from op.cit.

Figure 3. Knowledge Level of APEC Economies



Source: McKeon, R. and T. Weir (2000), p. 31.

Figure 4. Groups of APEC Economies in Terms of Knowledge Intensity



Source: McKeon, R. and T. Weir (2000), p. 32.

Table 1. Dimensions of a KBE

Dimension	Main Carrier	Main Function			Time Effectiveness
		P	D	U	
NIS	-Public & Private R&D Institutes -Universities	◎	△	O	S
HR	-School	△	O	◎	S / F
IT	-Government -Firms	△	◎	O	S / F
Entrepreneurship	-Firms	O	△	◎	F
Institutional Environment	-Government -Society	A	A	A	S / F

Note : 1. NIS = National Innovation System

HR = Human Resource

IT = Information Technology

2. P = Production, D = Distribution, U = Utilization,

A = All, S = Slow, F = Fast

3. ◎= Very active, O = Active, △= Less active

Source: The author

Table 2. Indicators for KBEs

	Population (million people, 1998)	GDP (US$bil, 1997)	GDP per capita (US$, 1997)	Scientists and engineers in R&D per million people (1981-1995)	Net secondary enrolment ratio (% of relevant age group, 1995)	Telecom-munications investment per inhabitants (US$, 1998)	Main telephone lines per 100 inhabitants (1998)	Mobile subscribers per 100 inhabitants (1998)	Internet users per 10,000 inhabitants (1998)	Estimated PCs per 100 inhabitants (1998)
Most Developed Economies										
United States	270.4	8,083.4	30,173	3,732	89	89.6	66.13	25.60	2.219.16	45.86
Japan	126.5	4,192.7	33,231	5,677	96	280.6	50.26	37.38	1.323.42	23.72
Canada	30.3	618.3	20.608	2,322	93	133.1	63.39	17.56	2,475.21	33.00
Australia	18.7	393.7	21,245	2,477	89	152.0	51.21	28.82	1,603.51	41.16
New Zealand	3.9	65.0	17,146	1,778	93	77.4	47.9	20.26	1,583.86	28.21
High Perfornimg Asian Economies										
Korea	46.4	442.5	9,622	2,636	96	176.0	43.27	30.19	668.32	15.68
Singapore	3.2	95.1	30,645	2,512	-	247.2	56.20	34.60	1,738.58	45.84
Chinese Taipei	21.9	255.2*	11,652*	27,430*	96*	109.0	52.44	21.56	1,373.07	15.86
Hong Kong, China	6.7	173.6	26.700	-	71	269.4	55.77	47.47	1,495.39	25.42
Asian Fast Followers										
Malaysia	22.2	97.9	4,517	87	91	101.0	19.76	9.92	360.66	5.86
Thailand	60.3	149.1	2,478	173	-	9.3	8.35	3.25	33.17	2.16
Philippines	72.9	82.2	1,136	90	60	12.7	3.70	2.19	20.56	1.51
Indonesia	206.3	215.0	1,068	151	42	7.5	2.70	0.52	14.54	0.82
China	1,225.7	917.7	734	537	--	14.4	6.96	1.90	16.72	0.89
Vietnam	77.6	23.4	312	334	-	-	2.58	0.24	1.29	0.64
Latin American Economies										
Chile	14.38	75.8	5,182	364	53	63.4	20.55	6.50	202.37	4.82
Mexico	95.8	402.4	4,216	95	-	16.7	10.36	3.50	140.87	4.70
Peru	22.8	65.2	2,676	273	53	29.8	6.67	3.00	80.65	1.81
Other										
Brunei(G)	0.3	5.0	17,556	-	-	-	24.68	15.60	317.46	-
PNG	4.3	4.9	1,205	-	-	-	1.14	0.07	0.12	-
Russia	147.7	445.38	3,030	-	-	-	19.66	0.51	67.71	6.43

* Chinese Taipei Statistical Data Book, 2000

Source: World Bank (1999); ITU (2000).

Table 3. Summary Table of Ecotech Activities by APEC Working Groups and Priority Themes (1999)

APEC Fora / Priority themes	EWG	FWG	HRD	IST	MRC	TEL	TWG	TP	TPT	ATC	CTI	EC	SME	ESC	SOM	Total
Developing Human Capital	-	2	36	6	-	10	2	-	4	-	20	-	-	1	1	82
Fostering safe, Efficient capital markets	-	-	1	-	-	-	-	-	-	-	1	4	-	-	-	6
Strengthening economic infrastructure	5	-	-	-	-	4	-	-	5	2	4	5	-	-	-	25
Harnessing technologies for the future	8	-	1	18	-	10	-	-	5	5	4	-	-	-	-	51
Promoting environmentally sustainable development	8	1	3	27	7	1	1	-	3	1	1	-	-	-	-	53
Encouraging the growth of small and medium enterprises	-	2	-	1	-	4	-	2	-	1	-	-	11	-	-	21
Other Activities	3	1	-	-	-	-	3	2	-	3	-	-	-	-	-	12
Total	24	6	41	52	7	29	6	4	17	8	34	9	11	1	1	250

Notes: EWG : Energy Working Group, FWG : Fishery Working Group, HRD : Human Resource Development Working Group
IST : Industrial Science and Technology Working Group, MRC : Marine Resource Conservation Working Group
TEL : Telecommunication Working Group, TWG : Tourism Working Group, TP : Trade Promotion Working Group
TPT : Transportation Working Group, ATC : Agricultural and Technical Cooperation CTI : Committee on Trade and Investment,
EC : Economic Committee, SME : Small and Medium Enterprises, ESC : Ecotech Subcommittee, SOM : Senior Official Meeting
Source: SOM Document

Table 4. Major Policy Challenges for KBE Promotion

	MDEs	HPAEs	AFFs/LAEs
National Innovation System	- increase R&D - strengthen natioal innovation system	- improve domestic innovation capacity - increase access to FDI-related technology transfers	- improve capability to efficiently adapt and utilize modern technologies
Human Resources	- improve schooling outcomes - expand job training - facilitate lifetime learning	- increase tertiary educational attainment - raise school, quality - increase adult education opportunities.	- increase secondary educational attainment expand science & technology education - increase worker training
IT	- complete fibre optic networks - promote use of ITs	- build digital networks - increase use of ITs	- modernize telecomm. facilities - allow competition - promote IT use
Institution & Culture	- establish more internationally competitive and efficient tax regimes - internationalization of education	- establish strong capital market laws and institutions - establish sound corporate governance laws - higher education	- improve marketplace laws w.r.t: banking, competition, intellectual property - modernize traditional infrastructure & culture - education-oriented culture

Source: Gera, S. and R. Hirshhorn (2000), P. 102, supplemented by the author.

KOREA INSTITUTE FOR INTERNATIONAL ECONOMIC POLICY

300-4 Yomgok-Dong, Seocho-Gu, Seoul 137-747, Korea
Tel: (822) 3460-1114
Fax: (822) 3460-1122
URL: http://www.kiep.go.kr

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