THE INTERNATIONAL POLICY DIALOGUE 2012

ECOSYSTEM FOR REGIONAL INNOVATION IN ASIA

Sains dan Teknologi

Science and Technology

科学与技术

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PREFACE

This is a record of the Second International Policy Dialogue on Regional Collaboration in Science and Technology (IPDCSTA2012) in Asia held on October 19 and 20, 2012, at the National Graduate Institute for Policy Studies (GRIPS), Tokyo.[1] The Policy Dialogue was co-organized by the Takeda Foundation, GRIPS, the Japan International Cooperation Agency (JICA), the Engineering Academy of Japan (EAJ), Honda Foundation, and the Japan Research and Industrial Technology Promotion Association (JRIA), and supported by the Ministry of Education, Culture, Sports, Science and Technology (MEXT), Cabinet Office, the Ministry of Economy, Trade and Industry (METI), and the Ministry of Foreign Affairs (MOFA).

The IPDCSTA2012 involved international workshops and a symposium on ecosystems for regional innovation. The IPDCSTA2012 welcomed the participation of 21 representatives from 9 countries including India, Bangladesh, Myanmar, Cambodia, Laos, Vietnam, Thailand, the Philippines, and Korea. At the international workshops, we focused on initiatives and challenges concerning the regional collaboration including: the introduction of regional collaborative initiatives including e-ASIA Joint Research Program, SATREPS (Science and Technology Research Partnership for Sustainable Development), and SEEDNet; the development of novel funding mechanisms that support regional collaborative research; the establishment of international open innovation research centers to facilitate the regional collaborative research; the facilitation of cross-border movement of human resources; the development of ecosystems for entrepreneurs. Essence of the discussion is summarized in “ESSENCE OF DISCUSSION”. At the end of the international workshops, all participants agreed to support the submission of policy proposals on the above subjects to Asian governments and science and technologies communities. The policy proposal will be published separately with the record of the IPDCSTA2012.

The international symposium enjoyed the participation of such eminent figures as Mr. Shin Maruo, Ambassador for Science and Technology Cooperation, Ministry of Foreign Affairs, Dr. Michiharu Nakamura, President of the Japan Science and Technology Agency, Dr. Teruo Kishi, Advisor to the National Institute for Materials Study, Dr. Aung Kyaw Myat, Director General, Ministry of Science and Technology, Myanmar, Dr. Hiroyuki Watanabe, Chairman, ITS Japan (Senior Technical Executive, Toyota Motors), and Dr. Hugh Thaweesak Koanantakool, President, National Science and Technology Development Agency, Thailand. After the speeches, we held a panel discussion based the discussion at the workshops. The panelists include Prof. Tateo Arimoto from GRIPS, Prof. Dong-Pil Min, Korean Ambassador of Science and Technology, Prof.

[1] The International policy dialogue is supported by a grant from Strategic Funds for the Promotion of Science and Technology Program, MEXT.

OM Romny, Director General of the Institute of Technology of Cambodia, Dr. Seetharam Kallidaikurichi, Principal Operation Coordination Specialist of the Asian Development Bank, Dr. Tatang Taufik, Deputy Chairman of the Agency for Assessment and Application of Technology, Indonesia, Dr. Teruo Kishi, Advisor of NIMS, and Prof. Wiwut Tanthapanichakoon of the Tokyo Institute of Technology. The moderator is Prof. Sunami from GRIPS. The contents of the speeches and the panel discussion are presented in this product.

Secretariat of the International Policy Dialogue on Collaboration in Science and Technology in Asia

WORKSHOPS ON ECOSYSTEM FOR REGIONAL INNOVATION IN ASIA

ESSENCE OF DISCUSSION

REGIONAL COLLABORATIVE INITIATIVES

Regional collaboration with Bangladesh

The investment in science and technology in Bangladesh is very low. The country depends on technology transfer while many talented human resources are working outside the country. The country faces many natural hazards including cyclones and water pollution. Many other Asian countries share the same situations.

Technology transfer is not sustainable without the development of local human resources. Previously, the focus was on technology transfer, but now the emphasis is on indigenous capacity building in which universities and the science & technology community play vital roles.

Bangladesh is not a member of ASEAN and is left out of regional collaboration mechanisms such as SEED-Net. Bilateral cooperation is very important, but multilateral collaboration will become much more important since S&T collaboration to date comprises mostly joint research.

e-ASIA Joint Research Program

The East Asian Science and Innovation Area Joint Research Program (e-ASIA JRP) is a mechanism to promote multilateral collaborative research with matching funds. Participating groups share outcomes and promote social applications for innovation. Members of e-ASIA JRP are public funding institutions of the 18 East Asian Summit, which does not include Bangladesh.

Bangladesh should be included in e-ASIA JRP. This will require approval by the board members, but there are many roads to participation. Bangladesh can be welcomed as a guest member of e-ASIA JRP. If their researchers are interested in participating in specific supported programs, they are welcome.

SATREPS

Japan has been assisting Bangladesh development using bilateral cooperation mechanisms including overseas assistance loans, grants and human resource development. The SATREPS project is one of these mechanisms.

SATREPS is a bilateral collaborative mechanism used to tackle global issues including environmental and energy issues, infectious diseases, and climate change in

cooperation with JICA and JST. JICA supports research groups in developing countries whereas JST supports Japanese groups. SATREPS supports 66 projects in 34 countries; one project is to develop approaches to the diagnosis and treatment of the neglected disease leishmaniasis (kala-azar) in Bangladesh.

The SATREPS scheme is oriented toward research. It is necessary to link SATREPS projects to the practical stage. There is a gap between R&D in academia and business development. JICA tries to fill the gap between public investment and private sector business to promote social innovation in developing countries. The key to success is identifying how to incorporate local conditions into both the technological and cost sides so as to be affordable.

It is essential to know about the local culture. More studies are needed concerning the ecosystem of the jobs that projects will create. It is necessary to understand the local environmental situation before undertaking projects.

SATREPS supports several biomass projects in Asia. Biomass is very important as a renewable energy source for Southeast Asian countries, because Southeast Asia is rich in biomass resources and the dependence on nuclear power energy is expected to diminish. In biomass projects, practical applications are important, and high priorities are placed on the development of technology and regional standards.

In Vietnam, the development of biomass is important, because it encourages rural development, and will increase farm income as well as complement the total energy supply. It is important to develop biomass with non-foodstuffs.

In India, IIT Madras is involved in a SATREPS project for disaster communication in cooperation with Keio University.

SATREPS accepts proposals from universities and research institutions in each country. Relationships between the partnering country and Japan are important, and must be taken into consideration.

Website

It is proposed that a website be set up with information on the subjects of study and links to the projects that are funded, so a country or researcher can contact the project researchers. A concentrated place for information is necessary. It is useful to consolidate the information and put it on a website sorted by subject area.

What is important is not just networking. It will be necessary to organize a meeting once a year where information is exchanged and renewed.

NOVEL FUNDING MECHANISMS

National public funding agencies operate within their own borders. It is necessary to establish international funding bodies that can make cross-border grants.[1]

There are several funding bodies that can make cross-border grants in the region and all are based on universal values. All support projects are selected on a needs-based priority.[2] Japan "pays a lot of money, but pays no attention" to the ASEAN foundation. We should pay more attention to existing mechanisms before we consider novel ones.

Public Private Partnership in Funding

Public funding gives stability but is not flexible, and sometimes it is shortsighted. It is better to open up to more participation from private companies. Private companies or congregated bodies such as chambers of commerce are more open to international participation. The private sector should have the opportunity to participate in proposals and in the review of proposals.

There are many examples of NSF funding mixed with private sector funding. For example, IBM has supported some computer science research programs. More recent activity involves the Bill and Melinda Gates Foundation, which provides funding for projects involving basic research for agricultural development.

Government systems are changing. Indonesia has more than 500 regional autonomous governments. 40% of the national budget goes to regional governments. So regional governments need to be involved and sensitized.

New mechanisms should be more flexible, and local governments should be players. Countries such as Brazil and Canada have more powerful local governments than national government. Japan's government is national. It is necessary to consider all stakeholders and recognize the different structures of government systems (e.g. local and central) in each country.

Funding for innovation

Public sector money is good for targeting social needs and R&D. But there is a "Valley of Death". Investment in development activities has been neglected at the public money level. There is a need to invest in translational research.

We should handle applied as well as basic research. International funding involves a lot of competition. Need affirmative action to handle BOP challenges. Competitive proposals give no chance to BOP people.

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[2] Osamu Kobayashi, IPDCSTA2012 p15 – 18, "A Preliminary Study on Cross-Borders Funding Mechanisms".

It is necessary to have a more open space for competition. We should have a call for proposals that each player can submit, and the projects should be chosen based on merit. Restrictions can be imposed such as requiring cross-country collaboration.
It might be necessary to restrict funding to research up to the level before commercialization. Restrictions will keep funding at the development level.

It is necessary to define competition and distinguish it from becoming competitive. Many countries are not competitive because of a failure to cooperate. To become competitive, you need to compete.

In the EU, basic research is done at the national level. The regional body does competitive funding for industry and partners to develop new technologies. There is a need for clear agreements between companies. No countries can do this alone. Technology is not immediately in the market. The regional funding targets technology below the company level.

New funding mechanisms should include support for the next generation of scientists and engineers. NSF's summer institute program provides students with an opportunity that allow 200 students to visit 7 countries for 8-9 weeks. The students can work with a mentor in the host country doing research related to their graduate study. Students should gain knowledge of a different country and how research is done there. Contacts early in their career will be helpful as their careers advance.

Proposal for novel funding mechanisms

We propose to start in coordination with existing programs and later create a regional funding body such as the Asian Research Fund.

New funding sources should be independent; not too close to a specific country or interest. Flexibility is crucial. It is essential to develop programs that are flexible, so they can be shaped as they grow. New mechanisms should include local governments as players. New funding mechanisms should also include support for the next generation of scientists and engineers.

INTERNATIONAL OPEN INNOVATION RESEARCH CENTER (IOIRC)

Traditional closed inward-looking research and development are no longer sufficient, and international university-industry-government collaborations in R & D are becoming increasingly more important. It is time for both developed and emerging countries to execute international and multilateral open innovation research collaborations on a university-industry-government basis, inviting different value judgments and wisdom as well as diversity[3].

[3] Yoshio Matsumi, IPDCSTA2012 p21 – 23, "A Preliminary Study on the Development of International Open Innovation Research Centers in Asia".

Open innovation depends on the stage of R&D. In the precompetitive state it is very open, and diversity is of great importance. At the competitive state, the firewall goes up. Intellectual property rights become important.

Japan has an experience of setting up a successful open research center where competing companies worked together. In the 1970s, the semi-conductor industry could identify a common technological gap, and an open research center was established with the help of the Japanese government to develop “basic and common technology” that was precompetitive at that time.

Toshiba has established the Tsinghua-Toshiba energy and environment research center (TTEC) in China to realize energy innovation. University-Industry research centers need to be related to local markets. Toshiba chose China, because the growing market is there.

It is necessary to share common visions that are often not the same. Mutual understanding between companies and universities is important. Companies have already focused on products.

Companies used to do a lot of basic research, but that is changing now. Basic research done in universities is therefore important. The creation of new business should be left to the business side. It is necessary to clarify each mission. They are connected, but the missions should be clarified.

The demand side is far more important for innovation these days. Market pull rather than technology push is more important. Demand sets standards for issues to be resolved.

Open innovation research centers are essential for Asia to accomplish sustainable economic growth. The region shares so many common challenges including natural disasters, energy sufficiency, and infectious diseases. Southeast Asia is rich in biomass resources, and the development of renewable energy is a national strategy for many Southeast Asian countries. It is necessary to establish an international open innovation research center for renewable energy, especially biomass in Southeast Asia.

In order to establish an international open innovation research center, there are many challenges to be addressed, including funding, participation of industry and cost-sharing, manpower, leadership, etc.

To encourage open innovation centers, we should start utilizing existing facilities. At the same time we need to explain how we are using these facilities for the benefit of all players. We need to proceed with actions in parallel.

It is necessary to establish a website to show activities of the open research centers to researchers, professors etc.

We propose establishing an IOIRC working group so that the discussion can be more specific next year and result in a definite proposal. Many issues can be refined by such a group, including coordination with the other two sessions.

CROSS-BORDER MOVEMENT OF RESEARCHERS AND STUDENTS

The cross-border movement of human resources is important because face-to-face exchange is one of the most important sources of knowledge creation. Personal information becomes more and more important as the amount of information increases exponentially with the development of information technology.

The US and Europe have their own methods. US government agencies, including NSF and NIH, make grants to university professors, and they can hire many foreign researchers with these grants. The foreign researchers receive a J1 visa with a confirmation of salary in the US, and come to the US to do research and study. Many sources of public and private funds, including the Fulbright scholarship, support foreign researchers and students to come to the US. There are even several Japanese foundations that support travel to the US and Europe.

ASEAN will be integrated in 2015, and within ASEAN people can travel freely without visa application. There seem to be no initiatives to facilitate the cross-border movement of non-ASEAN researchers and students to ASEAN.[4]

Many Asian people have studied and learned in the United States and Europe. Are we going to continue to rely on the United States and Europe for education and training in the years to come? On a long-term basis, the US and European power will be declining in terms of economy, in science, technology and education. The world will be Asia-centric on a long-term basis. Therefore, under such circumstances, we Asian people should have our own self-responsibility in setting new Asian ways or a new Asian model for education, human resource development, and, most importantly, brain circulation in Asia.

Proposal

We propose establishing a regional arrangement to facilitate the cross-border movement of human resources between ASEAN and non-ASEAN countries, especially within Asia, by 2015. “Human resources” should include the personnel of SMBs, NGOs, local governments and community bodies, as well universities, public research

[4] Takaki Noro, IPDCSTA2012 p28-30, “A Preliminary Study on the Cross-Border Movement of Human Resources”.

institutes and large-scale companies. Extension of the current mechanism of visa-waiver, including the APEC Business Cards and multi-entry visas, to facilitate cross-border movement between ASEAN and non-ASEAN countries should be considered.

We also propose establishing programs to support the movement of human resources by developing networks among public funding agencies and private foundations.

Points to consider

A system of national single-window initiatives has been proposed. These can be utilized as tools to improve and simplify access to visa services, and also to foster science, technology and innovation diaspora networks in the collaborating countries.

It is necessary to extend coverage of professions or occupations and eligibility in the visa-waiver agreement as in the case of the APEC Engineer agreement. However, the current qualifications for APEC engineers are too high. This should be deregulated.

We may need to think about the quality of human resource movement at the same time as we think about the quantity of human resource movement across borders.

Brain drain or brain circulation?

Human mobility enhancement may worsen the brain-drain problem of some countries. It may be wise to take a step-by-step approach in priority fields including food, health, energy, and the environment.

Human mobility is generally considered as part of human capital investment that can improve a country's future.

The Philippines also suffers from the problem of brain drain. However, the national government has come up with some measures—certainly not enough—to discourage people from leaving and encourage those who have left to come back after training. After having spent some time overseas, the Department of Science and Technology provides support in terms of travel and a position in a reputable institution, including a research grant, to get this person started again.

There is a saying, "It's better to have brain drain than to have brain in the drain". It means that if talented people stay back and have no chance to exercise their brainpower, their brains may be in the drain. So it's better to have brain drain.

In the German Humbolt scholarship, students can receive a scholarship, complete the highest doctoral studies, and return to their home country. Maybe after two or three years they're invited again to spend more time in Germany.

Programs to facilitate cross-border movement

The AUN/SEED-Net program is very important and provides big benefits to participating countries in the engineering fields. In Vietnam, about 60% of those who have graduated from foreign universities are products of the AUN/SEED-Net program.

The current undergraduate student exchange in ASEAN should be extended to the postgraduate level.

There is SEATUC, Southeast Asia Technical University Consortium. Also, there is the SEE (Sustainable Energy Environment) Forum. It would be wise to establish networks among all these initiatives including SEEDNet, SEATUC, and SEE.

Certainly there is a need for novel funding mechanisms, international funds from private and government sources that will provide medium- to long-term support. We should consider counterpart support for co-ownership of the program. This will help sustain programs.

We need an Asian version of the Fulbright scholarship program. We should establish an Asian foundation to support human exchange, economics study, and educational system reform.

Sometimes there is a language barrier. Some Southeast Asian countries are French-speaking, and students from those countries sometimes have communication problems.

The efforts we have today are not really matching the scale of the need. We can send one, two, or 20 scholars, but the real need is thousands or hundreds of thousands of students to study overseas.

Money is important in this world. Enhancing regional systems of human resource exchange should be supported by a large and stable financial support system. Government initiative is very important. A second point is that ownership—for all countries—is very important.

Actions

Establish a one-stop portal site that can offer information about exchange programs offered by funding agencies such Erasmus, Marie Curie, maybe the ASEAN Foundation and the Temasek foundation.

ECOSYSTEMS FOR ENTREPRENEURS

In developing countries, small and medium size enterprises are very important for building economic growth. Many countries focus on the nurture of entrepreneurs.

Social entrepreneurs are very important because they are the ones who tackle social

problems such as poverty, unemployment, and environmental disruptions based on innovative ideas. The International Center for Social Entrepreneurs (ICSE) promotes social entrepreneurship by educating foreign students and workers in Japan and awarding their innovative ideas at competition.

Two projects were introduced as examples of social entrepreneurial projects: the Lamp Rental Service [5] and the Community Goat Enterprise [6]. Both projects require entrepreneurial approaches and community participation to be sustainable. Both recognize the importance of capacity building of local people who participate in the projects.

In Myanmar, the Government Employee Cooperative was set up by government employees as the first welfare organization for public employees in 2001. It has been quite successful and the number of employees has grown from several thousand to 600,000 in 10 years. Major success factors are entrepreneurial management that fits the local culture and fair reward and compensation.

Context-relevant solutions

The first observation we need to make in these three cases is a well-defined problem and context-relevant solution. There are other essentials including domain expertise, understanding the market, mentoring, financing, and legal aspects. A university can provide manpower, infrastructure, networking, and visibility for the product that is being developed and interaction with entrepreneurs.

In Asia, there are many inherent cultures from which I think we can derive potential innovative ideas. Many people think innovation should be based on brand new technologies that nobody else has thought of before. But that is not the case. Innovation sometimes comes from day-to-day activities, and it should not necessarily be derived from a totally new concept. The time is right, and innovation is unlimited.

When we look at some local problems, we might have some interesting ideas. This does not require very high-level research. Nevertheless we could have a brilliant idea to save lives or to reduce the gap.

Creativity, design, and innovation should be established not only on the basis of engineering—engineering education—but also entrepreneurship and arts and humanity and social sciences education.

There are actually two prominent approaches to social development: top-down and bottom-up. The top-down approach utilizes funding, policy, government aid, the trickle-

[5] William Hong, IPDCSTA2012 p37, “Lamps for Rent Rural Lighting Project”.
[6] Mary Jane Alcedo, IPDCSTA2012 p38, “Community Goat Enterprise and the Ecosystem for Entrepreneurs”.

down policies. The bottom-up approach allows grassroots-level people to grab a chance to make their future and grow. Entrepreneurs live in the middle part of the pyramid, and they can have better access to the top and at the same time know more about the bottom.

Financing

In order to make ventures successful in Asia, we need powerful venture capital with: (1) large-size funds; (2) capability for follow-up investment; (3) capability and network for international syndicate investment. It's very difficult to have that kind of a large venture capital fund. There is none in Japan to my knowledge. The Temasek may be an equivalent, but there are no major venture capital groups like those in the United States. I always wonder whether it is realistic or unrealistic for Japanese and Asian companies—in the private sector of course—to jointly form a large venture capital group so that we can have more active, successful, dynamic ventures in Asia.

There should be national and local governments—supportive to business startups, whether they be small-scale or large-scale or whether they involve social entrepreneurs or social business or regular business.

Culture

What is important is an entrepreneurial culture, and that is contagious. ICSE collected foreign and Japanese students. At first, the foreign students were very aggressive in terms of social entrepreneurship, but the Japanese students were not. However, gradually the Japanese students became interested in social entrepreneurs in Asia. This year, students from Tohoku University and the International University of Japan in Niigata applied for participation in competitive entrepreneurship. That's a new trend.

Ecosystem

There is an incubation center named MassCahlenge which offers essential resources for entrepreneurship. They include mentors, funding for the innovation and entrepreneurship, legal advice, facilities, space, Internet, and communication tools. Then there will be a community of entrepreneurs, all doing different things but who are very similar in terms of their passion. The training is often done in common, and access to media and customers is important. Some other companies may be your customers and your team members as well.

For the development of a successful ecosystem for entrepreneurs, we have to focus on several systemic failures that can be improved step by step. The first is how to improve society, to motivate people to be entrepreneurs, not just laborers. The second is how to improve skills. The third goal is to strengthen networking among young entrepreneurs and mentors and then also senior businessmen. A fourth element is to foster creative, innovative cultures. Finally, the last point is how to improve public services in the community in order to foster entrepreneurship.

INTRODUCTION

Teruo Kishi

Last year, the Takeda Foundation organized the first International Policy Dialogue on Regional Collaboration in Science and Technology in Asia, inviting many eminent representatives from the Asian science and technology communities. It was the first region-wide cross-sectional policy dialogue on regional collaboration in science and technology in Asia and covered various subjects including the regional development of human resources and brain circulation, international collaborative research, and research infrastructure. During the policy dialogue we identified several important challenges: the need to address local basics needs, such as water supply, sanitation and transportation infrastructure, which would help the bottom of the pyramid zone people to participate in economic growth; the acceleration of cross-border movement of researchers and student; the development of novel founding mechanisms for regional collaborative research; the establishment of international open innovation research centers to facilitate regional collaborative research leading to innovation. Based on the last year's discussion, this year's International Policy Dialogue will focus on innovation ecosystems that will facilitate regional innovation to address basic local needs by developing novel founding mechanisms for regional collaborative research, establishing regional open innovation research centers, accelerating the cross-border movement of researchers and student, and nurturing regional entrepreneurs.

The International Policy Dialogue is a volunteer gathering and participants have no obligation or institutional responsibilities for their discussion. If they have a responsibility, it's to ensure that they freely discuss the possibilities and challenges concerned with the regional collaboration in science and technology for the future development of our region.

The participants come from various sectors of many countries and then International Policy Dialogue places the highest priority on cross-cultural, cross-sectional free discussion on the regional collaboration and the exploration of versatile policy choices to strengthen the competitiveness of our region.

However, free discussion is not enough to promote regional collaboration. This year, we try to formulate policy proposals on three subjects: the cross-border funding mechanisms for regional collaborative research; international open innovation research centers; the cross-border movement of human resources.

WORKSHOP I: International Collaborative Research toward Regional Innovation in Asia

SESSION 1 REGIONAL COLLABORATIVE INITIATIVES

Tatang Taufik (Chair)

My name is Tatang Taufik. I am deputy chairman at the Agency for the Assessment and Application of Technology, or BPPT, Indonesia. It is a government agency. It is a great honor for me to chair this first session of Workshop I. This Workshop I will discuss regional collaboration initiatives. We will start our discussions by allowing presentations from seven distinguished speakers. Please hold your comments or questions until all of the presentations are finished. First, we will have Prof. Jamilur Reza Choudhury from the University of Asia Pacific, Bangladesh, followed by Mr. Wakabayashi from JICA, Dr. Geng Tu from JST, Mr. Ishiguro from SARTREPS, Prof. Akio Nishijima from Waseda University, Dr. Le Anh Tuan from Hanoi University of Science and Technology, and the last speaker is Dr. Aung Kyaw Myat, director general from the minister of science and technology, Myanmar.

Chapter 1 Science & Technology in Bangladesh: the Prospects for Regional Cooperation.

Jamilur Reza Choudhury

As you can see, my background is in the academia. I had been a professor of civil engineering at the National Technical University. I taught for about 38 years before moving to a private university as its first vice chancellor and president—BRAC University—I was there for nine years. And about five months back I became the vice chancellor and president of University of Asia Pacific. Although I have been in academia all these years, I've been very closely involved with some of the government policymaking bodies and some of the largest infrastructure projects. I'll start with the background and science and technology policy and then industry-academia-government collaboration in research and development. I'll share with you a few success stories, then the technology transfer issue, and then focus on disaster management. Now, notice that—I think you're familiar, all of us are familiar with this map. I noticed that most of the initiatives which had been discussed in earlier years are focused mostly on Southeast Asia. It excludes Bangladesh and it is the first time, Bangladesh is invited to join this dialogue. So I'm very happy to share some of my experiences. Thank you for inviting Bangladesh.

Most of the countries which are represented here share some common heritage. New technologies were developed more than 4,000 years back, particularly the cart with circular wheels (Indus Valley civilization), then irrigation, water supply, sewerage systems, burnt clay bricks. These were all developed in Asia. Dhaka, where I come

from, was world-famous for its handloom industry. In the 15th century, our part of the world—Bengal—used to export one-third of the textile needs of Europe. So what happened to all these industries? We were colonized by the British in 1757 and we missed out in the Industrial Revolution. In fact, they closed down many of these industries, which were existing for centuries. Modern science education was neglected. Only about 150, 160 years ago universities and colleges were set up and some of these have produced world-class research, particularly Dhaka University. In the '20s and '30s they produced world-class research. Those who work on physics should have heard the name of S.N. Bose, after whom the particle boson is named. A few months back the Large Hadron Collider in CERN produced what's known as "God's particle," the Higgs boson, which is named after a professor who did his work in Dhaka University.

Bangladesh became independent in 1971, and for many years, we were actually busy rebuilding our infrastructure, and science and technology did not get the attention it deserves. The first science and technology policy was formulated in 1985 and it was recommended that 1% of the total budget of all public and private sector industries would be contributed to a central fund for carrying out R&D in selected thrust sectors of S&T. Unfortunately, this policy recommendation was not implemented. As a result, R&D institutions in science and technology set up under the public sector have failed to achieve the desired objectives. The country has to depend on import of technology, mostly from developed countries. And I believe this is the scenario in many of the countries in the region.

R&D initiatives focusing on solutions to specific problems which the country faces are mostly lacking. And there is this problem of "brain drain." Every year we have been sending thousands of our graduates of higher education systems to developed countries, and more than 90% of them decide to stay back. We do not really get them back. Only recently the reverse flow has started.

As far as the financing is concerned, Bangladesh spends only about 0.17% of its GDP for R&D while Japan spends 2.9% of GDP. So with this very low investment it would be presumptuous to expect that the R&D institutions would be able to come up with any results. Most of the money which goes into these R&D institutions is actually taken up by salary. Very little money is left for real—carrying out real research, particularly in science and technology, where you require a lot of investment in for equipment. So this is the problem that we are trying to tackle.

Of course, we have some recent successes in research. A nonresident Bangladeshi—one of these Bangladeshis who decided to stay back after completing his higher studies and now working at the University of Hawaii— was approached by the government to conduct research on jute. Jute used to be the mainstay of economy a few decades back but showed some inherent problems as a natural fiber. So the collaborative research among the scientist in the USA, Dhaka University researchers, researchers from the Jute Research Institute and a local software company started with funding from the government. Within a few months they decoded the jute genome. Now they're working to improve the properties of jute based on the DNA structure. Similarly,

last month they were able to identify the genome sequence of a deadly fungus which affects about 500 plants. So these have been some success. Nowadays, the development of IT has enabled researchers in other countries to collaborate.

Another success story was setting up an institute for modeling of surface water in which I have been involved. Flood is one of the major problems our country faces. Mathematical modeling became quite prevalent about 30 years back. We're able to get UNDP funding and Danish help to set up this government institution and now it's autonomous. They've been able to move out of the government-based structure, and they can attract some of the very good engineers with competitive salary package. They're now exporting their service to other countries in the region.

I mentioned about natural hazards. Whenever the name of Bangladesh appears in the media, it's most likely related to one of the natural hazards such as floods, cyclones and storm surge. I was involved in heading the team which prepared the master plan for cyclones and storm surge. So what we have done is we looked at all the possibilities. What has happened? On 12th of November, 1970, half a million people were killed due to storm surge going up to about 7.5 meters in the coastal areas. We have a network of cyclone shelters. So these are all school-cum-cyclone shelters built all over the 700-kilometer coastline. So people can evacuate at a very short notice. And this is contributing significantly to reduction in mortalities. This kind of experience, actually, can be shared with other countries. We can mobilize about 62,000 volunteers all over the coastal area in one hour notice of the warning.

There is another example of collaboration. The Canadians came to Bangladesh and we set up a separate department that trained the manpower. That department has grown and now they are helping the government explore natural and offshore petroleum.

As I mentioned, Bangladesh is out of many of these initiatives. We are not a member of ASEAN. Bangladesh at the moment is not included in e-ASIA JRP. I would like to suggest that regional collaboration network would include Bangladesh.

I've already mentioned about biotechnology. We are not so strong with nanotechnology, the natural disaster prevention, particularly earthquake, and climate change Climate change is really important for Bangladesh. Bangladesh is going to be severely affected with the sea level rise. I think maybe 20% of the population in the coastal area will be affected. We should think about infrastructure design and construction, particularly bridges and mass rapid transit. We also would like to share experience in ICT, particularly IT security. I'm closely working with this Asian Accord for Engineers and I was involved in setting up, with a Japanese leadership, NABEEA (Network of Accreditation Bodies for Engineering Education in Asia). The objective is to increase the mobility of engineers within Asia. Thank you for giving me the opportunity of sharing some of my experiences.

Chapter 2　Public-Private Partnerships – New Partnerships that Support Economic Growth

Jin Wakabayashi

We have been cooperating and supporting the Bangladesh government through official development assistance, ODA including loans, grants, technical cooperation, and human resource development projects. Our division was established in August 2010, when the new JICA was established. And our role is to enhance our partnership, JICA's partnership, with the private sector, particularly the private companies or entities. We have been cooperating with NGOs, NPOs, the grass-root level activities. We are trying to enhance more partnership on the private sector level. There has been huge increase in the activities by the private sector, particularly private companies investing in developing countries. Private company's foreign direct investment (FDI) to developing countries has been soaring as compared to ODA. So we have to leverage ODA resources together with the private financing or private investment activities.

What we do is that we solicit project ideas from private companies and select projects and support the cost for the survey. It can be categorized into PPP infrastructure-type program. Another one is the BOP (base of the pyramid) business activity program.

In the PPP program, private companies propose large-scale infrastructure projects: bridges, roads, highways, water facilities, solid waste management, and so on. Our division handles infrastructure projects with higher risks, whereas former Japan Bank for International Cooperation (JBIC) handles projects from power sector. On the BOP side, we also conduct similar activities, soliciting proposals on the BOP business activities.

There are always certain barriers or gaps when projects will be implemented. For example, in the sewerage sector, certain Japanese companies may have specific high-end technology. They would like to introduce it to Bangladesh through a PPP-type project. There could be various benefits, and there will be also risks involved in both ways. To the company, the cost may be too high, the knowledge may not be disseminated far enough, and so that even the proposal might be good, it cannot be taken up in the country as proposed.

In the BOP business, there exists a similar gap: the ideas the Japanese companies produce are too high to match local conditions. One of the key of successes of BOP business is how to incorporate the local conditions, both from technological side as well as the cost side, to the projects so that the projects would be feasible and affordable to the BOPs of the country.

JICA has SATREPS program which supports collaborative research with developing countries, and our PPP program supports application of made-in Japan technology to developing countries. There seems to be certain gaps in between these two relevant activities. If there is a way to fill this gap and to enhance the core

collaboration between the science and technology development activities and the private sector, particularly private companies' innovative ideas or proposals, within the framework of, for example, BOP business or even the PPP-type projects, I think there is a new ground to be developed. So I would like to seek opinions from the distinguished participants today, about what can be done to fill gaps.

In terms of the Bangladesh support, we have conducted many projects. Previously, we focused on technology transfer, but now we focus on indigenous capacity-building. I think there is a huge role that the universities or the research and development institutions can play in the areas of human resource development. JICA has been supporting human resource development activities in developing countries for a long time and has accumulated the experience. That is one of the JICA's strengths, as compared to other donor agencies. Unfortunately, collaborative research with SATREPS framework is not related to JICA's PPP activities. If we can find ways to collaborate university activities with private sectors activities including company's and NPO grass-roots activities, we can create innovative ways to support developing countries. There is a new concept of innovation, "reverse innovation". BOP business, is a two-way thing for Japan. Japanese companies try to venture out into developing countries through BOP business but it cannot be successful without harnessing the conditions as well as the know-how and knowledge on the ground, which actually is a reverse innovation activity. So I think that reverse innovation is a key word that I can drop onto the floor and I hope we can have a good discussion on this. Thank you very much.

Chapter 3 Introduction of the e-ASIA Joint Research Program (e-ASIA JRP)

Geng Tu

Before I enter the introduction of this joint research program, I would like to explain to some of the people here who don't know what JST (the Japan Science and Technology Agency) is. We, Japan Science and Technology Agency are an agency for the implementation of the 4th Science and Technology Basic Plan of Japan, and the main mission of JST is to contribute to the creation of science and technology innovation by promoting the creative research and development, and also maximize the achievement through a virtual network research management system, and to provide some science and technology infrastructure of Japan toward acceleration of the science and technology innovation.

Then, what is e-ASIA JRP? e-ASIA JRP stand for East Asia Science and Innovation Area Joint Research Program. The concept of the East Asia Science and Innovation Area was presented by the Japanese government to all the related countries in Asia in 2010. This joint research program is one of the important components of East Asian Science and Innovation Area initiative. To be more specifically, it's a framework for multilateral collaboration in science and technology with matching fund from funding

agencies or other organizations in the member countries. The goal of the e-ASIA JRP is to promote the further development and innovation in this East Asia region by addressing the regional or global challenges through the research collaboration. The philosophy of our program is pursuing the synergistic effects by multilateral research cooperation in this region, and sharing the outcomes and promoting the social application for innovation. E-ASIA JRP features fair and square decision-making based on the scientific excellence and socio-economic impacts to reduce the disparity in science and technology potential through the collaboration. We respect the diversity of the region including political systems, society, peoples, culture, and history.

What effects can be expected from this program? We think that collaborative opportunity can be provided in the science and technology. And also lifting up the level of science and technology will bring competitiveness to the whole region, and contribute to the development of innovative and robust society and economic growth.

The prospective membership is the public funding institutions, including the government bodies and/or public funding agencies from among the 18 East Asia Summit participation countries. That means the 10 ASEAN countries plus Japan, China, Korea and India, Australia, New Zealand and also the United States and Russia. We welcome the other country as a guest partner. Also the prospective members who need to take time before formal participation into this program still can act as a quasi-participating countries. And also other international organizations from outside of the EAS can also acted—our program as an observer.

Participating funding agencies jointly call for proposals, and proposals are jointly peer-reviewed by a joint committee of the participant organizations. We also encourage the following activities.

(a) research exchange by on-top funding to the existing projects in every country
(b) information exchange regarding the national priorities and best practice
(c) promotion of the research exchange among young researchers.

We organized e-ASIA Joint Research Forum twice, one in Singapore in 2011 and other in Tokyo in 2012 with 22 participants from 10 countries and the ASEAN secretariat. After the second forum, we discussed to explore the possibility of multilateral precursor projects in five scientific areas inviting researchers from these five areas. The five scientific areas include technology for a low-carbon society including biomass and plant science, disaster prevention, nanotechnology, material science, and infectious disease. Based on the discussion, we made the first pilot joint call for proposals in two specific areas including nanotechnology and materials, and biomass and plant science. We received 11 proposals of the joint research project from three countries Japan, Vietnam and Thailand.

The inauguration of the e-ASIA Joint Research Program was formally done in—on July this year at Singapore, after the first annual board meeting. The founding members are nine organizations from eight countries. And also two successful projects from the first pilot joint call for proposal were approved by the board. In the e-ASIA JRP, the member country or organization will support their principal investigators (PI). We have a board at the top, and an advisor council to support the activity of the board from

the scientific perspective. The secretariat is tentatively placed inside JST's Singapore Office. The "area advisors" are designated to provide the advice to the already-selected joint research projects and "peer reviewers" to review the new proposals.

We are going to hold the board meeting through the Internet to establish the Scientific Advisory Committee, approve the documents, and discuss the 2nd Pilot Call for Proposals. The 2nd Pilot Call for Proposals are right now being discussed by the member countries. Targeting areas include nanotechnology/materials, biomass/plant science, disaster prevention, infectious diseases, and advanced interdisciplinary research toward innovation. We are organizing an e-ASIA Symposium in December to discuss projects in the three new areas of disaster prevention, infectious diseases and also the advanced interdisciplinary research for innovation.

e-ASIA JRP was recognized at the last East Asia Summit and the Chairman of the summit welcomed the "Japan's initiative for implementing the e-ASIA Joint Research Program. However, we need more attention and cooperation of Asian countries to promote regional collaborative research with the framework of e-ASIA JRP. Thank you very much for your attention.

Chapter 4 Science and Technology Research Partnership for Sustainable Development (SATREPS)-Partnering with developing countries for innovation-

Suguru Ishiguro

Since just Dr. Tu has talked about JST and JST's international program, e-ASIA, and Prof. Nishijima will touch upon specific projects of SATREPS after me, so I will explain the background, aims, structure, and progress of SATREPS. The SATREPS program has just started in 2008 and has been conducted been through the collaboration between two completely independent administrative agency, JST and the Japan International Cooperation Agency (JICA). Based on the needs of developing countries, JST and JICA cooperate to promote international joint research targeting global issues such as climate change, biodiversity, conservation, water, sanitation, infectious disease control, disaster mitigation and so on, with an object to utilize research outcome in the foreseeable future. The background of this program: imminent threat of global concern and need of solution by science and technology; insufficient transfer of existing technologies; pressing need of innovation to address these issues; need of collaboration with counterpart countries. For this background, the Council of Science and Technology Policy (CSTP) issued a report entitled, "Towards the Reinforcement of Science and Technology Diplomacy" in 2008. In accordance with the report, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) and the Ministry of Foreign Affairs (MOFA) has launched SATREPS in 2009 aiming at the synergy of utilization of science and technology for diplomatic purpose and the utilization of diplomacy for the future development of science and technology. Purposes of SATREPS involve the following four pillars. First one is enhancing win-win relationship between Japan and counterpart country in

science and technology. Second one is development of new technology, acquiring new knowledge for addressing global issues leading to social and science innovation. The third one is capacity building for self-reliant and sustainable research systems and building of strong networking between Japan and counterpart country. The fourth one is implementation of research results in the society. SATREPS is not a program to support curiosity-driven science and technology of bottom-up of manner but one to tackle with global issues focusing on future implementation. We expect certain synergy for SATREPS projects. First one is advancing science and technology of both countries while deepening international cooperation and mutual trust. Second one is challenging to resolve a global issue as well as addressing local needs at the same time. Third one is that researchers in the counterpart country would learn Japanese experiences and technologies while Japanese researchers would also learn local issues in the developing countries.

Next one, please. JST provide research expense within Japan while JICA bears the cost in the counterpart country, which is the recipient country under the framework of ODA (official development assistance) technical cooperation.

Projects are selected in collaboration of JST and JICA. JST initially calls for research proposal from Japanese institution. At the same time, Ministry of Foreign Affairs (MOFA) and JICA receive a request from counterpart country for ODA technical cooperation for international joint research. It is essential for principal investigator in Japan to coordinate with researchers in the counterpart country in order to confirm the detail of the joint research. It is a requirement that official request for ODA technical cooperation be submitted by the research institution in the counterpart country to MOFA via ministry or agency in the counterpart country responsible for ODA technical cooperation. Research budget from JST is approximately ¥36 million per project per year and the total is around ¥100 million per project per year.

Next one, please.

Research fields of SATREPS are environment/energy, global-scale environment issue, low-carbon society/energy, climate change, bioresources, and disaster prevention. Currently, SATREPS supports 66 projects in the five research field. Roughly speaking, a half of them are carried out in Asian countries, one-third are done in the African countries. The remaining projects are in Central and South American countries.

One example of the SATREPS project conducted in Bangladesh is research and development of preventing and diagnosis for neglected tropical disease, especially kala-azar, led by Prof. Noiri Eisei of University of Tokyo Hospital and International Center for Diarrheal Disease Research of Bangladesh. Kala-azar is a serious disease that infect 30,000 [sic] of the world poorest people every year. It has been ignored in Bangladesh and other countries. It affects the poorest people and is not only the health hazard but a major obstacle to socio-economic development. This project aim to establish genetic diagnosis, immunodiagnostic urine tests and other diagnostic technique tailored to local condition and to get grip with the malady.

We have exit strategy of research results of SATREPS. Key idea of this strategy is

that there exists a gap between R&D stage and social implementation, and we have to fill the gap. Strategies to fill this gap would involve industry-academia collaboration program of JST and other funding agencies, such as NEDO or private corporations' product development, venture capitalist investment and so on, depending on the research results. In any case, we should keep in mind that who will be the next player and funder, and who will transfer research results to the next stage smoothly. We call this transit as "baton zone" and the action as "baton pass."

Right now, SATREPS is soliciting the application for the fiscal year 2013 and the deadline is November 13. So if someone here is thinking to submit proposal for next year, please keep in mind this date. SATREPS provides kind of a platform to make new project and also the communication of researchers or ordinary people. Thank you very much for attention.

Chapter 5 Biomass Asia Projects

Akio Nishijima

This is a SATREPS program. In the Southeast Asia, bio-diesel fuel (BDF) is used, but most of companies don't want to use current quality of BDF. BDF should be upgraded, and we are now trying to produce high-quality BDF. Situation of BDF is dramatically changed. Energy dependence on nuclear plants has been decreased because of the melting down of Fukushima nuclear plant, and expectation for renewable energy has been soaring. About 12 years ago, MITE headquarter asked me to arrange collaboration with East Asian countries. Besides information technology, nanotechnology, biotechnology, we discussed environment and energy. The southern part of China and ASEAN countries are rich in biomass resources, and we proposed a biomass strategy—2001—and started the Biomass Asia Workshop. The first workshop was held in Tokyo, the second one in Bangkok, the third one in Tokyo again, the fourth one in China, and in Indonesia. Last year we had the eighth biomass workshop in Hanoi. And ninth—this December we'll have the ninth workshop in Tokyo. Many Asian countries as well as US and EU would attend workshops and we discuss how to collaborate in the field of biomass utilizations. Our targets are equal partnership and the promotion of biomass technology from Asia to the world. Biomass Asia's concepts are to produce new energy and material, reduce the CO2 emission, foster sustainable primary industry, and build win-win collaboration with partnering countries. Also the sustainable development of primary and secondary sectors of industry is our target. One of the challenges of biomass development is to avoid foodstuff for starting materials. We are trying to use non-foodstuff including jatropha, pongamia, and algae. We are collaborating with automobile companies and also ERIA (Economic Research Institute for ASEAN and East Asia). Our projects are supported by Ministry of Science and Technology (MOST) and Ministry of Education of Thailand as well as SATREPS. Our basic strategy involves the remove of three or two unsaturated bond of unsaturated fatty oils derived from plants to produce fatty acids with one unsaturated

bond. Fatty acids with one unsaturated bond show good oxidation stability. We are now discussing how we can move to real application stage. We should optimize the manufacturing process and set standards based on road durability test. We also should discuss the economics and environment. The collaboration among industry, research institute and government is now required.

Our BDF is getting competitive now. It is still a little expensive, but much less expensive as compared to the third generation technology based on gasification followed by Fischer-Tropsch synthesis. Since biomass resources are in the Southeast Asia, collaboration with ASEAN countries is very important. Since raw materials are produced in the first sector and BDF is produced and used in the second sector of industry, the collaboration between the first and second sectors is essential. And fostering young researchers is also very important. Thank you very much.

Chapter 6 Biofuel Application to Vehicles

Le Anh Tuan

My talk will be about the biofuels application to vehicles and also I will address some collaboration activities among our countries. Biofuels are classified as alternative fuels, and we can use bio-ethanol, bio-methanol, bio-buthanol, biogas and hydrogen for spark ignition engines, and biodiesels or fatty acid methyl ester, vegetable oil, and hydrogenated vegetable oil for compress ignition engines. Biomass development is a key driver to increase the farm income and also to lower the greenhouse gas emissions. But we have to face the food and versus—food versus fuel issues. So the land use is a very important issue that the government should take care. In Vietnam, the biofuels master plans for production and application is already addressed in 2007. We target that in the year of 2015 the biofuels can meet 1% of the fuel demand in Vietnam. The vision of 2025 expects that 1.8 million ton of ethanol and biodiesel can be produced, which meets 5% of the fuel demands. Currently, the ethanol E5 has been already sold in the market since 2010. And we have already one ethanol production factory with the capacity of 125 million liters per year and another with 40 million liter per year's capacity in operation. Other three factories with the capacity of 100 million liter per year are under construction and one of them will be launching in the end of this year. So far ethanol productions in Vietnam is promising. And the main feedstock is cassava and molasses. But right now we have problem with biodiesels. We don't have the feedstock for biodiesel's production right now because in the past we based on the catfish fat to produce biodiesels. But now the price of the catfish fat is really high. So we have to change to other feedstock.

There are many issues for the practical use of biofuels in Vietnam. But I would like to emphasize pollutions. So far the environmental impacts of the ethanol and biodiesel are not serious as long as CO2 emission is concerned. But for the near futures, we have to take care of formaldehyde and acetaldehyde produced from alcohols on combustion. The emission of these toxic chemical compounds should be a concern. We also should focus on the modifications necessary to the internal combustion

engines if we would like to increase the fuel supplying quantity, the biofuels supplying quantities, due to the low hitting value of the biofuels. Another issue is materials compatibilities. Metals, non-metal materials such as polymer and elastomer can be affected by biofuels. When we convert the vehicles to use the biofuels, we have to take care of the materials of the hose, seals, injector, pump and filters. We also should concern fuel additives and lubricant replacement intervals. We have to know the interval of the lubricant replacement should be shortened when we use the biofuels. And of course the storage, transport and the biofuels distribution should be concerned. It will be necessary to change the concept of the engine design because we used to design the engines based on the fossil fuels. If we change to the alternative fuels, we have to change also the engine concept. There is a question whether engines have to adapt to alternative fuels or alternative fuels adapt to engines. It is very important to standardize the alternative fuels in order to use in the prime movers.

As for collaboration, people's awareness is very important. For example, I sent a proposal to e-ASIA Joint Research Project and found out that the Ministry of Science and Technology of Vietnam didn't know exactly how to approve the proposal in e-ASIA. I wrote proposal in English and then I had to convert it into Vietnamese to send it to the Ministry of Science and Technology and we have to follow the domestic processes to get approval of such kind of research. It is very complicated from the Vietnamese side. The biofuel feedstock development is very important for the ASEAN regions. The second generation of biofuels that are not from agricultural and forest residue and waste should be addressed for the low-cost production of biofuel. It is also very important in the developing countries to gradually introduce clean vehicles. It is also important to improve the awareness of the leaders of the governments in order to have good policies for the promotion of biofuels. Thank you very much for your attentions.

Chapter 7 Current Status of Engineering Education in Myanmar

Aung Kyaw Myat

The objective of this presentation is for regional cooperation and science and technology sectors among especially Asian countries. I would like to give some information about our engineering education system in Myanmar. We have a democratic government and a strong viable parliament to practice check and balance. Between the year 1996 and 2011, the former government set up new technological universities and computer universities in the regional develop zones all over the country. At the time the quantity-oriented production of engineers and technicians took place according to the national demand. But nowadays we need highly qualified engineers, scientists and technicians, as well as expert teaching staff for the promotion of our nation's economy. The Ministry of Science and Technology was established in 1996. The objectives of the Ministry are as follows.

1) Carry out R&D programs for the national economic development
2) Strengthen the national economy utilizing the national resources and raise the living standard of the people

3) Enhance the production in agricultural and industrial sectors through technology transfer and distribution of knowledge gained from R&D work
4) Plan and carry out human resource development
5) Carry out tasks such as laboratory analysis, quality control and standardization of industrial raw materials and finished products

Main tasks of the ministry are: (1) the development of human resources for engineering and computer education sector; (2) conducting research and developments which will be beneficial to all kinds of industries in our nation; (3) Carry out research works for the development of nuclear technology in the country for health and social welfare sector.

In general, the ministry has two main objectives, human resources development and research development. From the year 1996 to 2006, approximately 1,000 teaching staff of bachelor, master and PhD degree-holders were produced from the first to tenth batch of special engineering training course. Now they are assigned duties in those universities.

From 2006 to 2011, we conducted some research and organized international conferences. International Conferences on Science and Technology were held three times. International Conferences on Computer Applications (ICCA) were held 10 times. The ministry sent it's teaching staff to foreign countries for more exposure and more collaboration with professional institutions from abroad. Up to 2011, we produced the following degree holders: PhD, 800; MA, 1,842: and then so on. We have a total amount of teaching staff and researchers: 7,215. The number of graduates produced from technological universities and computer universities up to 2011 are: PhD, 1,400; MA, 9000. The total number of post-graduate students is 278,000 up to 2011. You can see that we produced many human resources based on the quantity-oriented policy. We now have changed our policy from quantity-oriented to quality-oriented. The reform strategy in science and technology includes: the fulfillment of the financial support, technical aids and necessary equipment, well-qualified and competent teachers in universities and colleges; the decentralization of university administration and promoting the status of universities as autonomous. We are setting up four centers of excellence in Yangon: Yangon Technological University, Mandalay Technological University and then computer universities in Yangon and Mandalay. The targeting level of COE is as high as Nanyang Technological University and the National University of Singapore. The Universities' Central Council under the supervision of the Minister for Education controls all academic institutions for higher education in Myanmar.

All students learn subjects in English in all universities in Myanmar. Students who've passed matriculation examination with minimum 450 marks are eligible to apply for the enrollment. We have only 500 students who can study at COEs. Two hundred and fifty students go to Yangon Technological University (YTU) and 250 students go to Mandalay Technological University (MTU). Students who passed their matriculation from lower Myanmar exam centers will be assigned to YTU and those who passed from upper Myanmar exam centers will be assigned to MTU. The reform strategy for the technical education system will commence on December 2012. We have two kind of

students based on the results of the matriculation exam. The one with higher marks can go to the center of excellent. They can get bachelor of engineering degree (BE) throughout end universities in six years. Students with lower marks can go to the other technical universities. They study there for 3 years, and if they are qualified, they can go to the BE course. In postgraduate courses in universities, master degree require 22 months to 24 months study. PhD degree requires minimum three years.

The Ministry of Science and Technology will try its best to implement the new plan and program for upgrading the status of engineering and computer education. In addition to the department of technical and vocational education and the department of advanced science and technology, there are seven directorates for the implementation of R&D. We believe that the reform plan can be successfully launched by the assistant of all friendship organizations from the inside of the country and also from abroad. Thank you.

Discussion

Chair (Tatang Taufik)

Prof. Choudhury has presented his general overview based on Bangladesh experience on science and technology and innovation. His speech describes common challenges faced by all Asian countries. Mr. Wakabayashi talks about JICA's PPP and BOP movement.

Dr. Tu explained about the e-ASIA JRP, Mr. Ishiguro discussed how SATREPS programs can respond by partnering with developing countries for innovation. Prof. Nishijima presented an example of SATREPS projects on the production of biomass and he proposed biomass projects to handle global issues in Asia. Dr. Anh Tuan talked more specifically about Vietnam's experience on biofuels application to vehicles. Dr. Aung Kyaw Myat, presented about current status on engineering education in Myanmar.

Wilaiporn Chetanachan

I would like to support Prof. Nishijima because Thailand actually not only already use 20% of ethanol in gasoline in—for the car, but also we use 5% of biodiesel already. Beside a lot of research that we have done in Thailand, there's a university in Thailand that conduct research to modify genes of jatropha to make it less toxic and also increase productivity. I also agree with Mr. Tuan from Vietnam that we can work together because Thailand already works a lot with Vietnam. Thank you.

Vicente Belizario

First, a commendation to SATREPS. Now, I was very happy with the SATREPS presentation of Mr. Geng Tu, Suguru Ishiguro in that there is a call for countries to collaborate with Japan and there is now a start of a call for the next year. I would like to suggest that SATREPS would address more urgent social and development issues that affect the countries in the region such as benefits of the bottom of the pyramid that was being mentioned by Dr. Kishi.

There is a sharing of some common health issues that are rooted to low social

issues, related to water and sanitation. Laos, Cambodia, Philippines, China and Indonesia, for instance. And maybe there's a possibility that Japan can collaborate together with two countries, you know, not just Japan and one country, Japan and two or three countries sharing the same health issues that contribute to low social development.

There is a need to cross borders, certainly, including crossing of disciplines. Now, it's not basically health. We will need to cross the border to touch on environment, to touch on social science, and to make use of more recently developed tools—information communication technology, biotechnology—to help solve these health issues affecting the poor related to environmental concerns. Is there a possibility for SATREPS to have a directed search, for example, a solicited application, where we identify specific institutions already in the countries concerned, you know, and we actually invite them directly to participate rather than an open call. If we can link these identified institutions that are our best bets in those few countries with the appropriate institutions in Japan, we come up with the best proposals that have the best chances of getting funded. Thank you very much.

OM Romny

We submitted two SATREPS research proposals to the Ministry of Education, Youth and Sport. Then they sent the proposals to the Development Chamber in Cambodia for the decision of the submission of the project proposal of the SATREPS. One is the development of technology for the co-innovation of biomass fuel generation system for developing synergy of energy systems in Cambodia district. The second one is the research and development of the optimization of the biomass dual fuel mixed combustion: electricity power generation by the diesel generation using agricultural waste and energy crop.

I am also involved with e-ASIA JRP. This program facilitates multilateral collaborative research with matching funds. However, a problem is that when we ask the fund from the government, we need approval from the high-ranking office of the government. In some countries in Asia, matching fund system is not easy. Sometimes there is no funding agency, and we seek support from JICA or from other sources.

Akio Nishijima

Thailand is very positive about the biomass research, because Thai government already made a financial support. Thailand and Japan are almost equal partners. When we collaborate with other countries such as Indonesia, Vietnam, Cambodia, and Myanmar, the collaboration among primary sector and secondary sector industries is very important.

Le Anh Tuan

Thailand is one of the countries that successfully implement the biofuels project. We, Vietnam, have, just started. We hope that we will have also the support from Thailand and other countries.

Norio Ohto

Prof. Choudhury presented a very basic problems which all the Asian country face. He said the budget of the R&D is only 0.17% of GDP. So they do not have enough budget and they do not have research facilities. So what can we do? We should discuss how we develop collaboration with Bangladesh. SATREPS has one project in Bangladesh, but what about the e-ASIA? Is Bangladesh in the scope of e-ASIA JRP?

Geng Tu

We should get approval from the board, but basically, there's no reason to exclude Bangladesh in this joint research program. I want to mention that even before you become the formal member of this joint research program, you still have a lot of ways to participate in the collaboration under the program. Bangladesh's funding agency can participate in specific joint call for proposal as a guest member. If researchers from Bangladesh are interested in participating the specific joint research project, they are also very much welcome.

Suguru Ishiguro

I would like to respond to the question from Dr. Belizario. Let me start with the second question. We accept three countries collaboration. But, the difficulty is that even inside Japan, many organizations such as JST, JICA, MEXT and MOFA are involved. Each participating country submits ODA proposal to the relevant ministry or department. The Philippines side has to submit ODA proposal to the Philippines department and Indonesian side does the same thing. Japanese researchers submit a research proposal to JST and all three proposals have to be matched. If one proposal is missing, then, the whole project will be disqualified.

The last question was that we had better take a solicited approach so that Japanese best university and the Philippines's best university can collaborate. I think that one of the most important elements for the collaborative research is pre-existing mutual confidence. For example, if there is a good relationship between the University of Tokyo and the University of the Philippines, a new project can be developed based on this pre-existing relationship. I can say that we want this kind of project.

As for the field of SATREPS projects, we have five fields right now. Please look at the application guide. We accept interdisciplinary one such as a mixture of biodiversity and low-carbon society. SATREPS accepts wide fields of project.

Jin Wakabayashi

SATREPS scheme is very much oriented for study level. These research projects should be transferred to practical stage, and that's where our PPP programs come in. We are very much flexible. If there are new ideas to collaborate with the private sector, I think there is room for our facility to be utilized. One constraint will be that our facility ought to be initiated from a Japanese entity. It has to be a kind of Japanese-initiated activities, which will have collaboration in the regional sense. But I think I see certain possibilities for the participant entities to seek, through the SATREPS model—and to

link it with the private sector activities through our facilities.

Yoshio Matsumi

I'm a businessman. I will make two brief comments. One, in response to Dr. Ohto's comment, I'd like to say that the bilateral cooperation has been very important but at the same time multilateral collaboration will be very important too in coming years. In fact in Session 3, I am going to address this issue.

The second comment is that the science and technology collaboration in Asia to date have been primarily and mostly joint research. And, as we know, the major subject of this international policy dialogue is ecosystem for innovation. Therefore, it's very important, in my view, to discuss how to promote research and development result into innovation in Asia. Thank you.

Seetharam Kallidaikurichi[7]

Reflecting on some of the comments made from Philippines and Thailand and Bangladesh, I want to make two important points which I think we need to reflect on. The first is, many of these initiatives, they are noble in their intention, like SARTREPS. But their scale is not enough to make a distinct impact. We are doing small compared to what is actually needed. If a million is needed, we are discussing one or a hundred or a 10,000. We have not come to the scale of the problem. That is what is reflected in the conversations. We do one project, which is maybe ¥100 million. But the size of the actual problem over there is much, much larger.

Well, the second point is that we are still operating within our comfort zone, meaning government to government, keeping the same procedures that we have already been following, because it's very comfortable for us. Private sector puts hundred times more money. Let's look at medicine, and pharmaceutical sciences. They (private companies) break all barriers because they want the action to happen. Now, how can we bring that (kind of impact) in the research collaboration? We may not be able to jump immediately, but we need a multi-year vision, which allows much more freedom to collaborate. Even if the Japanese ODA can be made available every year, the counterpart governments do not give the approval because of budgetary constraints. So it just gets shifted to the next year. So we may need to think of a multi-year programming approach so that if it doesn't happen this year, it will certainly happen in the future. Researchers sometimes do not actually need so much money (within one year). What they need is the assurance that it will eventually come. If they know that next year it will come and when things will be solid, they will have far more comfort.

We should consciously look at how to harness far more resources that can be got from the private sector and also other philanthropic initiatives. For example, Bill Gates Foundation now gives more money than any other bilateral or government-funded agencies for research. The second one is how we can engage in a multi-year research initiative

[7] I participated in my individual capacity and my comments do not reflect the policies of the Asian Development Bank.

without being constrained by our existing procedural formalities. I myself have such procedural formalities in our Asian Development Bank. We know the limitation. But let me say, it may be time to freely discuss how we break those barriers for the larger good while still keeping within the existing systems. Thank you.

Tateo Arimoto

I just want to say that it is really important to improve existing funding mechanisms as well as establishing a new funding mechanism. Improving the SATREPS, e-ASIA and other funding mechanisms to cross boundaries, organization, and disciplines is very, very important.

Suguru Ishiguro

There is a kind of gap between R&D. What we are always doing is to encourage researchers to think about the final stage and how they pass the baton, research outcome to the next player and how to find funder. There are some other program, A-STEP or NJST or NEDO. NEDO projects are a little bit larger. And if the private company is involved then, then size would bigger than the SATREPS. In SATREPS's case, average grants are about US$1 million per year including JST and JICA for five year.

David Koilpillai

I would just like to mention that from the IIT side, we are involved with JST and JICA on a project which deals with disaster communications. What do you do in terms of communications when there is a natural disaster and all the existing communication systems have been affected? We're working with the University of Tokyo and Keio University and it has been a very good partnership. I would like to address Dr. Seetharam's point that how do we scale up? Now, if we could share the learning based on our project with other countries that have similar needs, then we could start to see the scaling effect coming into place. I think learning from each other. The platform on which we can share this information may be a very useful step in terms of the multiplication effect that we could bring in such a fora.

Jamilur Reza Choudhury

I agree with Dr. David Koilpillai's suggestion. It will be so convenient if we have a place where all the information is available. You know, there's a lot of work going on. We can set up a website where all the information is available and you can see all the projects which are being funded under different initiatives in the Asian region. We need some place where all the information is collected and put in a website. Thank you.

Tatang Taufik

And in addition, I think, we also need to have mailing lists of the alumni of the workshop.

Norio Ohto

Actually, we're going to discuss about networking among the existing funding agencies and also existing programs at the Workshop II.

Myint Wai

About five years ago we planted a lot of jatropha in Myanmar. We have a lot of waste land there. We did plenty of plantation. A friend of mine, Mr. Shiraishi asked me what we do with all these things. But we were under that military government. The environment we have is also quite different. So we were not in a state to advance in the way we wanted to. But now, the situation has changed and many people are coming to Myanmar to start business. I always tell them that they should know more about the culture we have in Myanmar. We just, just can't jump in and do all these things. So what I really like to suggest to all my friends here in this place and to those friends who are trying to be the entrepreneur should understand, should try to study more about the ecosystem of the place, of the job, of the field, of the provisions we are going to do about it.

Mary Jane Alcedo

It's just a quick comment from sociologist's side. So I'm not well versed on biofuel technology and all I know is that it's a booming technology in business. And there's a lot of international and local funding institute like SATREPS who are funding this technology. And as what have Dr. Le Anh Tuan presented, there are pros and cons in these kind of technologies. And as policymakers and researchers or policy formulators also, we have also to consider the pros and cons of these technologies. He mentioned about the problem on food versus fuel. So it's a question between food and fuel. And we know very well that there are thousands of people around the world who are dying of hunger. And so is it worth it, the social cost and the environmental cost? We should consider this kind of situation when deciding some policies. Thank you very much.

Jin Wakabayashi

Thank you for the kind suggestion and I think it is a bottom line to first understand what are the conditions, environment, situation on the ground before we intervene into whatever type of support. Or even research activities. And I think we have been conscious about that, although your suggestion is very much well taken and I hope that we could collaborate on that ground in the future.

Just a quick response on scaling up the funding activities, although what I'm doing now is a little bit different or a little bit have a difficulty in expanding the current research activities that all the participants today are very much closely involved. For example, JICA or JST as a public institution have of course a budgetary limitation. It is really important to engage—we need private funds in these activities as well. And also to get more engagement from the private sector, the private companies. Not just the philanthropic entities but the private companies that are interested or the private financial institutions that are more interested in supporting these activities. Might be an

important point for these research activities to be put on the practical—to be scaled up on the practical level. Thank you very much.

Le Anh Tuan

Food versus fuel issue is a big issue that has been raised since 2009 and it is why the world is now changing to have a new approach on biofuels productions. So the food versus fuel comes from the biofuels that produce from food—feedstock. It is edible feedstock. But now it goes to the second-generations of biofuels. So it is non-foodstock—non-feedstock biofuels productions.

For example, we use feedstock that comes from the residues—agricultural residues—or the—for example, the solid waste. So with that feedstock, the food versus fuel issues is not related.

For example, jatropha is also the non-edible feedstock for biofuels production. So let's say that if we find another feedstock, another raw materials for biofuels productions, the issues of food versus fuel will be reduced. The third generation of biofuels should come from algae and microalgaes. It is very promising now in the world in order to produce biodiesels.

SESSION 2 NOVEL FUNDING MECHANISMS FOR REGIONAL INNOVATION IN ASIA

Tateo Arimoto

My name is Arimoto from the GRIPS as well as the JST. The title of the second session is novel funding mechanisms for regional innovation in Asia. Dr. Osamu Kobayashi has done some preliminary study on the cross-border funding mechanism. He will present his study and suggest proposal at the end of his presentation. Dr. Kobayashi please.

Chapter 1 A Preliminary Study on Cross-Border Funding Mechanisms

Osamu Kobayashi

National public funding agencies operate within their own borders. If we seriously pursue international collaborative research, it will be necessary to establish international funding bodies that can make cross-border grants. I'd like to introduce you some existing examples of the borderless funding mechanisms for your reference to consider how to develop novel funding mechanisms to facilitate regional collaborative researches. These five mechanisms include the ASEAN Foundation, TEMASEK Foundation, FP7, HFSP and DNDi. First of all, I'd like to explain about ASEAN Foundation. ASEAN Foundation is the independent international foundation established in 1997. Its mission is to support human resources development activities or projects such as education, training, seminars, workshops, exchanging, network buildings, fellowships and information dissemination in the region. ASEAN Foundation is totally different from the ASEAN

itself. They create a distance from the ASEAN secretariat. Donors are not only ASEAN membership countries but also the countries or organizations which have common interest in the development of this region. The donors include ASAEAN member countries, Japan, China, Korea, Canada, and Microsoft and Hewlett-Packard which are from the private sectors. They make grants to government institutions and NGO of ASEAN countries.

Next, I'd like to introduce the TEMASEK Foundation. TEMASEK Foundation is a private NPO and supported by a private investment company called TEMASEK Holdings. This is a very big investment companies in Singapore. To fulfill the responsibility as a corporate citizen of this region, TEMASEK Holdings put a lot of money to support the TEMASEK Foundation. The mission of the TEMASEK Foundation is to help capacity-building in this area in the fields of healthcare, education, public administration, and disaster preparedness. They make grants to 14 specific countries.

Next example is EU Framework Programme 7. This is the seventh stage of the framework in Europe from 2007 to '12-13. We think that this is a role model of the regional cooperation in the science and technology. Later Dr. Barbara Rhode will explain about the FP7 as well.

The fourth example is Human Frontier Science Program (HFSP). This is the international organization and this mechanism has been established to realize the international common interest of human beings. HFSP is established to pursue research in the common research field, bioscience. This is a quite successful mechanism of independent foundation for more than 20 years. Donors include Japan, Australia, Canada, and EU and the number of donors is 13.

More than 6,000 researchers from more than 70 countries have been receiving grants. So this is very good example of the borderless foundation.

The last example is DNDi (Drugs for Neglected Diseases initiatives). The organization was established for the development of affordable drugs to treat neglected diseases. They support researchers who conduct research for the neglected disease. An outstanding point of the mechanism is its revenue balance. They receive money from public and private organizations, and the balance is almost 50 to 50 so that they can maintain their independence and neutrality from the specific donors.

The five mechanisms are based on universal values and they work as responsible world citizens or corporate citizens. They support needs-oriented projects.

My second point of the discussion is that we should develop networks among these existing mechanisms and use their grant programs to supports regional collaborative research, because it will take a long time to establish a new international entity to make cross-border grants. My third point is that when we establish an international fund, this organization should keep some distance from some specific groups, like countries or private sectors. We should consider some balance of the donor money so that the new organization can be more independent.

Visitors of ASEAN Foundation home page consist of 68% of American, 25%

ASEAN, 5% China, 5% and 2% EU. I could not find any Japanese visitors, although Japan paid 20 times more money than other countries. I would like to say we should pay more attention to the existing mechanisms to consider new mechanisms. Thank you very much.

Chapter 2 How to develop novel funding mechanisms for facilitating regional collaborative researches

Patarapong Intarakumnerd

I'm originally from Bangkok, but now I'm a professor at GRIPS since last April. My research area is financing of science and technology development and innovation. When we talk about establishing a fund, we should consider three important aspects of funds. One is sources of fund. Another is the usage of fund. And the third aspect is management of fund. My opinion is similar to Prof. Seetharam, that we are very much in the comfort zone where a lot of initiatives already are taken. But its only involves public money. Of course the public money can give stability to the fund and creditability to the fund, but it's not so flexible and it can be short-sighted as well because sometimes you don't know the present and future situations of the market. Funding should welcome more participation from the private sector, from individual companies. I In Asia we have so many large companies that have a lot of money and they are more willing to participate, maybe. Many Asian countries including Japan have large corporations. For example, Thailand has Siam Cement Group. It's huge and much more open now for international collaboration. There are also the chamber of commerce or trade association, industrial association or even SMEs association that have potential to donate fund to promote collaborative research in the region. They are willing to collaborate internationally because they know that we live in globalization world. We should encourage participation from the private sector, either individual companies or association or foundations. As for source of funds, joint investment between public and private would be ideal. The private sector should have an opportunity to participate, even in the writing of the call for proposal or evaluating projects, and participating the peer review. The private sector should be invited to provide another perspective, market-oriented perspective.

Another issue is where we should spend the money. Public money is very useful for targeting common social needs and the long-term investment. In Asia, basic research receives a lot of grants, but development stages including prototyping and scaling up, or translational research does not receive much funds. I think this is one feature of valley of death syndromes in the development of commercial goods and services. We invest a lot in basic R&D but not much in in development activities. We also should invest in start-up companies and translational research, which will be more meaningful because many countries in this region are not targeting this type of research at all. And venture capital industry is very premature.

My last point is about administration of fund. Professional financial managers know

the market well and know the financing issue well. I think that the overall administration of the fund can be supervised by a financial committee. It's better to leave in their hands rather than in the hands of bureaucrats. They are success factors. If we want to make the meaningful project, meaningful mechanism, we have to bring in more professional. And you can tie-up the salary or the compensation for professional managers to the performance. If they perform well, they can get higher salary or higher compensation. And then is the—we incentivize much more appropriate funding mechanism.

Chapter 3 Preliminary Comments on the Preliminary Study on Cross-border Funding Mechanisms

Seetharam Kallidaikurichi

If you want to nurture innovation, the starting point is that we should be willing to give up the barriers and the fences that we have built on our own to create the comfort zone. Therefore, flexibility is crucial. When I say this, I'm reflecting on the experience that I have had in the Asian Development Bank and also more recently at the National University of Singapore, working with funding agencies like TEMASEK Foundation and so on. While money is available—but it is fenced by so many constraints. Normally, for example, some grants cannot be spent offshore. So if you are partnering with another country, cross-border, if it is funded by a Country X, they want it to be spent on their people or on their land because that's how the tax incentives operate. Consequently, the money is actually not freely available for other country people.

The second limitation is while the objective is to foster cooperation, the key performance indicators for the donor agencies are to show more activities for organizations or companies or research institution in their own country. So a priori they put that restriction, such that anybody cannot request a proposal. One needs to have a partner in the home country or in the region—because these are key performance indicators for that funding, which is coming from some country's taxpayers. In the end, money is not freely available.

The third part, which is the most challenging part, is that while the money looks very big—yes, every extra dollar is important. But it is much smaller compared to the actual problem that it is attempting to solve. We need a long-term horizon—10 years—to solve the problem, whereas the funding agencies have annual budgets. They may approve the funding in one year, which may be disbursed within three years.

Therefore, the academic community or researchers cannot embark on long-term investigations because they don't know whether their funding will be continued..

I'll share with you an example. I was involved in the TEMASEK Foundation, which was mentioned in Kobayashi-san's explanation. It is a young organization but they have given $100 million in capacity-building initiatives. As per their annual report, they have trained about 25,000 people in the last five years. Their capacity-building is well funded, because they bring experts from Singapore agencies and then bring the recipient participants from the developing countries to come and train in Singapore or send the experts to the

developing to be trained. So it's a very a very noble and good intervention.
Now, they're committing another $100 million for the next five years. The amount is very big, but it will only train, if it goes by the same pro rata, another 20,000 people, whereas the need out there is a million people. It cannot by itself, produce all the impact that is needed on the ground.

When I requested them for a program which will support the Institute of Water Policy, I suggested to them to fund for a program 10 years, rather than a program for a year or two. So for the very first time they agreed to fund a $5 million program for 10 years. Of course, each year we will be only spending half a million dollars. But they committed that they will fund for 10 years, subject to a biennial evaluation of outcomes. As a result, the program will now be able to train 3,000 people during the 10 years. Such long-term commitment can make a big impact. We need to promote this kind of thinking within the constraints that we may operate. We need to have programs which allow the flexibility so that we can shape the programs as we go. At the same time, it will allow that commitment to be shared commonly. And so the people can think more openly about collaboration.

There's a last point that comes in here: often when we talk of research collaboration, most of the time we're looking at some kind of blue sky research to produce IPs to win big business opportunities. Most of this research is already happening in the industry. If I go and look at a problem in the water sector to be solved, private companies have already solved these problems. They're waiting with tools and products to sell in the market. If it is so attractive for business, someone is already investing money and time. In academic research, we are not yet there.

However, there is another set of big problems which has a major impact on poor people in Asia: public health, basic education, water and sanitation. These problems are not trivial. There's a lot of accumulated knowledge in countries like Japan and South Korea. They had faced such problems but over the last five decades they have solved them completely. Now, if their experience and knowledge is shared properly through research collaborations and new solutions are developed, it will produce a huge impact on the society.

I think we should focus on innovative mechanisms that will allow to give incentives to problem-solving research rather than IP-generating, blue sky kind of research. Thank you for the opportunity.

Chapter 4 Promoting Cross-Border Economic Growth through Education Funding-the Case of Thailand

Xue Jinjun

I'm doing research of the theory of economic value now. My talk has two key words. One is "innovation capability of local people," because when we talk about technology and innovation, we always talk something like international technology transfer, so from an advanced country to developing countries. But for the future economic development, we need local people to do the technological innovation by themselves. So that is something we should expect. Another key word is "education,"

"educational integration." We are living in a global era and also regional economic development and integration is developing very fast. So we need this kind of economic integration but also educational integration. If you have no universal value, you have no universal technology or science base, you cannot talk nothing about technological innovation.

Many Asian countries and regions have a long economic growth during the past 40 years. Japan has become as the second-largest economies in the world, since 1970s. So Japan and other country like Korea and Taiwan have roughly 15 years high growth. And also China is now, you know, conducting another Asia's miracle. They achieved 10% annual growth rate in the last 30 years. ASEAN and other countries are following Japan and other countries.

There is a famous economic growth model, a flying geese model, and this model has been innovated by a Japanese professor, Akamatsu who is a professor at the economical center at Nagoya University. Nagoya University is very strong in theoretical studies. We have four Nobel prizewinners in chemistry and physics already. And hopefully we have another Nobel Prize in economics. This is very new model to show how technological transfer happens among countries. Japan, Germany, UK, USA and other advanced countries have abilities to perform high-level technological progress. High-level technology can be transferred to lower-level technology countries such as China and ASEAN through activities of multinational enterprises, cross-border trading or economic activities. Two years ago, China passed Japan to be the number two in the world in total GDP. Other Asian countries such as NIES, ASEAN and India are on the way of catching up with Japan. Per capita GDP of Asian countries are now catching up with Japan. Per capita GDP of Singapore has surpassed Japan. And other countries are under way of catching up.

I just published a book called Low-Carbon Economics to show that how this kind of high tech in the field of low-carbon economy can be transferred to other countries. China is number one carbon emitters in the world. So how China can overcome this kind of problem and to reduce its total carbon emission is a challenge. We produced this kind of a model to show that there is a tunnel effect. I have drawn an environmental Kuznets curve with economic growth and carbon emissions as variables. According to this curve, it will take a long time for a high economic growth country with low-level technology to develop low-carbon society. But, we can't wait such a long time, because right now China is producing huge amount of carbon emission. So if we dig a hole in this Kuznets curve from the both side, we can create a tunnel and through this tunnel the low-level technology country can catch up and get a high sustainable growth with low pollution or low carbon emissions. This is something we should do by regional collaboration. China has been trying to reduce carbon emissions and saving energy, and they have succeeded at significant amount. Seventy-one percent of that contribution came from technological progress.

Thai has a very good performance not only in economic growth but also income distribution. How Thai can achieve that kind of miracle in a short period? One important

factor is the international labor migration. Thai is now in a good condition of economic growth but the shortage of labor is a very serious problem. They invited laborers from neighboring countries including Myanmar, Cambodia, Vietnam, Laos, and India. I was wondering how unskilled laborer can work at a Thai factory. I found out that they have a very good training system. Based on these studies, I would like to make four policy suggestions. One is to promote educational integration and joint education such as integrated courses or programs, and promote training program for migrant workers. We have many cases in the UK, EU and USA. In the next few years, labor shortage, especially shortage of skilled laborer will be a serious problem which Asian country will face. Second one is to improve technological transfer and diffusion among regions. Third one is to promote local technological innovation. So different countries may function differently. Last year in October, JST held a conference, and I listened to one famous Chinese officer and he said that China now at the moment does not need Nobel prizewinner because China needs developed technology that can be used immediately in China's economic development. Every country has its own development stage, and one country need a particularly technology, not something very high. So we should develop this kind of technology that fit to that country's situation.

And finally, we need to conduct joint research and surveys. We talk a lot about policies and suggestion. But we need to know the real situation. Thank you very much.

Chapter 5 Regional and Bi-regional S&T Cooperation in support of Innovation Systems in ASEAN: Perspectives from the EU

Barbara Rhode

We are very different countries and have our own landscape at home and are also very different in funding and how to shape science and technology. Over the years I think we have done quite well. The last decade has had an enormous shift from the old players such as Japan, US, and Europe to new players. Framework Programme has seven years budget. So it is a long- and a medium-term budget. We can spend it also for projects up to four years or five years. We see very clearly that it is important to have long-term commitments. We are the most open international research program. Everybody can participate from around the world. Everybody is invited. The only condition is that we have three players from three different countries in Europe. We used to have an old type Framework Programme to connect us inside Europe. But t we opened it up to the world and now everybody can come and participate in any program. I think the only country we are excluding is North Korea. But apart from that it's open. The philosophy is cooperation and competition. And I think this is also a learning process because this is not easy to understand and to work in a project. We are working together with industry, high-level industries, competing industries. But we are also creating the power to go together to standardization or create the next step.

EU is facing a challenge but we made our decision that we stay together and I

hope that Asian countries—ASEAN—can learn from us. Don't make mistakes, do those things which are feasible. So we are somehow paving a way for regional collaboration.

We have two human resource programs in the Framework Programme. But what is very important in human resources and exchange is that we give a return fellowship when we collaborate with low-income countries. We do not want to take away human resources from developing countries, and we give a return fellowship.

ASEAN and EU have several joint projects including Dengutools. Due to the climate change, Dengu fever is spreading and objectives of the Dengutools project are better diagnosis, surveillance, prevention and prediction, and as well as prevention of Dengu fever to previously uninfected regions including Europe. The research consortium consists of 15 countries including 4 ASEAN countries (Sri Lanka, Malaysia, Thailand, and Singapore), France, UK, Germany, Switzerland, and Brazil.

Another example of multi-regional project is Aquaculture for food security, poverty alleviation and nutrition project. The project tries to strengthen the knowledge base on food security and poverty, and develop new rigorous methodologies to quantify the contribution of aquaculture in combating hunger and poverty in developing countries. Participants include 6 Asian countries (Malaysia, Thailand, Bangladesh, Vietnam, India, and China), 3 European countries (UK, Norway, and Denmark), 3 African countries (Zambia, Uganda, and Kenya), and 3 Central and South American countries (Nicaragua, Chile, and Brazil).

And now SATREPS. Why don't we collaborate? Let us find a way how to do. We are very ready for that. I don't know how this could function but let us just throw the idea and we can talk about it, because we have a lot of knowledge on how to collaborate internationally.

We classify different countries. We are funding developing countries including BRICs. Industrialized countries and emerging economies have to pay their own share. So we are not funding the United States, Japan, and Australia, Canada, and Korea and others.

Tateo Arimoto

How long did it take for the EU to develop European Research Area?

Barbara Rhode

We started in the '80s when we saw that Japan was going ahead very much in chips and computers. And we were seeing that we were staying behind. So then we pulled together.

Chapter 6 Comments on the Cross-Border Funding Mechanisms

Edward O. Murdy

We are trying to increase the level of science and engineering collaboration with not only Japan but all countries in the East Asia-Pacific region. One of the most important communities that the National Science Foundation invests is the next generation of scientists and engineers, the young scientists and engineers. We believe

that they are one of the most important investments we can make. And consequently all NSF grants include support for students, for graduate students, for postdocs. If a new funding mechanism for ASEAN or other regions in this part of the world is created, it should includes support for the next generation of scientists and engineers.

I would just like to give you one example of a program that's supported by NSF and seven countries in the East Asia-Pacific region. It's our Summer Institutes program. In the Summer Institutes program, NSF sends 200 graduate students to one of seven countries in the East Asia-Pacific region for an eight- or nine-week period during the summer. The seven countries that are participating are Korea, Japan, China, Taiwan, Singapore, Australia, and New Zealand. We started this program with Japan back in 1990. The model is pretty simple. These graduate students spend eight to nine weeks working with a mentor in the host country. They are doing research that is related to their graduate studies. We don't expect that these graduate students will have a research publication after only eight or nine weeks of research with the host scientist. But what we expect is that these students will gain knowledge about the country that they're in; they'll gain knowledge about how research is conducted in that country; they'll gain a pool of new contacts, both graduate students whom they're working with in the lab as well as the host country mentor, and these contacts will carry with them for the next 20, 30 years of their career and they'll draw on those contacts for future collaborations as their research career advances.

So I just wanted to put this example out there as something we might want to think about in the course of discussions on future funding mechanisms.

Chapter 7 Mode of International R&D Programs

Tateo Arimoto

Until the 1980s or 1990s the advanced countries were developing global, multilateral and bilateral collaboration funds and programs such as ERA and HFSP to solve global problems. They also developed big infrastructure for international collaborative research including ITER, CERN, and EMBL. Now, we are developing new collaboration mechanisms including e-ASIA JRP, SATREPS and NSF and USAID joint programs to respond to new players at new stages of collaboration. But we are still under way to adjust or reshape programs and funds for new situation. And another point is flexibility. I invite you to express your comments and opinions.

Chapter 8 Discussion

Suguru Ishiguro

I am a manager in charge of SATREPS. I'm stationed in Tokyo and you are here. So we can start from discussing collaboration between Framework Programme and SATREPS. Anytime I can see you .

Tatang Taufik

I have two questions. First, I'm talking from the perspective of a country like Indonesia. I think it is important to handle global issues, like brain drain, for example. And one of the alternative is to develop some science and technology diaspora network to handle how those people who are going abroad to study or to develop their careers. I think this is relevant to a country like Indonesia because we lose a lot of people and we are unable to keep them. We would like to have the connection with those highly talented people.

And a second initiative is related to the changing of our government systems. In Indonesia, now we have more than 524 autonomous regional governments and local governments. And to some parts the policymaking are in their hands. So let's say, for example, the budgeting system. About 40% of the national budgets goes to the regional government. So it means that if you would like to have some extent of S&T impacts on the social-economic development, then we need to involve the regional local governments to be aware of the importance of science and technology and innovations. We should consider the development of some mechanisms to educate regional governments to have possibility to learn from countries like Japan and Europe.

And the last one is the—we are thinking about the affirmative actions for the bottom of the pyramid of the people. How can we develop some sort of actions that—to provide real opportunities for those people? They can't have a chance to win on a usual competitive funding.

Osamu Kobayashi

I'm from JST and JST has some missions to support very high-level science and technologies. And we are part of the national government, and our counterpart should be from the national level. New mechanisms which we will discuss about now should be more flexible. And of course, local government should be recipient of the new fund. Japan has a very powerful national government, but in some countries like Brazil or like Canada, their regional governments are more powerful than national government. So in that case, collaborating with regional governments will be more effective. In the new scheme, we should think about all members, not only government but also the private, local—yes, every stages, every stakeholders we should think about.

Norio Ohto

I'd like to ask Dr. Patarapong and also Dr. Barbara Rhode. Dr. Patarapong said we should fund innovation research as well the basic ones. But when we talk about domestic funding, it's okay. But when we support regional, and international research, funding applied or innovation research is not so easy because of IP sharing. If we fund some innovative research, there should be severe competition and there are a lot of the fighting among the participating companies. My question is how you can handle this problem.

Barbara Rhode

I think basic research is done mainly on the national level and only the ERC (the European Research Council) is basic funds. This is personal funding. Otherwise this is belonging to the national landscape. We are doing competitive funding for industries, for partners because we believe that on great challenges we are developing new technologies and it is much more important to see the different partners—sometimes this is creating also alliances for future collaboration. And we always advise—we do not sign any contract if there is not an agreement on IPR. Different companies have their IPR, and they have their own territory. But you sometimes need to use technology in other company's territory and you have to have very clear agreements between the companies how to deal with this. Of course, you don't disclose what you don't want to disclose. But very often, if you want to come to results that are advancing technologies, you can collaborate also in standardization or in future negotiation. This is also the potential. None of our countries could do this alone.

Patarapong Intarakumnerd

I think this problem can be solved by trying to have a more open space for competition. We can have a call for proposal and then each individual teams or companies can write a proposal and then we can select them based on their merit. I think this is the same as the basic research as well. And also we can put some conditions, like they have to collaborate across countries with other companies or universities or research institutes across country. New type of funding can encourage collaboration not only across country but also between companies and university as well. Or we only fund the research up to the level before commercial development. There are several important processes before commercialization such as prototyping or scaling up or translational research. We can impose some conditions to encourage funding at the development stage or very prior research. Otherwise we keep repeating the same level of projects again and again and never expand our funding mechanism to confer the dead value.

Akio Nishijima

In our case, the next step is the development of demonstration plant. The main player is the private sector. But it is not easy for the private sector to develop demonstration plant by themselves. So government support will be necessary at the development stages. Anyway, collaboration is very important. Without collaboration among many players, it usually difficult to move to the real application.

Tateo Arimoto

This morning, Prof. Choudhury proposed to set up the website in order to share the information and experiences about the collaboration, collaborative project as well as the funding mechanisms. And do you have any more detail? Okay.

Jamilur Reza Choudhury

In the two sessions, we have come across many of these funding mechanisms. So my proposal was to consolidate all the information and put up a website where all the information is available. That way, it doesn't require much of an effort to sort of sort out the different subject areas where these are available. And then we can be linked to all these separate initiatives. That was my proposal.

Norio Ohto

I have no plan yet but I'll take a suggestion that we might be able to provide some website's information. But what is important is not just information. I think what is important is networking and continuing effort to renew information and disseminate. So if we build network we should have meeting too, like once a year, and all the relevant institutions and foundations get together and exchange and renew information. That kind of effort is very necessary. Just the website is not enough.

Myint Wai

I was quite interested and very curious to know about the philosophy of cooperation and competition. I think that is very interesting. So far up to the day of this environment, up to the days of these cultures, I think we never had such an expression which is being together at the same time, it's contradicting at the same time. And in our science and technology I think this type of philosophy and concept would be revolutionary and like Mr. Choudhury said about the website, if we ever be able to practice such an idea, it could be very helpful. But for me, I do not know how to approach to cooperate each other, at the same time to compete each other.

Barbara Rhode

Technology is not immediately in the market. We do not touch on market research. We do not touch on the development phase. We do not touch at what companies do. But we are on the level below. On the long way below, we share research, we share results and this under conditions we have agreed upon before. So later on we can go—if we have the car industry, then I think Chevrolet and Mercedes can then go to different directions, but the brakes may be similar or something like that. This is—in this way. It's very easy to do and in very many cases also we have then collaborations coming out. It is normally beneficial and it is also a culture.

Yoshio Matsumi

Everybody agrees that the funding collaboration between public sector and private sector is just desirable in sharing funding burden and also in reducing funding risks. But it's easy to say and very difficult to implement because there are often stringent rules and even inflexibilities in public funding. So my question—and I'm very curious—whether there has been any precedent in the US of joint funding between NSF and private sector in particularly science diplomacy. Also, any precedent of joint funding between ADB and private sector in research projects.

Edward O. Murdy

On the question of private and public funding, NSF funds are in many cases mixed with funds from a private entity. NSF seeks partners everywhere. IBM is a very good partner in many of our computer science projects that we fund. Often, the money that IBM or Hewlett-Packard provides is less than what NSF provide but it's still a significant portion.

And another more recent activity involves the Gates Foundation and the Gates Foundation is actually providing more money to an NSF activity than NSF is providing. And we're very happy with both this program and some of the activities that are being funded under it.

Seetharam Kallidaikurichi

Before responding to this, I also want to comment on Mr. Wai's good observation about the distinction between competition and cooperation because I also mentioned it in my comment.

I think we need to define competition, and also distinguish it from "becoming competitive." Cooperation is a necessary step to become competitive. That's the prerequisite. Otherwise we'll be just in our own—again, the other comfort zones. Many developing countries today are not competitive because they're not adequately yet cooperating or receiving the cooperation with earnest. The money is available, the grant is available but it is the recipient country which need to use it to the fullest advantage. So the tiger economies which grew from that developmental obstacles were those who willingly received but then you have to become competitive, then you compete, maybe with the developed countries, like what Singapore, Hong Kong has shown. They can become competitive and even become developed to do things where they can compete.

So I see that transition as a necessary step. Rather than doubting the abilities, I'm sure every developing countries as was shared—Bangladesh, Myanmar, Indonesia—India included also—all have lots of talented people so as a nation there's no need to be any fear about competitiveness. But it's a matter of getting together the act and then moving forward. So I see that as not an obstacle.

Now, coming to private sector involvement. I bring the same paradigm. If you look at it as a business, even in the poorest of the countries, the government is the biggest businessman around. If they think of it as a business. But unfortunately the government does not operate like a business to really bring development as a developmental objective. They're doing it perhaps as a social good just to redistribute wealth. But when it comes to research and innovation, you need to add the business hat. So in that sense I think partnering with the actual private sector will bring that rigor because private sector puts money—it's not actually sharing risk. They will actually really question every risk because they won't put a single dollar on the real project if they don't see any bang for the buck.

I have some experience raising money from the private sector for research

initiatives that I've initiated in the Asian Development Bank and I can pledge ADB's money easily because it was a grant anyway. I can just say, "Oh, this is for research." But if I want to get even a small money from the private sector, they want to ask exactly what this project will do, exactly what this will result in, exactly what they will get as a bang for the buck. So it actually brings back excellent questions which will improve the quality of the funding that the ADB would have put in in the first place. Otherwise—I was sharing informally at the lunch table—it will produce more paper, of reports.

So we want to bring that catalyzing effect. But we need to set good precedents because these discussions, again, can become just table conversations but not resulting in real, actual concrete initiatives. So I find that our conversation here is a good step forward—is to do what I call as "pilot activities," which actually kind of convince: the proof of concept. Because we need to break our barriers and try some bold experiments. Some may work, some may not work. But if you don't do, it never worked. But it's worth risking to try something.

And here is where I want to bring the conversation back to the private sector. The private sector does a lot of corporate social responsibility kind of gifts—give away. But they are given after profits have been made or as a sign of goodwill. But they can be actually packaged as research partnerships, here working together with governments or multilateral organizations, where they actually cut the strings with their actual business interests, but just give it away. Some have done it after the owners have become very wealthy and they become philanthropists. But this philanthropy can start even much earlier in the business cycle and that's where I think new opportunities will emerge. So we don't need to wait for the owner to become a multi-billionaire and then when he makes a bequest he gives a charity. It can start very early and if we can bring that concept of funding, which—grants come from private sector and grants that come from the government or multilateral organizations. But then partner with the people which actually create new ideas. And it can create business opportunities eventually. Thank you.

Shigeru Futamura

I'd like to ask Ishiguro-san, Barbara-san, and Murdy-san that if they are satisfied with the results. Funding project is a kind of investment. Sometimes money is lost. Some project can be a big success. I'm wondering if you are satisfied with your results and if not, I would like to know if you are doing some special planning to improve the quality of your evaluation.

Barbara Rhode

We are handing out taxpayers' money to other countries. Europe, for the moment, is in crisis, and we are very much concerned about the results. We are fighting also for our research budget for the next seven years. The research budget is the one that

brings a lot of win-win situations. Also, science is not predictable, you cannot get what you expect, but very often also the side effects of these projects are very important. It is knowledge of a region, knowledge of different thoughts, and knowledge to communicate. Much more knowledge is available. We do have very tough evaluation and monitoring systems that are looking very clearly on our hands.

Shigeru Futamura

What about the monitoring system after the end of the projects?

Barbara Rhode

We receive reports during the research and a final report after the project is over. We have enough monitoring system. Our scientists are very much complaining about us that they have to submit too many reports. And we are trying more to go down because we had a phase where in particular you got an audit here and there—audits, technical audits, all can happen. So we have masses of external audits.

Edward O. Murdy

I will mention what the National Science Foundation does evaluation. As with, as Barbara mentioned there, in her system there are reports and in the NSF system there are also reports. There are annual reports and final reports and we've just instituted a process where we now require our awardees to write a short report that's non-technical for public consumption. So anyone, any taxpayer in the US can access this website and find out about the results of a research project in language that they can understand, hopefully.

But I should also say that the review process at NSF is very stringent, very competitive. Only about 20% of the proposals that we receive are funded. And if an awardee finishes a project and has not been productive, has not produced papers, has not graduated students, has not trained students, the next time that individual submits a proposal to NSF, the lack of productivity on the previous grant is going to be noted by the review committee. So that is one of the ways we try to sort of siphon out those individuals who are not so productive as they should be. But as Barbara mentioned, science is unpredictable and many times it takes 10, 15, 20 years before the results of a project can bear some fruit. So you have to be patient.

Suguru Ishiguro

Regarding evaluations and reports from the researchers, we post them on the homepage. But not like NSF, language is not always easy. They are not reports specially written for general people. However, many parts of our SARTREPS leaflet are ~~was~~ written by the second-year university non-science major students who interviewed all projects. And they introduce each project in plain words. So I think our leaflet~~s~~ ~~are~~ is ordinary-people-friendly.

SARTREPS started five years ago. Many projects are in the final stage of the plan or some have already ended. However, not all projects have specific players who will use the

results from the projects. As I explained in the morning, passing batons to the next player is very difficult. So when we solicited projects this year, we recommended that from the start of projects, projects involve assumed next players such as private sectors as project members in order for streamline baton passing. So every year we are gradually learning and changing the schemes.

Tateo Arimoto

Both Ohto-san and I are making some proposal in this session. The first proposal is establishing regional networks among existing funding systems to seamlessly support regional collaborative research that will lead to innovation system, which means building “system of funding systems.” We also should improve existing funding systems, and share information and experience about collaborative projects and funding systems.

The second proposal is establishing regional funding entity, tentatively called “Asian Research Foundation”, as a regional public goods in the region by raising funds from the public and private sectors. This is just tentative proposals.

Norio Ohto

I hope all of you support the general idea of the proposals.

Naoya Abe

I’m quite happy with the proposals and I’d like speak that. One point I would like to mention is about actually the goal of regional innovations, you know, so far we haven’t discussed about why actually we need to do regional cooperation for innovations. I think most prominent and very exciting collaborations have very specific goals. When goals are very specific, everyone can understand the significance of activity and they believe that they can share the benefit from the collaborations. I think that sharing common goal is so important.

SESSION 3　INTERNATIONAL OPEN INNOVATION RESEARCH CENTER

Wiwut Tanthapanichakoon (Chair)

I would like to give you a brief background of this topic. At the IPDCSTA2011, it was pointed out that it’s necessary to develop international open innovation centers through collaborations among academia, industries and government to promote innovation, human resource development, cultural exchange and brain circulation. Last year, the Tsukuba Innovation Arena (TIA) and a joint research center between Tianjin University and NIMS (National Institute for Materials Science) were introduced as possible candidates for IOIRC. This year we are going to talk more about new IOIRCs in the field of renewable energy.

The first speaker, Mr. Matsumi will touch upon the following points: the necessity of

IOIRC in general, and the establishment of IOIRC on biomass in Thailand, and linkage between TIA and Asian research institutes and establishment of TIA as one of the IOIRC in Asia.

Chapter 1　A Preliminary Study on the Development of International Open Innovation Research Centers in Asia

Yoshio Matsumi

Innovation is a key driver of economic growth, strengthening of international competitiveness, and improvement of quality of life. Today the world economy is in stalemate and each nation is accelerating its efforts for innovation, making it an important part of growth strategy. Global innovation competition is intensifying. The recent American publication entitled Reverse Innovation reads as follows: “The global dynamics of innovation are changing. No longer will innovation traverse the globe in only one direction, from developed nations to developing ones. They will also flow in reverse. Innovating for emerging markets, rather than simply exporting can unlock a world of opportunities.”

Science and technology are a driving force of innovation that creates new social and economic values. Today closed inward-looking research and development by one company or by one country is not sufficient anymore when globalization is developing, when global challenges are getting more complex, and when scientific and technological disciplines are melding or converging. Under such circumstances, international university-industry-government collaborations in R&D are becoming increasingly more important. For more than a decade, large-scale international open innovation research collaborations on a university-industry-government basis have been underway at SUNY Albany, the United States; MINATEC, France; IMEC, Belgium and Munich Biotech Cluster, Germany. In MINATEC, France, 400 companies from 35 countries participate in international open innovation research collaborations. In SUNY Albany, IBM Corporation contributed $100 million and the state government of New York contributed $50 million in launching IOIRC. In France and Germany, venture capitals and patent lawyers also participate in such centers. Those international collaborations have been developing not only in scientific research but also in talent development, capacity-building, networking expansion and commercialization of R&D in order to mutually benefit from jointly working on complex global issues. It is time for both developed and emerging countries to promote together international and multilateral open innovation research collaborations on a university-industry-government basis, inviting different value judgment and wisdom as well as diversity and sharing cost and funding of R&D.

Large-scale international open innovation research centers, like those in the United States and Europe, do not exist in Asia. If the efforts at this International Policy Dialogue result in launching international open innovation research centers in Asia with objectives to respond to and solve global challenges and local needs in Asia, there could be high expectations that such centers, taking advantage of diverse knowledge,

wisdom and capability of Asian people, would spark ideas and solutions, realize innovation and contribute to the development of Asia.

In this Session 3, it is desirable to discuss direction and measures for establishing international open innovation research centers in Asia. A couple of Japanese speakers will address three ideas on Asian IOIRCs and will appreciate comments, suggestions, desires or requests from participants from various countries of Asia.

The first idea is an increasing multilateral collaboration between the National Institute of Materials Science of Japan (NIMS) and Asian countries. To date, NIMS has already been actively developing cooperation with Thailand and China. It has also been working together with South Korea, Singapore, Thailand, Taiwan, Malaysia and Vietnam through Asia Nano Forum.

But NIMS apparently has a strong interest in launching collaborations with business firms of Asia and expanding collaborations on a multilateral basis. NIMS is also eager for two-way exchanges of NIMS researchers and Asian researchers. NIMS currently operates five international open innovation centers, including the Center of Materials Research for Low Carbon Emission. A realistic approach to international open innovation collaborations using the existing facilities like the ones of NIMS should be beneficial to every party. It is desirable for Asian countries to make NIMS of Japan one of the platforms of international collaboration in Asia and to best utilize it.

The second idea is international collaboration between Tsukuba Innovation Arena of Japan (TIA) and Asian countries. TIA's 17 research projects in nanoelectronics, power electronics, N-MEMS, nanogreen, and carbon nanotubes are participated by 100 companies. Participation by industry is a very important aspect of TIA. TIA is interested in welcoming more Asian researchers to Tsukuba, Japan and having them use advanced facilities and equipment at TIA in conducting joint R&D on nanotechnology for green innovation. If TIA and Asian countries could make TIA one of the platforms in Asia and develop open innovation nanotechnology research on a multilateral basis in energy and environmental fields, I believe every party is expected to significantly benefit. It could be a good start, heading for ultimate commercialization of new technology that means innovation.

The third idea I would like to discuss today is an establishment of international open innovation research center on renewable energy, next-generation biomass energy in particular, in Thailand. In coping with global warming and developing green economy, renewable energy is expected to play a major role in reducing greenhouse gas emission, replacing fossil energy in future. About 40% of world's biomass reserves are available in Asia. Several countries in Asia including Thailand exhibit a strong interest in strategic development of biomass and application for fuels from the perspectives of energy security and conservation of environment. It is highly advisable to pursue a launching of international open innovation renewable energy research center in Thailand on next-generation technology for biodiesel fuel from biomass, opto-synthesis, energy from algae and bio-refinery. Technology-rich countries and resource-rich countries of Asia could combine their strength and advantages and work together on vitally important renewable energy in Thailand, located in the center of Southeast

Asia. The renewable energy research collaboration in Thailand could start at an existing facility in Thailand with participations of other Asian countries and eventually launch a larger IOIRC in future, striving for commercialization and industrialization.

I believe that there are two critical factors for success of international open innovation research centers. One is funding, and another is participation by industry. As for funding of IOIRC, concerted efforts in Asia must be made for raising and securing significant size of funds from governments, public funding organizations, private sector foundations and business firms for different IOIRCs. Various schemes such as e-Asia JRP or SATREPS should also be mobilized. As for industry participation in IOIRC, it is of just mounting importance. Without an active role by industry, university-industry-government collaborations will not be able to deliver innovation to the society. All the parties concerned are urged to have industry participate in open innovation research collaborations in Asia from the very early stage.

Lastly, one-day discussions about launching IOIRC to mutual benefits may not likely be concluded in very specific manners. The discussion must continue through next year so that all the parties could jointly reach a final specific decision.

Thank you very much for your attention.

Chapter 2 Current Status of Tsukuba Innovation Arena for Nanotechnology (TIA-nano)

Hiroshi Iwata

TIA-nano is a global nanotechnology complex in Tsukuba (Japan), created under the leadership of the National Institute of Advanced Industrial Science and Technology (AIST), the National Institute for Materials Science (NIMS), the High Energy Accelerator Research Organization (KEK) and the University of Tsukuba. The combination of these four institutes provide very useful infrastructure for research, especially nanotechnology research. One of the special features of TIA is that many companies participate in the TIA. TIA-nano is a fruit of public–private cooperation and supported by the Japanese government (Cabinet Office, the Ministry of Education, Culture, Sports, Science and Technology (MEXT), the Ministry of Economy, Trade and Industry (METI)) and the private sector (Japan Business Federation (Keidanren)). Currently, more than the 500 researchers from 100 private companies are conducting research at TIA. TIA-nano has been chosen as one of the major strategy targets in the New Growth Strategy: Blueprint for Revitalizing Japan, which was approved at a cabinet meeting in June 2010, and is expected to function as an innovation engine in future research, development and training in nanotechnology sector not only for Japan, but also for countries around the world.

TIA-nano aims to function as an open innovation research base and to accelerate the introduction of nanotechnology innovations to the market, in conjunction with education for the next generation. TIA-nano has six core research domains. They are nanoelectronics, power electronics, MEMS, nanogreen, carbon nanotubes, and

nanomaterial safety. TIA has three core infrastructures. They are Nanodevice Research Foundry, Nano Open User Facilities, and the Network School of Nanotechnology which is dedicated for human resource development. These facilities are now open to the world. Although participants are mainly Japanese companies or Japanese researchers, facilities are not restricted to Japanese. We welcome the participation of researchers in the Asia area. When we started TIA, there was a criticism that there is no need of setting up another large research center because there are already big international research centers like Albany or IMEC. However, one special features of TIA is that it will also develop human resource as well as conduct research. If you just want technology, you can go to IMEC or somewhere, but here we conduct research and at the same time we develop human resources.

TIA-nano has been successfully growing up. Already, 23 national projects have been launched; the related budget exceeds 60 billion yen. TIA-nano partner companies are one hundred and more than five hundred industrial researchers participate in those projects. Current status of TIA-nano is, however, not yet enough to satisfy user's demands. In order to revitalize research and development activity, TIA-nano aims to become a place where technologies in 6 core research domains converge; material, device and system researchers gather; industry-academic-government researchers discuss daily. Thank you for your attention.

Chapter 3 Researcher Networks for Nanotechnology and Materials in Asia

Masahiro Takemura

I'd like to focus on the research networks for nanotechnology and materials in Asia, specifically two forums. One is the World Materials Research Institute Forum (WMRIF) and another is Asia Nano Forum. The first directors' meeting of the World Materials Research Institute Forum was held in 2005 at Tsukuba in Japan. At that time, we had only 15 member institutes. But now the Forum is expanding and we have 47 member institutes in the world including 21 member institutes in Asia and also one potential member's institute in Australia.

In Japan, we have two member institutes, AIST and NIMS. Current president of WMRIF is Prof. Dr. Thomas Boellinghaus, and Prof. Teruo Kishi is the founding and the honorary president.

Our regular events are a general assembly in every two years. We organized five general assemblies before, and the next one will be held in Switzerland next May. We also organize a young scientist workshop and the last one was held in Thailand, hosted by MTEC in NSTDA.

Asia Nano Forum (ANF) was established in 2004. We have 15 member economies. We use the "economies" term, because Taiwan and Hong Kong are treated as an independent member. In Japan, we have two member institutes, AIST and NIMS. Prof. Kishi is President, and Prof. Sirirurg from NANOTEC, Thailand and also Dr. Ramam from IMRE, Singapore are Vice President. I am the secretariat. Prof. Wiwut is one of

the founding members of this forum. We regularly organize the summit meeting and Asia Nanotech Camp for fostering young scientists. We have several working groups including standardization, research infrastructures, and nano-safety issues. We regularly disseminate information on nanotechnology in Asia through newsletters and annual reports.

Finally, I'd like to summarize the regional collaboration in nanotechnology and materials in Asia. We organize the regular face-to-face communication and policy dialogues and technical workshops in which both policymakers and researchers attend. Each institute has researcher invitation programs and we frequently conduct research exchange for up to one week. Preferably, student exchange or young researcher exchange would be more effective to carry out actual research collaboration. We are now developing student programs including an internship program, summer school, and a joint graduate school program. NIMS is now developing joint graduate school programs with which overseas graduate students can stay at NIMS for up to two or three years. In the research collaboration, ANF and WMRIF member institutes are receiving grants from e-ASIA JRP. The next step would be the establishment of joint research centers including Tianjin University-NIMS joint research center. Thank you very much.

Wiwut Tanthapanichakoon

Thank you much, Dr. Takemura. Talking about ANF, we organized the kick-off ANF meeting in Phuket in 2004 when there was a very huge earthquake in Sumatra, Indonesia. We were very lucky because the big tsunami hit Phuket soon after we had the meeting. At that time, about 20,000 peoples including tourists from many countries were dead in Thailand.

Chapter 4 Open Innovation: SCG Perspective

Wilaiporn Chetanachan

I come from Corporate Technology Office, which is in charge of R&D, innovation management and new technology business of Siam Cement Group (SCG). SCG was established in 1913 by King Rama VI, and the major shareholder is still the Crown Property Bureaus. We start the business almost 100 years ago from cement and then we diversified to chemicals, paper, building material and distribution. We have over 250 group companies in ASEAN. The last year's sales revenue is about 12 billion US$, but the profit margin is still very small because we produce mostly commodity products. The total number of employees is about 38,000. Our vision is to become the ASEAN business leader by 2015 by creating continuous and sustainable innovation. We pursue an innovative workplace of choice and good governance and also sustainable development. We have two strategies. The first one is "go regional" and then "HVA."

We have a green initiative which pursues a target that one-third of the total sale revenue come from SCG eco value products in 15 criteria. We invest in technology and

innovation and we target that about 50% of the sale revenue will come from high-value-added products and services by the year 2015. In the past, we mainly buy technology from abroad including Europe, US and Japan. However, we started to have our R&D in 2004. The budget increased from $1 million in 2004 to $36 million last year. Our R&D budget is still very small in comparison to European or Japan, but largest in Thailand as single company. We already spent about $23 millions in the first half of this year. The high-value-added products and services grew from only 4% of the sale in 2004 to 32% last year. We have 940 people for R&D and product design. During the past five years we have about 1,500 projects, and thirteen percent of them come from collaboration. The number of international collaborations is 54, which is about 20% of total collaboration. Beside each business unit focus: Cement, Chemicals, Paper, Building material and Distribution, Corporate Technology focus on four research areas; energy, environment, material and supply chain. In the energy area, we would like to reduce the usage of fossil fuels and develop renewable energy including biomass. As sources of biomass, we utilize cultivated plants and wastes including sludge from the paper industry, rice husk from the farm, tire scraps from cars, and municipal solid wastes. In the area of materials, we are working on composite materials and food packaging since we have the paper industry in our group. In the nanotechnology area, we are working on self-cleaning technology for cement industry.

In Thailand we give scholarship to 100 students who would like to pursue in science and engineering for bachelor degrees. We also make grants to our universities and research institutes. We have researcher exchange programs with foreign universities and institutes. We are very much looking for the international collaboration, because we are already doing it.

Chapter 5 Research and Development Collaboration between Toshiba and Universities in Asia

Miyoko Watanabe

I am from Toshiba, and would like to talk about R&D collaboration between Toshiba and university in Asia. In Japan, we have three big research centers. The biggest one is R&D center and about 1,000 researchers are working there. The R&D center has three subsidiary research centers in Europe, the United States, and Beijing, China. The second research center in Japan is Software R&D center. The Software R&D center has two subsidiary research centers outside Japan, one in Bangalore in India and another in Vietnam. The last one is the Power System and Industrial System R&D center, which doesn't have any subsidiary research center outside Japan, but is strongly connected with Tsinghua University in China. In Asia, we are collaborating with many universities in China, Vietnam, Singapore, and Thailand.

The most strongly connected university is Tsinghua University in China. The collaboration with Tsinghua University started in 1991. At the time, China was a small country in economy. The GDP of China was only 13% of Japanese GDP. But we had

perspectives that China will grow so much in the future. We were interested in the future of China. And we were also interested in software engineering in China. We started the support of education. That was the beginning of our collaboration. In 1998, we had an overall contract with Tsinghua University. At the time, Toshiba started globalization. We had a sense of risk and a sense of urgency. We thought that if we cannot start globalization now, then we cannot grow in the future. We started many contracts with many companies and many universities in the world. We started giving scholarship and conducting joint research and contract research. In 2008, we established research center for energy and environment. That was a big event for Toshiba. At this time, we have stopped the scholarship programs because scholarship means just financial support and we wanted to commit more active support. We started a student activity support program which would help students' self-motivated activities with Toshiba's researchers with Toshiba's research fund. Toshiba's collaboration with Tsinghua University resulted in the establishment of the Tsinghua-Toshiba Energy & Environmental Research Center (TTEC). The first phase started in 2007 with the collaboration with only specific departments. The second phase started last year with the collaboration with the whole university. We had an opening ceremony twice, and in both times, Toshiba president and Tsinghua University president attended. So it was very important for both the university and Toshiba.

Research subjects are based on Toshiba's policy. We have a policy focusing on two regions of innovation. First one is a total storage innovation and the second is a total energy innovation. All research subjects are concerned with the two types of innovation in order to realize smart community. Smart community is a very important business concept for Toshiba. We already started smart community business, and we would like to expand more.

In Toshiba, local employees play a very important role. We have a research center in Beijing, China, and more than 100 researchers are working there. They act as connectors between Japanese Toshiba people and people in Tsinghua University's. Without these connectors it is quite difficult to have good collaboration. We have a lot of programs to educate local employees.

Finally, I'd like to touch upon issues in collaboration. The first issue is realization of real innovation. We can achieve technology innovation, but it is quite difficult to create new business, new products and new systems. Real innovation means the creation of innovative goods and services for local markets. Real innovation cannot be created if technological innovation is not related to the local market. Collaboration with local people is quite important to realize real innovation. The second issue is concerned with collaboration which is also quite difficult. We have to hold a common vision. Participants of the collaboration tend to embrace different visions, but it is essential for each participant to hold a common vision to realize real innovation through collaboration. We also need various kind of communication including the communication between top executives of Toshiba and the universities, and communication between the top executives, researchers and salespeople inside Toshiba. If these issues are satisfied, I believe we can make very good open innovation

in the world. Thank you very much.

Chapter 6 Examples of International Open Innovation Research Centers in Semiconductor Industry

Mitsuo Akagi

I will talk about several open innovation research centers. The first example is the establishment of VLSI Technology Research Association Cooperative Laboratories, shortly VLSI Laboratory. VLSI stands for “very large scale integration”. VLSI Laboratory was established in 1976 and ended in 1980. VLSI Laboratory is the first cooperative research project in the world in the semiconductor industry. About 100 researchers and engineers from five competing Japanese companies and a national laboratory, the Electro Technical Laboratory (ETL), got together and conducted collaborative research. President of VLSI Laboratory developed a unique concept of collaborative development of basic and common technology in order to encourage these competing companies work together. If they pursue competitive technology, the collaboration among competing companies would become very difficult. Later, pursing basic and common technology has been defined as pursuing precompetitive stage technology. VLSI Laboratory project was quite successful producing the cutting-edge technology including electron beam exposure system, pattern writing software, ultraviolet reduction projection, and improved specifications for the pattern fabrication. These technologies actually pushed up the Japanese semiconductor industry to the world first-class. After the success of the VLSI Laboratory project, the United States and Europe developed the same kind of projects.

The second example is IMEC (interuniversity microelectronic center) in Leuven, Belgium. IMEC’s goal is to develop technologies which are 3 to 10 years ahead of the industry, and a bridge between fundamental research at the universities and technology development in the industry. They are very strong at chip processing and others. IIAP (IMEC’s industrial affiliation program) is the program to invite private companies as partners, and conduct precompetitive R&D together with a group of other technology leaders to share risks and costs of advanced research. In semiconductor industry, they need to make pre-production lines before making their own production lines and a large amount of money is necessary to make the semiconductor manufacturing lines. It is a good practice for semiconductor companies to join the cooperative research activities. Number of researchers is about 2,000, and the budget is €300 million in 2011. €45.7 million comes from the Flemish government, and the rest of €247 million comes from partner companies.

The third example is Semiconductor Technology Institute, SEMATECH. SEMATECH also targets precompetitive areas. Their perspective is collaborative strategies for the next decade.

My important findings are that working together at a fixed place and pursuing precompetitive technology with common goals are key factors that enable collaborative research among competing partners to work. Working at a fixed place with common

goals will nurture good teamwork and help them to feel that they are working for their own project. However, it is not easy to define what precompetitive technology areas are. Being precompetitive depends on fields of technology, financial and technical situations, worldwide competition, and other parameters. We should pay special attentions to situations of industry, worldwide competition, and future directions of society.

Discussion

Tatang Taufik

I have two questions and one suggestion. The questions are related to the term of open innovation. Does it have anything to do with intellectual property right (IPR) such as the open use of the resulted IPR, or it may mean that it is physically open to everybody to join?

My second question is related to a perspective view of research. We spend whole day talking about science and technology and R&D activities. But most of the time we discuss science and technology from the supply side. But when we develop a better ecosystem for innovation, we cannot ignore the demand side and the linkage to market. So how can we see science and technology from the demand side? I also think that we need to pay attention on soft engineering as well as hard engineering to make our regional ecosystems better in the future.

Lastly, I would like to suggest visiting Tsukuba Innovation Arena next year. What Mr. Iwata talked about Tsukuba Innovation Arena is very interesting.

OM Romny

I would like to ask a question to Dr. Watanabe from Toshiba. The important thing that she mentioned is that a company and a university usually have different visions even when they carry out collaborative projects. So my question is that how you can compromise when partners have different visions.

Miyoko Watanabe

A long time ago we had many basic research, even in the inside's company. But the situation is changing now. I think that basic research should be done in universities so that we can focus on creating a new business and making a new product which only businesspeople can do. I think that missions or roles are different when we carry out collaboration with universities. Of course these different missions are connected to pursue a common goal.

OM Romny

Just one more question I would like to add. What kind of country are you interested in to collaborate? You invested in a big country like China, because you think that results from the collaboration can be applicable to you company. If your company is in a developing country and still would like to carry out collaboration with universities, what can you do?

Miyoko Watanabe

When we select a university for collaboration, we always think of their market. If the market is growing up, we are interested in the market and the local place. We would like to grow our business and the growing market is very attractive for us.

Xue Jinjun

I'm very interested in the case of joint research projects between Toshiba joined and Tsinghua University, China. I am curious to know if there's any difficulty involved, because the Chinese government provides grants to Tsinghua University, and Toshiba's grants belong to private sector. My second question is concerned with whether the joint projects have produced any practical results that have made any contributions to the development of your company.

Miyoko Watanabe

First of all, I would like to answer the second question. Actually the joint projects have produced many practical results, because we are expanding our business outside Japan. Maybe more than 10 years ago our business—dominant business—was inside Japan. But now the dominant business is outside Japan. And many research collaboration and business collaboration play a very good role to our outside business expansion. About the first question. Tsinghua University has their own research fund, and Toshiba also contributed quite a lot of research fund in the research center.

Jamilur Reza Choudhury

Mr. Iwata provided us TIA-nano booklets, and some of its activities are written in the future tense. For example, "education of next-generation scientists and engineers," "TIA-nano will establish a capability for postgraduate studies." Similarly, "TIA-nano will cooperate with the expansion." Can anybody give us current status of its activities?

Teruo Kishi

As for Networking School of Nanotechnology, we already started a graduate course for nanatechnology. The importance of nanotechnology has been emphasized in these last 12 years, but universities in Japan have few departments of nanotechnology. So we planned to have a graduate course of nanotechnology. But it is not easy because nanotechnology covers versatile expertise including physics, chemistry, biology, and engineering. We are planning to establish a graduate course with Tsukuba University and two private universities, and in the future we would like to have close cooperation with Tokyo University and Kyoto University.

Jamilur Reza Choudhury

Is there any win-win situation in the collaboration with private companies?

Teruo Kishi

We just started TIA-nano three years ago, and already established some good

relationships with Japanese private companies. In the future, in addition to Japanese industry and academia, I hope many Asian countries join TIA. TIA is located in Tsukuba, 60 kilometer northeast of Tokyo. Win-win situation is one of our targets.

Hiroshi Iwata

We are constructing a new building for network school in Tsukuba. The next April, you can visit the new building. I would like to go back to the Dr. Tatang's question about the definition of "open." One definition of open research is that participating companies simply combine their own technologies to produce solution. The other meaning is that facilities are open to any companies. Anyone can use TIA-nano facilities when they register. Dr. Tatang's second question is about demand or supply side. At TIA, the industrial and the government researchers get together to find solutions from supply and demand sides, that is our strategy of being open.

Tateo Arimoto

I would like to ask questions to Matsumi-san. He talked about the three steps to realize international open research centers in Asia. The first and the second steps are now a little bit ongoing. I would like to know how the final step would be realized following the first step and second steps.

Yoshio Matsumi

The most idealistic way is to build new large-scale international open innovation research centers from scratch, but it would take time. We have to discuss various challenges including funding for the centers and inviting overseas researchers. In order to expedite materialization of new international open innovation research centers, we had better start with the utilization of the existing facilities. We also have to take the parallel actions. While we work on the use of the existing centers, we have to discuss long-term perspectives of the center. I also would like to refer to the open innovation. During the so-called precompetitive stage, research is really open. Participating researchers from different companies share facilities and information, and diversity is a key factor for the realizations of solutions during the precompetitive stage. But when they reach the competitive stage, they enter into contracts about intellectual property rights and responsibilities and benefits. I think we have to understand that characteristics of collaboration differ from phase to phase. As for demand side, there is a growing recognition on a global basis that demand side is far more important for innovation these days. Demand side means market pull or issue-driven, rather than technology-push.

So in order to really make this innovation happen, whether it's a university or industry or government-owned research organization, they have to understand the meaning of demand side research. We should make the best efforts so that people of the country enjoy the benefits of innovation that solve their needs and problems.

Myint Wai

In 1964, I was in Japan and joined Toshiba after the graduation from the Tokyo

Institute of Technology. At the time I was working at the data processing center. We were using IBM 7090 computer, which was about the size of this room. When we put the input, we have to punch the card. And we had to carry big tapes of about two inches width. That was how I worked in Japan.

Now, I'm very much impressed that we can talk about technology innovation for new business and local markets, and regional collaboration with common vision and proper communications. That is very much interesting. About 45 years ago, people from our neighboring countries came to Myanmar looking for jobs. When people got enough money and want to do the shopping, they came to Myanmar for the shopping. When Singapore became independent, Mr. Lee Kuan Yew, Leader of Singapore, said that Singaporeans have to work three times harder than previously to catch up Burma (At that time Myanmar was called Burma). Because, he was so impressed with the prosperity of Burma (Myanmar). And now we are quite far behind our neighboring countries. In this workshop, I have heard that Thailand is pursuing innovation, and there is a proposal of developing an international research center for renewable energy in Thailand. That's a wonderful idea. To learn technology, we don't have to go to Japan or Europe. We can just cross the border and learn technology there. I also would like to make another comment on regional collaboration. As Ms. Miyoko Watanabe said, communication should not be done only with the public departments, public's sector. It should also be done to the private sector. For instance, my colleague here, Dr. Aung Kyaw Myat, is from the public sector, and I am from the private sector. I am really grateful that both of us are invited for this important workshop and that we can learn what to dream in the future for our pretty country, Myanmar. Thank you very much.

Wilaiporn Chetanachan

I will share a little bit with what Dr. Tatang said about the demand side. During the past 10 years, IMD studied on world competitiveness and Thailand was ranked around 50 in technology and science infrastructure. Both the industry and the government were worried about R&D status of Thailand, and discussed what we can do about this. Since then we have been working on the improvement of national innovation systems. We discussed the collaboration between public sector including universities and research institutes and the industry. We think that universities and research institutes should support the industry. If the industry creates innovation and makes money, then the industry can create more jobs. The industry also pays tax, and we can hire more high-education people. I just want to say that if universities or research institutes can work together with industry, we can become more competitive, and international collaboration will be more prosperous. Thank you.

Tateo Arimoto

It may be a good idea to set up a website for international research centers which lists up all collaborating universities and private companies, and various technologies from hi-tech to appropriate technology.

Hugh Thaweesak Koanantakool

I think it's very interesting for Asia to form some kind of open innovation and make it large and collaborative. Although I'm pretty new to open innovation and the only book I read is Henry Chesbrough on Open Innovation, I feel that there should be a plenty of hurdles to be cleared including financing, man-power, infrastructure, and management to establish open research centers. What I am proposing is that we should develop a concept paper that will define the framework of open innovation in Asia. I am also quite impressed with the concept of precompetitive stage which Matsumi-san defined. It will be a very healthy collaboration if we make all the precompetitive stage research open. And then it's also healthy for research to step up to a competitive stage, and the competition starts. So that's the kind of thing that I'm expecting from this kind of policy dialogue. Thank you.

Norio Ohto

Dr. Naoya Abe raised the question about what the common interests or goals for the regional collaboration in science and technology should be. He also said that common interests or goals should be specific, otherwise we will lose long-time commitment. But Asia is so diverse in their histories, cultures, political systems, and development stages. I really think it difficult for Asia to develop specific common goals for regional collaboration in science and technology. So I would like to propose that the common goal for the regional collaboration in science and technology should the development of common tools including international research centers, funding mechanisms, and networks which any country in the region can use to pursue their own goals. In other words, we should develop regional public goods from which every country can benefit.

I would like to propose that we should establish several international open innovation research centers as one of the regional public goods to address common regional issues by government-academic-industry collaboration. And as a first trial, why not establish this international open research center for renewable energy research in Thailand? There are the demands of the renewable energy.

Wiwut Tanthapanichakoon

We have got two proposals from Dr. Ohto. One is to establish several international open innovation research centers in Asia to address common regional issues by government-academia-industry's collaborations. And I suppose we would all agree about this basic concept of the IOIRC. His second proposals is that as a first trial, we should consider to establish IOIRC for renewable energy research in Thailand, which is about biomass, because we heard from JST and also some other speakers that there are already ongoing research collaborations on biomass, and we can use that research collaboration as a foundation for the international open innovation research center on biomass.

Teruo Kishi

That's a very nice proposal. But to whom we propose? Stakeholders? Governments? Citizen? United Nations? Targets become very important. We have to focus when we are practically making a proposal.

Norio Ohto

We should propose to the science and technology communities of Asia and our governments.

Yoshio Matsumi

As our Thai friend suggested, we need to prepare a paper to refine a framework of Asian IOIRC. I would like suggest that we establish an IOIRC working group to prepare refined frameworks of Asia IOIRC so that we can discuss more specifically about the establishment of IOIRC at the next IPIDCSTA. There are a lot of issues to be refined by the IOIRC working group including targets of proposal, participating organizations, financing and management, research strategies, and rationales for IOIRC in Asia. So probably it may be a good idea to form the working group among the participants of IPDCSTA. Thank you.

Wiwut Tanthapanichakoon

I think it's a very good first concrete steps to move forward, since we don't have actually sufficient time for in-depth discussions about all the details and necessary ideas. I agree that we should form a working group first to work on these IOIRC issues and so on.

Mary Jane Alcedo

I would also recommend that if you're making some conceptual framework, as Dr. Kishi suggested, you have to be clear for whom and for what we are doing this. So we have to define this one very accurately in our conceptual framework. Thank you very much.

WORKSHOP II: Regional Development of Human Resources in Asia

SESSION 1 CROSS-BORDER MOVEMENT OF RESEARCHERS AND STUDENTS

Seetharam Kallidaikurichi

I used to study with Prof. Fumio Nishino in the Department of Civil Engineering of the University of Tokyo. At that time, he created an international education program and invited many Asian students to the department. People thought that the civil engineering department was not having good business or simply that they were very crazy. The program has actually produced so much contribution to the international production of human resources, and now has become a role model that many other countries are trying to replicate. When you think about studying abroad, you tend to go to the US or Europe. But I would like to emphasize that Asia had great educational systems such as Nalanda University in India where many of young people came to study. And we still have many good universities in Asia.

My second point is about Asian values of education. Education is inspirational: from the teacher to the student. It is not a bookish knowledge transfer from paper to paper. From a practical point of view, you can get all the information you want through Wi-Fi, Internet and YouTube, but real education involves the exchange of students and professors. When I talk, I use a lot of metaphors. Metaphors are like magnetism. What I mean by that is that magnetism cannot be transferred without actual physical contact. You need to have an inspirational contact. This cannot be transferred by reading a book or something.

My third point is about the goal of the cross-border movement of human resources. We have become so advanced in science and technology, and some of us have become wealthy. But yet, there are so many poor people left behind in our countries who suffer from basic needs. This is not acceptable in the 21st century. The ultimate goal of regional collaboration in science and technology and human resource development is to create tools and actual programs to address the basic needs of poor people. So we have to do something together to create a future that our young children can be very proud of, where everybody is living happily and peacefully because that is the vision Asian cultures cherish. So with these introductory remarks, let me invite Dr. Ohto as the first presenter.

Chapter 1 Facilitation of Cross-Border Movement of Human Resources

Norio Ohto

Mr. Noro prepared a preliminary report on the cross-border movement of human resources under the guidance of Prof. Shinichi Kobayashi. Unfortunately, today he is engaged in other matters and can not attend the workshop. So, I will explain to you what he studied and would like to propose. This challenge of importance of the cross-border movement of researchers and students was actually raised by Dr. Seetharam at

the last policy dialogue. That's why he sitting here as chair. And I'm going to explain why the cross-border movements of human resources are so important. It's the social creation of knowledge. You will cross borders to attend an international meeting, and at the meeting exchange ideas, information and know-how. That's the source of the creation of knowledge. The informal exchange of information and opinion is very important. And personal information becomes more and more important as the amount of information increases exponentially with the development of information technology. The physical contacts become as important as ever.

There is a famous international conference in the physics world. It's called the Solvay Conference, originally organized and sponsored by Alan Solvay. In the beginning of the 20th century, many famous professors including Einstein, Niels Bohr, and Marie Curie attended the conference and exchanged their ideas. They also had a summer school and summer seminars and they learned new theories, tried new instruments, and exchanged ideas. These contacts actually help these talented people create the great products of theoretical physics including quantum mechanics, photon theory, and nuclear fission. In the beginning of the 1930s when the Nazis grabbed power, many eminent scientists moved from the European continent to the New World. And these refugee scientists started meetings in the US. One of such gathering is the Cold Spring Harbor Laboratory Symposium. The famous Max Delbrück organized the phage research group in Cold Spring Harbor and, ever since, they have the Cold Spring Harbor Laboratory Symposium every year. The Human Genome Organization conference (HUGO) also originated from the Cold Spring Harbor Symposium. Another case involves the Gordon Conferences. They are famous for informal meetings, especially the discussion after dinner. They actually discuss unpublished data. When I was a graduate student, my professor was invited to a Gordon Conference on free radical reaction mechanisms. There, he presented my unpublished data and discussed them with his colleagues. And then he came back and said to me, "I was so down. I was attacked by everybody. They said, "Your mechanism is impossible from the point of thermal dynamics". But these kinds of exchange and criticism are very important when you create knowledge. So again, I would like to emphasize that international meetings and conferences are a source of knowledge creation.

The US and Europe try to attract talented people, and they have their own strategies and methods. US government agencies including NSF and NIH make grants to university professors, and they can hire many foreign researchers with these grants. The foreign students get a G-1 visa with the confirmation of salary in the US, and they can study in the US without difficulty. I actually got a G-1 visa and then went to the US to study. And many public and private fund sources, including the Fulbright scholarship, support traveling fees to the US. There are several Japanese foundations that support studying abroad in the US and Europe. Last April, the director of the National Science Foundation, NSF, came to Japan and he gave a speech about the activities of NSF. He

clearly said that the strength of the US is being able to collect talented people from all over the world.

What's happening in Europe? Europe has the European Research Area, a concept of an internal market for research where researchers, technology, and knowledge circulate freely. They have the Marie Curie Actions and Erasmus Program for young students to travel and study in Europe.

What's happening in Asia? There are no region-wide movement programs in Asia. There are no mechanisms that can facilitate the exchange of information and physical contact in the region. There are many exchange programs but few regional cooperation mechanisms across borders. ASEAN plans to accomplish economic integration by 2015 with the aim of facilitating the free movement of goods, services and people within the region. At present, people from seven countries other than Myanmar, Laos and Cambodia can visit one another without the need for a visa. Based on the preliminary study by Mr. Noro, I would like to propose the following.

Proposal one: Establish a regional arrangement to facilitate the cross-border movement of human resources between ASEAN and non-ASEAN countries, especially within Asia, by 2015. "Human resources" should include personnel of SMBs, NGOs, local governments and community bodies, as well universities, public research institutes and large-scale companies. The current mechanism of visa-waiver, including the APEC Business Cards and multi-entry visas to facilitate cross-border movement between ASEAN and non-ASEAN countries should be considered.

Proposal two: Establish programs to support the movement of human resources by developing networks among public funding agencies and private foundations.

Chapter 2 Comments on the Cross-Border Movement of Human Resources

Tatang Taufik

I think free human resource mobility is somewhat similar to international trade theory or rural-urban linkages. I think unless we also carry out some important improvements from international partnerships that lead to a win-win situation, human mobility enhancement may worsen some countries' brain-drain tragedy. And it happens in a country like Indonesia. Hence, it may be wise to take a step-by-step approach to this.

Secondly, my general overview is from a country's development perspective. Any attempts made through policy measures need to bring practical benefits to solve development or real-life problems faced by a country. And even with human resource development activities there are always high expectations of real socio-economic impacts, especially from our society and also politicians. In addition, human mobility is generally considered as part of human capital investment that can improve the country's future. And this is happening in Indonesia, related to brain drain. One is the emigration of highly qualified science and technology and innovation human resources from our country to outside. Recently, many people move from Indonesia to Malaysia and Singapore. A second type of the brain drain is the migration of talented people from

rural areas to large cities. And a third type is profession or occupation switching. For example, a lot of agricultural PhDs do not work in agricultural fields. They work in banks or become journalists or politicians. And then the last type of brain drain is the massive exodus from R&D organizations, including from BPPT, to other or different organizations, including to political party organizations. So these kinds of brain drain happen in Indonesia.

I would like to suggest that in order to make free mobility human resources effective, we need to focus on certain fields of the STI to be given high priority as a starting agenda. These fields include food, health, energy, the environment and so on. We also should promote the enhancement of locality uniqueness for sustainable industrial and regional competitive advantages, such as agro-based industries, herbal medicines, creative industries and so on. A second point, I think we need to enhance the balance of R&D activities and results, including from human mobility activities. So from a research perspective, STI partnerships are important not only to advance and utilize science and technology itself but also to provide for the socioeconomic impacts of R&D, including to the bottom of the pyramid of society. And then the third factor is we need to develop long-term R&D joint projects, including for science and technology human resources mobility.

Related to these three recommendations, I have the following suggestions.

First, referring to Recommendation #1, I would like to propose national single-window initiatives. These can be utilized as tools to improve and simplify access to visa services, and also to foster science, technology and innovation diaspora networks in collaborating countries. We would like highly talented people to contribute to our country's development by knowledge-based society construction. We also should build integrated regional arrangements. Unless we can improve rural conditions, people will keep coming to the large urban cities producing human mobility across the countries. People will keep going to Japan and the United States unless we can help Indonesia, Myanmar or Vietnam and other similar countries improve their ecosystems for innovation.

Referring to Recommendation #2, I think we need to make some necessary adjustments to the qualifications if we extend the coverage of profession or occupation and eligibility in the setting, such as in the APEC Engineer agreement. Last week, I talked to the Indonesian engineer association president and he mentioned that there's still no real benefit to the Indonesian engineer association from the APEC Engineer agreement so far because the qualifications required are too high. We also need to develop some sort of mutual recognition agreement on visa treatment, especially among ASEAN countries and non-ASEAN countries.

Lastly, I would refer to Recommendation #3, related to funding support. We need to develop attractive and flexible funding supports because improving the availability of funding support is good but it is not sufficient. We need to have available and accessible as well as attractive incentives to resolve professional brain drain towards brain gain.

Chapter 3 Development and Expansion of Ecotechnology

Shinichi Noyori

I'm Shinichi Noyori from the Honda Foundation. The founder of the Honda Foundation is Honda Motor Company's founder, Mr. Soichiro Honda. He said that, "Whether it be learning or technology, everything in this world is nothing more than a means to serve people. Science and technology must serve to ensure people's happiness." To make his words come true, Mr. Soichiro Honda and his young brother, Benjiro, established the Honda Foundation in 1977 using their own money. Soichiro focused on the integration of technology and ecology. The word "ecotechnology" was coined by combining "ecology" and "technology." It has been widely recognized and used in daily conversation among people for many years now. But it was originally created by the Honda Foundation about 40 years ago. Our mission is to dedicate the advancement of eco-technology, and our activities include the organization of international symposiums and workshops, and conducting awarding programs including Honda Prize and Honda YES Award.

The first international symposium was held in 1976, in Tokyo. Since then, we keep providing a place for international experts from various fields, including industry, government and academia to gather and exchange their knowledge and experience of eco-technology. In early times, symposia were held in European countries, but recently they are in the fast-growing Asia region, such as Vietnam, Thailand and India. We co-organized an international symposium in Jakarta, Indonesia last June with the cooperation of the son of the former president of Indonesia. In the same year, we also co-organized a workshop in Yangon City, Myanmar with the cooperation of Mr. Myint Wai, the chairman of the Myanmar Association of Japan Alumni.

The second pillar is the Honda Prize, which is the oldest international science and technology award in Japan. The laureates of the Honda Prize include Dr. Denis Le Bihan who made a major contribution to the development of the diffusion MRI.

This is the third pillar: Honda Young Engineer and Scientist Award. We called it the "Y-E-S" award. The project started in 2006 with the aim to strengthen mutual exchange among Japanese and other Asian future leaders in the science and technology field. The program has been introduced in Vietnam in 2006, in India in 2007, and extended to Cambodia and Laos in 2008. Actually, Dr. Le Anh Tuan, deputy director of the School of Transportation Engineering, Hanoi University of Science and Technology, Dr. David Koilpillai, professor, Department of Electric Engineering, Indian Institute of Technology in Madras, Dr. Om Romny, president of the Institute of Technology of Cambodia, and Dr. Saykhong Saynasine, vice president of National University of Laos are winners of the Honda YES award.

This award is given to undergraduate students, and grants are awarded in two stage. The basic grant of US$3,000 is provided to all awardees. Additional grants are given to those who would be attending graduate schools or interning at universities, research organizations or companies in Japan. If the duration is less than one year:

US$7,000 is granted, and if it's longer than one year: US$10,000 is provided. This system is distinguished in that the grant money not restricted to tuition but may be used for a broad range of activities. Another unique characteristic of the system is that details are set up to be flexible to each country.

Likewise, Mr. Soichiro Honda, Mr. Takeo Fujisawa, former vice president of the Honda Motor Company, created a Foundation called Sakokai that supported young Japanese science and technology researchers from 1960 to 1983. This program was organized into the YES program. Today's panelist, Dr. Teruo Kishi was one of the recipients of the Sakokai fund. Honda YES award was given to 140 students in four countries. This foundation is highly praised by the awardees, in terms of the fund itself as well as providing the chance to study in Japan.

The Honda Foundation will continue to support the development of eco-technology and encourage its wider use through our activities. We appreciate your continuous support and guidance to our Foundation. Thank you very much.

Seetharam Kallidaikurichi

Thank you very much, Mr. Noyori. We wish more success to the Honda Foundation, to do more and more in the region. I see that countries like the Philippines are not yet covered. So on that note, let me ask the next speaker, Dr. Vicente Belizario, to share his comments.

Chapter 4 Importance of cross mobility of human resources

Vicente Belizario

I strongly support this cross-mobility of human resources targeting students and researchers. It will certainly help bring the capacity of students, including young researchers, towards the development of a critical mass of researchers in health and allied health research in the various countries in the region. We would like to note that training and fellowship, mentoring with physical contact, eye-to-eye contact, should definitely lead to further advances in terms of developing that critical mass to ensure sustainable development. Institutional strengthening, of course, is an outcome that will contribute to national development in our respective countries and we hope to be able to also contribute in a major way to global discussions concerning the improvement of health policy and practice. My presentation, incidentally, is a little bit focused on health and the allied health sciences.

In the Philippine setting, we suffer from the problem of brain drain, as Mr. Tatang has described. Our national government—including our university—has come up with some measures to encourage people to come back after training. Therefore, there is provision of assistance to researchers returning from abroad. Now there are two major programs, one of which is the Balik Scientist Program—"balik" means "returning." After having spent some time overseas, the Department of Science and Technology provides support in terms of travel, a position in a reputable institution, including, of course, a

research grant, to get this person started again. At the university level we have our "Balik PhD"—again, the "returning PhD"—where we encourage overseas PhD Filipinos to return and teach in the university and do research with us.

Of course, these are not enough. We will need to look at how these measures have had an impact, and we will certainly need to expand this broad coverage of benefits for returning researchers.

Of course, it will help if we are able to assure our returning scientists, researchers and students of permanent posts, preferably research posts with some limited teaching. The reality that we experience, even in our university, is that PhDs come back and are actually overloaded with teaching, with very little time for research. Therefore, there is a need to guarantee protected time for research and scientific activity. We also wish to be able to provide our young returned scientists with tenure prior to their departure so that they are at least assured of a post when they return following training.

Now, the current undergraduate student exchange in ASEAN should involve exchange at the postgraduate level. I strongly support Dr. Ohto's proposal of regional visa requirements for visitors from outside ASEAN to support the movement of human resources from ASEAN and outside regions, specifically East Asia.

The proposed international exchange program for students and researchers is highly commendable. I do, however, have a suggestion to make: we will probably need to shortlist some themes. You know, rather than an all-out campaign for this regional cooperation touching on various themes, I will propose maybe a shortlist of two or three themes that this forum might adopt. This will provide the stage or venue for collaborative research between promising or emerging research centers in the ASEAN region, and establish research centers in Asia, including Japan.

Certainly there is a need for novel funding mechanisms, international funds from private and government sources that will provide medium-term to long-term support. For middle income countries such as the Philippines, I strongly recommend that you consider counterpart support for co-ownership of the program. This will also help sustain the program to continue capacity-building and institution-strengthening and so on.

In Southeast Asia, we are still plagued with neglected diseases. There are infectious diseases of poverty that affect the bottom of the pyramid. I call it unfinished homework or assignment because generations have actually passed this on to us, and it is our own generation now that is faced with this big challenge of controlling effectively, if not eliminating, some of these diseases. These diseases are related to poor conditions such as the lack of water, sanitation and hygiene, and education. And by education I don't only mean attending school. Education means understanding the disease process and how it can be controlled or eliminated.

Therefore, I would say that these problems are of relative urgency because I don't want the next generation after us to inherit the same problem. We now have a golden opportunity to do something about it. I agree with the chair when he says it is no longer acceptable for people in this day and age to have these diseases. To solve this problem, we need to develop tools to address these neglected diseases. Diagnostics is

a major issue for some of these neglected diseases. Some parasitic infections are so misdiagnosed in the communities and health centers that people remain sick and continue to transmit the pathogenic agents to the environment so that control is never achieved. Novel diagnostics should be developed using biotechnology. There will be a great opportunity to do health-policy-related work in disciplines such as the social sciences and health economics. We need to touch on agricultural issues. Did you know that irrigation and aqua culture could promote the transmission of some of these diseases?

I will propose that we should consider 7 metrics to put forward effective control and elimination of neglected diseases. The seven metrics include the organization of policy dialogue and technical meetings, the involvement of students and researchers in exchange, funding of research proposals, publication of research, the formulation of policies and practical guidelines based on research results, and the application of patents. These are measures that will be adopted if we have this regional collaboration, cross-border cooperation going. I would like to put stress on the policy and practical guideline formulation based on research results. This will help ensure maximum benefits. Of course, that will be a greatest leap forward. The application of these policies is the next step. But if research results such as products, patents and new evidence are incorporated into policy, then we are at least one big step toward effective control and elimination of these neglected diseases.

Seetharam Kallidaikurichi

Thank you. A major point that Dr. Belizario brought out is how to shape very good policies in developing Asia, because that creates a conducive environment for long-term action. Unfortunately, the political climate in many of developing countries is not conducive to create such a policy environment. The leaders cannot show leadership. So when leaders cannot show leadership, it is the responsibility of the academics and the researchers to demonstrate leadership through great ideas.

In the past, Asia had this great culture. The leaders always sought advice from academics and scholars, even monks. They gave them unbiased views about how to conduct the government, how to make policies, and so on. But today that is lacking. We are relying on the Internet and other secondary sources to shape policies, which is very dangerous. So I think that's a very important point that we should reflect on: how to bring policies which are conducive for long-term sustainable growth, and in that regard we should re-emphasize that we should tackle these fundamental problems and create a conducive environment that allows mutual sharing of good knowledge without prejudice. We need to actually share lessons of experience from other countries with good intent so that we create an environment that is for the future. Our next speaker is Dr. Saykhong Saynasine of the National University of Laos.

Chapter 5 Human Resources Development in Lao PDR

Saykhong Saynasine

Laos is a small country in South Asia. It's a landlocked country with a population of six and half million and a mixture of about 48 ethnic groups. Laos is one of the poorest countries in Asia, and the goal of the government is to free the country from poverty by the 2020s. At present, there are five universities providing training in engineering and other fields. There are five public teacher training colleges and about 86 private higher education colleges. The Ministry of Education is in charge of all these universities. Some universities, such as the University of Health Science, belong to other ministries. The goal of higher education is to help the government achieve its goal to graduate Laos from least developed country status by 2020. Now the government has initiated higher education reform covering both the public and private education sectors. Our immediate education policy includes the development of high quality human resources who meet the needs of the social and economic development of the nation. The higher education systems also aim to train students for all socioeconomic sectors, improve the efficiency and quality of human resource management and the teaching activity of higher education, develop higher education in a pyramid shape, and link higher education to industry and research.

The future direction for the higher education systems in Laos is to improve the quality and standard of the higher education systems so as to be prepared for regional and international integration such as the ASEAN economic integration in 2015 and the World Trade Organization. Very importantly, we try to promote the development of scientific research and technology. Recently, there are some organizations that give assistance to the ADB Project, which aims at the capacity-building of higher education in Laos. There is also a Lao-Australian scholarship program that provides scholarships to Lao students who study in Laos or abroad. JICA also provides assistance to human resource development in Laos. Our university has two projects that receive assistance from JICA.

We also send our students to study abroad, mainly for masters and PhD degrees. We receive scholarships from Vietnam, Japan, China, Thailand, Korea and other countries. I would like to point out that the AUN/SEED-Net program is very important and has been providing large benefits to our country, particularly in the engineering fields. About 60% of Lao students who graduate from foreign universities are the products of the AUN/SEED-Net program. We also send students abroad with the support of the Erasmus program of EU.

There are some problems in the human resource development in Laos. The first concerns the education systems. In Laos, the education period for primary and secondary education (from elementary school to high school) is 11 years whereas other countries have 12 years of primary and secondary education. The government of Laos is increasing the period of primary and secondary education from 11 to 12 years, and reducing the period of higher education from 5 to 4 years. Another problem is the

quality of students. We are producing many students, but in terms of quality, they are still low from the point of the socioeconomic development of Laos. The third problem is language. Laos is a France-speaking country, and students are not so good at English. When Lao students study abroad, they will have a language problem.

Seetharam Kallidaikurichi

Before we open for discussion, I'll invite Dr. Kobayashi, who has done the background study that Dr. Ohto already presented to make some additional comments.

Chapter 6 Comments on the Cross-Border Movement of Human Resources

Shinichi Kobayashi

My name is Kobayashi, Professor of University of Tsukuba. There is a famous drawing that shows the inter-relationship of feasibility, desirability and viability made by Laura Weiss. It clearly shows that innovation can appear at the intersection between technological feasibility, human desirability, and business viability. We should consider business factors, technical factors, and human factors at the same time. The key concept of this drawing is "design," which enables the three factors to be integrated. So the engine for innovation is design. I found the same kind of picture on the website of the d.school at Stanford University. This school is famous for design thinking. We need to design the inter-relationship of technology and technological feasibility, business viability, and human values when we try to create innovation. There is also the famous Olin Triangle, which shows the inter-relationship of entrepreneurship, engineering, and human aspects. Anyway, these ideas show that human values and business aspects should be combined with technology. Social and technological innovation can be achieved with the full use of not only sophisticated global knowledge and technology but also appropriate and local knowledge and technology. To do so, we should mobilize various people including people from the profit- and non-profit sectors as well as universities, public institutes, and government agencies. Real problems evolved in the 21st century are worth tackling by mobilizing all of our capacity, even if there are local and ill-structured problems. Nowadays, people often say, "Think globally, act locally," but I would like to say, "Think locally, act globally." I also think that capacity-building is critical for every country including Japan. To do so, we should encourage the exchange of younger people, including undergraduates and postdocs and so on. My last comment is that money is important. I think that the regional systems of human resource exchange should be supported by a large and stable fund.

Chapter 7 Matching Higher Educational Aspirations for the Need of Growth

OM Romny

There are three points that consider to be important for cross-cultural exchange.

That is:

Firstly, Cambodia is a member of the ASEAN country, we can understand each other even we do not speak the same languages. Historically, Cambodia, Laos and Vietnam were French speaking countries in the past and turning to use English because of the need for the communication among members. Our students are advised to learn English because we know that learning to speak English may be the best thing they can have to get a good job in all skills, and especially improve their life. But different students have different difficulties and problems in learning. They make different mistakes in pronunciation or vocabulary usage unlike students from other countries who already adapted this language.

Secondly, concerning the research, we are still lack on this. There are some institutions that start do/apply research but still limited because research may need more fund to invest including human experiences in the academic performance.

My third point is the recognition of levels. Levels performance of students are different based on where they are educated. We should recognize this difference in the levels of students because the academic requirement of some universities is very high and very strict to control the quality but it needs to improve.

We have been being involved with many networks including the AUN/SEED-Net which established under the initiative of ASEAN leaders countries and Erasmus Mundus programs is the network with link to EU. AUN/SEED-Net was implemented 10 years ago and we have been working with this network since beginning (Phase 1 and 2). The mission for the Phase 3 of AUN/SEED-Net program is to establish linkage and strengthen research collaboration between university and industry.

Chapter 8 Discussion

Seetharam Kallidaikurichi

Now we start the open discussion. Please feel free to add your add comments to the points made so far or to ask any questions or for clarifications. And at the end, I'll request Dr. Ohto to make some final remarks.

William Hong

I am from the Philippines and a recent graduate of the Tokyo Institute of Technology. Since I was an international student myself, this particular topic of cross-border movement is very relevant to me. I really feel that if you want to get a better education, the best way is to move to another country that is more developed and has better educational systems. Practically, you can only do that through scholarships. However, as Dr. Seetharam clearly mentioned, the current efforts are not really matching the scale of the need. Now we can send one, two, 20 scholars, but the real need is thousands or tens of thousands. This is my idea. Most companies are actually already off-shoring their production lines. So how about off-shoring universities? Instead of sending students to other developed countries, maybe we can send universities to those countries that need higher education.

Seetharam Kallidaikurichi

Excellent comment. Prof. Xue and then we'll come to Mr. Wai. Xue first.

Xue Jinjun

I think that we need an Asian version of the Fulbright scholarship. The Fulbright scholarship is founded by Senator Fulbright using the trade surplus of the USA. It is a very high-level, government-level exchange program. Many people have benefited from the scholarship, including me. Many Fulbright scholarship alumni become eminent scholars, business leaders and social elites in all sorts of fields. We should have the same kinds of foundations like the Fulbright or Ford foundations for two reasons. One is to promote human resource exchange, especially at the high levels. Another point is to support studies and surveys to address common issues of the region. In fact, Japan have received, and China is now receiving grants from the Ford Foundation to do surveys in Asian countries, especially China, for household surveys. Ford and Fulbright foundation has been helping China in its educational reform since 1980s. Now Chinese universities invite many very famous scholars, including Nobel Prize winners in economics, to give lectures at Beijing University and Tsinghua University. Many Japanese professors were also invited as visiting professors. They teach courses there. So this is a very good example of a universal education system. Now people are integrating economic activities in ASEAN, and we should consider the integration of regional education systems because many Asian countries have different education systems. So I may follow the idea of Dr. Ohto to suggest a foundation such as the Fulbright, an Asian Foundation for Education and Research (AFER).

Myint Wai

My name is Myint Wai. In 1825, the king of Myanmar sent 97 students abroad: 10% to India, and 90% to France, Germany, and England. That was the starting point of human resources cross-border movement done by Myanmar kings. This continued until 1945. Myanmar military students were sent to Japan for military training. It stopped for a while during the last war, but after the war, many Myanmar students have been sent again to Japan with scholarships from the Japanese government and the Myanmar government.

As Mr. Ohto mentioned, knowledge can be created by exchanging ideas. My association, the Myanmar Association of Japan Alumni, is also trying to practice the same idea in Yangon with the help of the Honda Foundation. I thank Mr. Ohto very much for showing photos of Einstein and Marie Curie and enlightening us to the fact that their knowledge was created through seminars and conferences. But I'm also worried about whether anyone is listening to our proposals. We were talking here a lot about good ideas and proposals, but who will recognize our thoughts and who will implement our ideas? I envy the Honda Foundation. Mr. Noyori says that within five years, 140 students from Vietnam, India, Cambodia and Laos were supported under the YES Award. They have their own ideas, and they don't need to propose to anyone.

But they implement it and they executed it. I welcome such an idea and such an execution and such an implementation.

Now our country is so popular and a lot of businessmen come to Myanmar and visit my association to seek contacts in Myanmar. They are very fond of doing feasibility studies and calculations. So I gave them a name: “NATO: No Action Talk Only. Let’s hope that we are not given that name.

Seetharam Kallidaikurichi

Thank you. We have four or five more people to make their comments. So Mr. Matsumi first, and then we’ll go around the table.

Yoshio Matsumi

As we all know, many Asian people have studied and learned in the United States and Europe. Are we going to continue to rely on the United States and Europe for our education and training? As we know, the US and European power will be declining relatively in economy, science, technology and education on a long-term basis. We also know that Asia will be a leading power in the world on a long-term basis. I think we Asian people will have our own self-responsibility to set a new Asian way or new Asian model in education, human resource development, and, most importantly, brain circulation in Asia. Therefore, my brief suggestion is that we should form an alliance between this international policy dialogue group and leading Asian universities to study and design new Asian ways or models for the development of talent and elites, and also education of the bottom of the pyramid, and then, of course, brain circulation in Asia. A policy recommendation could be submitted to the governments in Asia.

Tateo Arimoto

As Dr. Vicente Belizario mentioned, we need policies and practical guidelines, a so-called code of conduct, in order to ensure the maximum benefit as well as scientific integrity. In Japan, we are facing very serious difficulties, particularly after March 11 last year. Our science communities are losing the confidence of the general public. Our science communities cannot give appropriate advice to the government as well as the general public. This code involves not only education and training, but also yesterday’s subject, the funding mechanism, as well as international open innovation centers. All of these activities should have this kind of code of conduct or policies in order to maintain their integrity and provide maximum benefits and qualities.

Atsushi Sunami

Dr. Ohto talked about brain drain and brain circulation. And I’m sure you’ve heard the expression, “It’s better to have brain drain than to have brain in the drain.” If you keep your talented people in your country without giving them opportunities to explore, then those people are in the drain. I know it’s still a big problem when you are losing human resources, so in order to prevent brain drain, I would like to introduce a way of sharing education with different countries. We call it a split program for PhD education.

Instead of a student spending all of his or her time doing PhD research in a particular university, we split the PhD education into several universities in different countries. A student studies his research theme at a certain university for one year, then moves to another university in a developed country and stays there for one year, and finally comes back to his own university and receives the PhD degree. Erasmus Mundus has similar projects. Under the EMMA (Erasmus Mundus Mobility across Asia) program, students are expected to study in at least two universities.

The other recommendation I would like to make is to develop a program resembling the German scholarship, the Humboldt program. A student from a developing country comes to Germany with this scholarship and completes the highest doctoral studies there. When he goes back to his country, he is given an opportunity to come back and explore for a job in Germany after a certain number of years. So these are some of my thoughts that I would like to share with you. Thank you.

Mitsuru Suemori

The SEED-Net project is one of the success stories of the cross-border movement for researchers and students. This SEED-Net was materialized in 1999, when Asia experienced an economic crisis. Then Prime Minister Hashimoto made a proposal concerning the regional development of human resources at the ASEAN summit meeting, and later Prime Minister Obuchi continued the efforts saying, “We have to realize this project as soon as possible, because human resources, especially in the engineering field, are very necessary for economic development in the Asian region,.” In order to realize this program, the Japanese government asked Dr. Nishio, as Prof. Seetharam just mentioned, to develop a framework for the project. With his leadership the framework of SEED-Net was formulated. So I want to just say three important things. Firstly, that government initiative is very important. Secondly, the ownership of programs is very important. Finally, funding is important. SEED-Net receives funding from the ASEAN foundation as well as JICA.

Le Anh Tuan

I would like to point out that professors in SEED-Net member countries are dispatched to Japan for study. In the case of human cross-border movement, I think not only students but also professors should have the chance to visit Japanese universities or other universities within the region. That way, they will know each other and have access to up-to-date techniques or research activities. In addition to AUN/SEED-Net, I also would like to mention the SEATUC (Southeast Asia Technical University Consortium) and SEE (Sustainable Environmental Energies Forums) programs. I would be very grateful if we could integrate all such programs.

We have a special education program for top students carried out in conjunction with European universities. We would like the same kind of special program with Japanese universities.

Naoya Abe

I was also one of the beneficiaries of a Fulbright scholarship. I studied in the US, and last March, I was assigned to organize a kind of alumni event for Fulbrighters in Japan. Anyway, my point is that we may need to think about the quality of human resource movement as well as the quantity across borders. So we need to think about how to add some additional value to the exchange of human resources. I also agree with Dr. Tuan about the necessity of the movement including not only students, but also scholars and professors. Currently, our knowledge value is degrading so quickly because so many things change so easily and quickly. So even professors should study abroad for some time.

David Koilpillai

Picking up on the point that was mentioned, I think what they're saying is that we need to train the teachers. In India, in order to achieve skill, we have taken it one step further. We also exploit the distance learning part. IIT professors teach local teachers using distance learning. This is not one-way teaching—they exchange information with each other using distance learning. So face-to-face, eye-to-eye contact can also be there. So training teachers and leveraging technology will be one more way of extending the reach and expansion of skills. Thank you.

Osamu Kobayashi

I am Osamu Kobayashi from JST Singapore. I would like to make a comment from the standpoint of funding agencies. So there are a lot of systems that can support brain circulation among Asian countries. Not only among the Asian countries but, you know, all over the world. But does everyone know about such kinds of systems and programs? Most of us actually don't know all these programs. So I'd like to suggest one thing. How about making a one-stop portal site that can offer information about all these programs including the Erasmus and Marie Curie, programs, and maybe the ASEAN Foundation and thematic foundations? JST has an Asia science and technology portal site, and maybe I can talk with someone in charge of this section so that we can have some portal site of this kind.

Seetharam Kallidaikurichi

Before I hand the discussion over to Dr. Ohto, I want to leave an inspiring thought. Asian cultures use a very important metaphor of the banyan tree, the seed of which is extremely small. However, this small seed can grow into a huge tree that can last for hundreds of years. The banyan tree can grow to be very big. In fact, many academic campuses actually have a banyan tree because in earlier days the great teachers used to teach under this tree. Some will sit and maybe meditate under the tree because the tree is supposed to inspire knowledge, and we use it as a symbol of knowledge. So I feel that the inspiration for this session is to create that kind of network. I think that the exchange of professors and networking with students are long-term processes, and there's no one way to do accomplish them. There are many ways. There are so many

mechanisms. To address this challenge, we need flexible arrangements and large funding mechanisms. We need visionaries who can actually think beyond business and other political or government or national priorities. So on that note, let me hand it back to Dr. Ohto.

Norio Ohto

Essentially, we all recognize the importance of cross-border movement, and also I think we actually support the general idea of facilitating cross-border movement, although we have many good suggestions as well as concerns from the Indonesian side, such as drain brain within the region. I'll draw up a basic proposal taking all of your comments into consideration, and we can complete the proposal together. Thank you very much for the passionate discussion.

SESSION 2 ECOSYSTEM FOR ENTREPRENEURS

OM Romny

I am from the Institute of Technology of Cambodia, and co-chair of session 2 together with Dr. Dong-Pil Min. This session is focused on the ecosystem for entrepreneurship. This is very important because we teach students who will be focusing on the future of their own businesses after graduation. They will learn the basis for entrepreneurship as well as basic knowledge from universities. In a country like Cambodia, many students will be engaged with small or medium businesses after graduation. Small and medium size enterprises play a very important role in a developing country as the basis for economic growth. To start the session, I would invite Prof. Abe to say some words about the ecosystem for entrepreneurship.

Chapter 1 Incubational Activities of International Center for Social Entrepreneurship (ICSE)

Naoya Abe

I am from the Tokyo Institute of Technology (Tokyo Tech) but would like to make my presentation as a director of a non-profit organization, the International Center for Social Entrepreneurs (ICSE). I have committed to the activity of this organization since 2010 when it was established. It is quite a new organization, but has some historical background. ICSE is based on the Social Entrepreneurship Program that was conducted at Tokyo Tech from 2007 to 2010 with financial support from the Japan Society for the Promotion of Science (JSPS). Prof. Takashi Watanabe was then a professor at Tokyo Tech and led the program. When the support from JSPS ended, he decided to organize an NPO to continue the social entrepreneurship program, and invited several people, including me, to establish the ICSE. Our mission is defined as follows: to support social entrepreneurs who tackle social problems such as poverty, unemployment, or environmental disruptions based on innovative ideas regardless of nationality. Through this, we expect social entrepreneurs to contribute to the building of sustainable society.

The scope of social entrepreneurs is slightly different from those of business entrepreneurs. According to the definition by Dr. Greg Dees at Duke University, social entrepreneurs are the ones who are adapting a mission to create and sustain social values. They also recognize and relentlessly pursue new opportunities to serve that mission. They engage in a process of continuous innovation, adaptation and learning. They act boldly without being limited by the resources currently at hand, and exhibit a heightened sense of accountability to the constituencies served and the outcome created.

Annually we organize the so-called Social Innovation Plan Competition. We invite potential social entrepreneurs, who are often members of the very young generations, to present their ideas aimed at contributing to a sustainable society. We don't limit the application fields, and basically welcome any ideas as long as they try to contribute to society. We have set four criteria by which we evaluate their ideas: social impact, originality, feasibility and commitment. We have been focusing on international students and foreign workers in Japan because we believe that they have their own perspectives and a better understanding of the social issues in their home countries. Fortunately, two private companies have been supporting us, NEC and International Development Associates (IDeA), a professional consulting firm for international development. Social innovation can be defined as follows: a novel solution to a social problem that is more effective, efficient, sustainable or just than existing solutions, and for which the value created accrues primarily to society as a whole, rather than private individuals.

I want to emphasize the relationship between bottom of pyramid (BOP) business and social entrepreneurship. Yesterday, Mr. Wakabayashi from JICA talked about BOP schemes. BOP business is a new thinking in a sense and a new way of doing business in the world's poor market where so many poor people are waiting for improvement in their quality of life. If a private company can do business for them, and at the same time improve their quality of life, then that would be a win-win situation. So social entrepreneurs are actually thinking about BOP approaches as new innovative strategies to overcome poverty and save the environment.

Anyway, after my presentation, two cases of social entrepreneurial projects will be introduced by Dr. William Hong and Ms. Mary Jane Alcedo, who are our former awardees of the business competition plan.

Chapter 2　Lamps for Rent Rural Lighting Project

William Hong

I am from the Philippines and a recent graduate of Tokyo Tech under Prof. Abe. Today I'd like to share our project, a very simple startup project that I worked with during my doctorate. I call it the Lamps4Rent Project—rural lighting in the Philippines. I formed an organization called ruralenergy.org, an NGO, to administer this project. This particular project deals with the energy access problem, essentially the lighting access challenge. Lack of access to electricity is a

global issue: 1.3 billion people around the world don't have access to electricity. In the Philippines, we have a population of about 3 million people without access to electricity in distant rural areas. So this is the area that we actually implemented our project.

This is Pangan-an Island. It's near Cebu in the Philippines. It's a typical rural island in the Philippines with no direct access to the main island so people have to travel there by boat. There are about 300 households on this island. In a typical island like this, people would rely on kerosene lamps and diesel generators for some electricity and light. This particular island is actually special because in 1998, a solar power plant was installed with the help of the government to provide power for the people of the island. However, this power plant was not really appropriate for the community, and after about 10 or 12 years, the efficiency was much decreased. The people are back to their old ways: kerosene lamps and diesel generators at night. So given this social problem, we wanted to look for opportunities to solve it. This is only one of many such islands in the Philippines, so it could actually involve more islands.

The alternatives are actually kerosene lamps and diesel generators. They are costly and not friendly to the environment. We looked into a new LED technology, which is more affordable and effective, and wanted to capitalize on that.

We have developed a solution in a very simple manner: provide a lamp rental service using the existing solar plant. We would charge our lamps in the morning, because the solar panels are actually still functioning, and then we rent them out at night for people to use. They return the lamps in the daytime for recharging, and we do this on a daily basis. This creates some innovation. On a daily basis people can actually afford to pay for the rental as opposed to buying their own lamps, which are currently still very expensive. This particular system adds more income to the people there. Further, we designed the pricing so that one particular lamp can actually pay for itself over its lifecycle, which is about two years.

To develop this project required some elements. We needed a supplier. This particular technology is not available in the Philippines, so we acquired Sanyo lamps. We had funding sources, again from ICSE, and the Abe Research Group. We were very fortunate in receiving their support. We also included implementation partners: the cooperatives and technology experts from the Department of Energy. Our proposal started in 2010, while I was still working on my PhD thesis. While I was working on my PhD thesis, I acquired partnerships. In 2011, we started the project with 20 lamps. We've experienced ups and downs, but we've designed the project to grow and be self-sustaining. We are simply learning from this and looking for ways to actually expand the program. Currently, we're seeing positive results.

So as a matter of expansion, we are creating new ideas about how to capitalize on opportunities. We are looking into underwater solar lamps. The original lamps are for lighting households, and we are now looking into the possibility of using LED lights for fishery. If fishermen bring them to fishing or use in more harsh weather, then they can actually earn money from using the lights. This will be a new face of this LED light project, and we're looking into individualized or solar home systems as a recharging system.

Some lessons we learned during this exercise. We have to consider stakeholder benefits. If we do not consider the benefits for people, this project cannot actually turn out well. We have to create a practical operation policy. Reality is very different from theory, and we have had the chance to see that. One of our research interests is actually the capacity and willingness of these people. We were able to ensure that both these elements were present in the project.

Just as a final note about the ecosystem for entrepreneurs, I think that there are two kinds of approaches, top-down and bottom-up, to development. A top-down approach uses the initiatives of governments or NGO's with funding from governments or private foundations for the benefit of the lower group of the BOP pyramid. A bottom-up approach uses the grassroots-level voluntary efforts of people to make their own future and grow from there. Social entrepreneurs sit in the middle of the top and bottom part of the BOP pyramid, and that way they can have better access to the top while, at the same time, knowing more about the bottom. So just to summarize, we started with a social problem, a lack of electricity in rural communities. We can provide them with innovative solutions to address this problem. As a developmental approach, we can consider the roles of the middle of the BOP pyramid or social entrepreneurs. Thank you very much.

OM Romny

Renewable energy is very important, especially in developing countries. They really need energy for their own use in the household. To continue our discussion we would like to invite Ms. Alcedo to give presentation.

Chapter 3　Community Goat Enterprise and the Ecosystem for Entrepreneurs

Mary Jane Alcedo

I am currently connected with the Department of Agriculture, Philippine but currently on official leave for my MS study here in Japan, at Nagoya University. My business title is Community Goat Enterprise System, a business that aims to capacitate and nurture families in the rural area. The mission of this start-up business is to augment farmers' income from goat raising by capitalizing on the existing capacities and resources of people living in rural area, mobilizing and creating a community goat enterprise to serve the increasing demand of chevon in the market while developing capacity and nurturing rural social capital. The vision of this business is to see a vibrant and capable community contributing to food security and economic progress.

In Philippine rural area, livestock production is being carried out by farmers to augment their income. Livestock are raised as part of the multifunctional activities of farmers. On average, farmers have one head of carabao (water buffalo), one head of cattle, three goats, three swine, and three native chickens in their backyard. Ruminant animals are usually fed through cut-and-carry or open grazing. Researches reveal that

the potential of the ruminant industry, specifically goat industry, is high and its growth and transformation offers an opportunity for poverty reduction and food security. However, the question is whether farmers are capable of catching up the fast transformation of the ruminant industry, or generally, the livestock industry. As of this moment, small ruminant animals are still being considered by farmers as a safety net rather as a commercial enterprise. It is said that the goat industry offers high opportunity for rural poor, however the optimum potential as the main source of meat and milk has not been fully tapped yet in the Philippines. Ninety-five percent of goat production is still in backyard level and only five percent accounts for the semi- and commercial goat farms. Rural farmers have still insufficient capacity on the proper production and management of goat. As a result, high mortality rate and poor goat productivity is achieved making them earn minimal or no return of investment at all. With this kind of situation, farmers are less motivated to increase their stocks. They are already contented of having two goats on their backyard, two native goats having only 12-15kgs mature weight with roughly 6-7.5kg dress weight which explains why supply of chevon in both whole sale and retail market are insufficient and demands a high price.

Why then I choose goat for my business start up? Goat business requires small initial investment, their management is simple and goat can survive on marginal farm input. Goat can convert crop residues to human food (meat & milk) and can maintain soil fertility. They have inherent advantages, such as high fertility rates, a short gestation period, early maturity and a capacity for multiple births. Based on these merits, high return of investment will be expected.

Business market channels include the auction market, individual consumers, wholesalers, supermarkets, NGOs, LGU, government, multiplier firms and retailers. Forproduction and management, I need to maintain good hygiene and sanitation throughout the year to produce quality meat and healthy stock. Health certificates for each animal should be issued. Innovative packaging such as vacuum seal with logos will be used. Promotion through advertisement, accepting visitors for field tour in my farm and participating in agricultural trade fairs will be done. This business model can be extended to other areas during the second phase of project implementation. A small-scale processing venture can be considered for value-added products such as chevon burger and hotdogs. Canned products will be considered in the future. Likewise, consider production of processed products using goat milk including white cheese, yoghurts and other sweets. Exporting products to other countries will be considered in the future too.

In order to sustain the goat business, I, with the help of NGOs, SCUs and some government agencies, need to develop the capacity of the community members who will be my business partner because they don’t know yet the proper production and management practices in goat production. This business needs to create push-up factors that will motivate and help them produce their own livelihood. I will be coordinating with government and private agencies and NGOs for tie-ups or for technical and financial support.

I see the overall impact of this business as the following: health and existing breeds of goats in the rural area will be improved and it will contribute to food security by narrowing the gap between supply and demand. It is expected that net income will increase by 45 to 66% because goat production has a high return on investment if proper care and management practices are achieved. Likewise, this business is environment-friendly because there will be an improved agricultural waste management. Agricultural waste products from rice and crops will be given to goats as food or processed feed in the form of silage and urea-treated rice straw. The business will contribute to community job generation and at the same time, community bonding will be strengthened. Children, who also help in goat raising, can be taught of activities worth doing and farmers are expected to gain self-esteem and pride in their community.

My potential business site is in Region 1 of Luzon Island, which is considered the third top goat-producing region in the Philippines with sufficiency level of 60% only. This region has very active local government units who are very supportive in the promotion of goat production. This region harvest rice twice a year so and it has international port. These information are very important for the sustainability of this business.

In my own opinion, the ecosystem for entrepreneurs includes a stable and conducive policy environment, support from the national and local government, strong incentives to motivate rural people who engage in small and medium enterprises, and an environment that nurtures entrepreneurs who have high levels of motivation, clear vision, leadership, knowledge, and networking. Thank you very much.

Chapter 4 Innovation Ecosystem In Myanmar

Myint Wai

About 15 years ago in Myanmar I founded the Government-Employee Cooperative (GEC) whose members were government employees. When it was formed, it had only a couple of thousand members. Eventually, GEC grew to 600,000 members, and a capital investment of about US$6 million. All of the government departments worked together and made GEC a strong business organization. Before the establishment of GEC, there was no organization serving the welfare of the public sector employees. GEC was the very first organization at the time that would look after the welfare of government employees. When Yangon had a population of about 6 million, 200,000 GEC members were from Yangon alone.

The most remarkable milestones set by GEC were as follows: 25 healthcare centers across the major cities; 35 retail shopping centers and two warehouses to serve the daily needs of the members; public transportation that served not only the GEC members but also the general public. Of course, the GEC members enjoyed the concession rates for the bus fares. Two state-government-owned manufacturing factories became limited public companies, and the factory workers became equity shareholders. The first profit distribution was made at the end of the third year of operation, and the distribution for each share was approximately US$500. This was

150 times larger than the share value. GEC was started as a small organization to serve government employees, but later it has grown to a private enterprise.

How did we deliver this innovation? I would like to explain the process. GEC grew from retail centers to a public community entity through self-privatization. GEC has produced a whole new culture in which rewards and compensation go directly to hardworking hands. GEC has created a culture among not only high-ranking governmental intellectuals in different departments, but also among engineers in the manufacturing institutions. The success of GEC has created an organizational environment in which every member can enjoy creating his or her own opportunity of sharing his or her rights.

GEC was developed during the socialist era when things were managed in a true socialistic style, and the political party played a vital role in environmental factors. When you did anything, you needed pre-agreement with the authorities. Unfortunately, the systems and environment that GEC created were not permitted, and it ended after five years. GEC still exists as just an organization serving the public. The increasing market power of GEC was not welcomed at that time. But the innovative culture that GEC created is alive as an ecosystem for entrepreneurs. If you come to Myanmar, you will know that we have spirit and that there are ecosystems for entrepreneurship in Myanmar. So now the Myanmar government is welcoming every institution. We look for innovation in science and technology for the country. If you want to collaborate in science and technology in Myanmar, the Myanmar Association of Japan Alumni with its 1400 members is ready to help you. Thank you very much.

Chapter 5 Roles of universities in the innovation ecosystem

David Koilpillai

I am from the Indian Institute of Technology, Madras, and I'd like to present a perspective on the ecosystem for entrepreneurs. As described by William Hong and Mary Jane Alcedo, the first requirements for entrepreneurs are a well-defined problem and a context-relevant solution. I'd like to give you an example of that based on the IIT Madras experience.

In India, we have a very fast growing cellular phone market with more than 900 million subscriptions and about 700,000 base stations across India. India has a severe electrical power shortage. Grid power is unreliable; in some places, as few as 16 hours of grid availability a day. So cellular phone operators have to have diesel generators for their base stations. They must have air conditioners for the base stations that consume approximately 2 billion liters of diesel fuel, which accounts for 30% of the operational expenses of cellular phone operators. Diesel generators also produce carbon dioxide. On the other hand, we have abundant solar radiation. A challenge with solar power is that solar radiation varies depending on weather. As well, there is the efficiency loss when you convert from DC to AC. Taking all these factors into consideration, IIT Madras considered using solar power with DC directly, which means converting appliances to DC. Electricity from the grid costs around 5 to 6 rupees

per unit/kilowatt hour, while the cost with diesel generators is about 30 rupees per unit/kilowatt hour. But with solar energy, the cost can be as low as 7 rupees per unit/kilowatt hour. This reality opens the door for a number of entrepreneurs to come up with context-relevant solutions.

The second principle that we see is that we have to learn from others. There's a lot of knowledge outside. We need to leverage that. And for that, we traveled to the state of Massachusetts in the US. There is a very successful entrepreneur initiative called the MassChallenge. The Massachusetts Challenge involves an annual competition inviting teams from all over the world of which the best 125 are chosen. They are given space in Boston's innovation district and given a number of resources. What I would like to do is look at what resources they give. So what exactly does MassChallenge offer? It offers the essential resources for entrepreneurship. One is mentors. A second is funding. Third, there is legal advice, and fourth, facilities such as space and Internet communication. But what they are really creating with these 125 entrepreneurs in one building is a culture of entrepreneurship. There is mutual learning, a very competitive spirit, and, of course, very successful models. All of them are doing different things, but are very similar in terms of their passion. MassChallenge also offers training, which is often common, and access to media and also customers. So what MassChallenge provides is a culture of entrepreneurship, a culture of learning, and a culture of competition, and these are the essential factors for success.

We now move onto the third requirement, which is innovation for an optimized solution. There is a company called Neurosynaptic, which is dealing with remote health. In India, basically we have patients in the rural areas and doctors in the urban areas. We have a very good telecom network. This company is trying to develop medical devices that can be operated in rural areas. With this device, doctors can sit in the urban area and give diagnoses. The company has developed a number of products that are used for rural health. So what did IIT Madras provide for this company? We provided infrastructure, where they developed prototypes. We provided some basic funding and human resources who were students. We provided access to hospitals. When you want to sell a medical device, people are not ready to listen to a startup company, but they are willing to listen to a university. We have access to public and private funding, and, of course, networking with business opportunities. Also, the university has a system by which we can give legal advice as well as intellectual property rights. This company now has been selected as a Social Entrepreneur of the Year.

So in summary, success factors include a well-defined, context-relevant objective. There are some essentials that the company brings, including domain expertise, understanding of the market, mentoring, financing, and legal aspects. These are all necessary essentials. What can a university provide? We can provide manpower, infrastructure, networking, and visibility for the products developed by entrepreneurs. One surprising observation that we have made is that subsidies from the government or from other organizations are really not a requirement for success. In fact, none of the successful entrepreneurship experiments received any subsidy or grant. And, lastly, the

best practices are not domain-specific, but can be easily learned from one another and be applied towards success. Thank you.

Chapter 6 Investing on Innovations

Toshihisa Adachi

I am Chairman of the Japan Venture Capital Association at the moment. Venture capital makes investments to potential ventures or entrepreneurs so as to foster them and help them to grow globally. It's a really high-risk, high-return business. I think it very important to help potential entrepreneurs to create new industries and new employments, to energize economies. Just a week ago, the Japan Venture Association hosted the first Asia Venture Capital and Private Equity Council Meeting in Tokyo inviting representatives from seven Asian countries including Korea, China, Taiwan, Hong Kong, Singapore, India, and Japan. It is clearly obvious that venture capital and private equity business models cannot succeed in a single, closed country any longer. We must go global from day one. All of us at the conference agreed to promote cross-border projects, to nurture potential entrepreneurs in this region, and to create new industries by means of open innovation. We also agreed to invite new membership from countries such as ASEAN countries, for example, the Philippines or Indonesia, Malaysia, etc. I believe it is critical to incubate and nurture innovative business seeds from a global mindset from the beginning. With that in mind, I'd like to say again that open innovation cannot be achieved in a single, closed country; instead, it must be pursued by means of various technologies and business models. In this regard, this international policy dialogue is so critical in light of promoting something new and innovative from this region.

Innovation cannot be made in a day. Innovation is quite often arises from cultural science or humanism. The other day I heard from one of my American friends that many American software companies learned the Japanese culture called "wabi-sabi". You know the term "wabi-sabi"? It has a very deep meaning, but in short it's a taste for simplicity and quietness. Wabi-sabi. Even Apple, thanks to iPad or iPhone, learned this wabi-sabi culture from Japan to design their own products. So innovation does not necessarily mean adding totally new functions or making complicated systems. In Asia, there should be many inherent cultures from which I think we can derive potential innovative ideas. Many people think innovation should be based on brand new technologies that nobody has ever thought of before. But it doesn't. It's my opinion that innovation sometimes comes from day-to-day activities, and it should not be necessarily derived from a totally new concept. The time is right, and innovation is unlimited. So I would like our Asia VCPE Council to act as a platform to help create innovative business, ideas and new industries from this region. So let's try our best. Thank you very much.

Chapter 7 Discussion

Tateo Arimoto

I would like to listen to comments from Prof. Watanabe and Prof. Abe, because it is quite rare to pursue social innovation in the traditional Japanese university system. We need to reform such traditional university systems to allow professors to pursue entrepreneurial classes.

Takashi Watanabe

I am Takashi Watanabe, Chairman of the ICSE (International Center for Social Entrepreneurship) and Professor at the Shibaura Institute of Technology (SIT). Before I joined the Tokyo Institute of Technology (Tokyo Tech), I worked for the Development Bank of Japan for 30 years. When I joined Tokyo Tech, I was surprised by the Japanese university culture. Most professors do not change their research fields. I wanted to stimulate the university culture by introducing a social entrepreneurship program in Tokyo Tech. But grants from JSPS ended after three years of practice at Tokyo Tech, and I decided to establish a non-profit organization, the ICSE, and have been helping foreign and Japanese students develop social innovation. At first, Japanese students did not show much interest, but starting last year, they are showing their interests in social entrepreneurship in Asia. This year, groups from Tohoku University and the International University of Japan in Niigata have applied to the competition. That's a new trend. They might have been affected by the East Japan Earthquake in 2011.

Naoya Abe

I joined Tokyo Tech five years ago, and before that I worked for the government agency that Mr. Suemori is now working for. When I joined Tokyo Tech, I felt that I could not change the university culture by myself. However, I wanted to provide my students with some sorts of opportunities that would allow them to exercise their innovative ideas, and meet various people including senior experts, businessmen, and people from NPOs who were not part of the campus. I think that engineers need to meet various people. If they only work with engineers, they become very narrow minded. I believe that Tokyo Tech is one of the leading engineering schools, but I wanted my students to be different from typical engineers. That's how I joined the ICSE.

Yoshio Matsumi

This is just a comment. When we want to improve the ecosystem for entrepreneurs, we have to focus on at least six systemic failures that need to be improved step by step. The first is how to improve society, to motivate people to be entrepreneurs, and not just laborers. The second problem is how to improve skill. Dr. David Koilpillai mentioned about learning a culture in society. The third point is to strengthen the networking among young entrepreneurs and mentors, and then also

senior businessmen. The fourth element is to foster creative, innovative cultures. The fifth is to handle the value of depth of innovations. To some extent, I think it has something to do with the funding system because classical banking systems are not proper for startup companies. Finally, the last is how to improve public services in the community to foster entrepreneurship. Thank you.

Toshihisa Adachi

When we talk about a large-size project such as international open innovation research centers, this idea of entrepreneurship is so important to Asian development. Therefore, human resources development discussions should obviously include entrepreneurship education. In fact, Nanyang University in Singapore has a class teaching entrepreneurship. We also need powerful venture capital with (1) large funds; (2) capability of follow-up investment; (3) capability and a network for international syndicate investment. It's very difficult to have that kind of large venture capital fund. There is none in Japan to my knowledge, although Temasek maybe an equivalent. Therefore, I always wonder whether it is realistic or unrealistic for Japanese and Asian companies—in the private sector of course—to jointly form a large venture capital group so that we can have more active, successful, dynamic ventures in Asia. Thank you.

Participant

Just a suggestion. I would hope that social entrepreneurship would certainly certify the quality of any of solutions and interventions. Safety is very important because we bring this to communities with people as end users. Is the technology, the innovation that we're introducing safe for people? And last but not least, the acceptability of the solutions, you know? We enter into a local community with a new technology, and the local people have their own knowledge, attitudes and practices. If we understand the local culture, knowledge, attitudes and practices, innovation will be more easily acceptable and it can produce maximum benefit.

Teruo Kishi

In the field of science and technology in Japan, we have big issues. The first is the activity of universities, which has been discussed by Dr. Arimoto and Dr. Watanabe. The Japanese university ranking is going down every year. Some people do not believe the meaning of university ranking, but the ranking is important. There exist five rankings in the world, and the rankings of Japanese universities are going down in all 5 measures. A second issue is innovation. People emphasize its importance, but I think that university ranking and innovation are linked, and we forget the linkage. We should consider a merger of university activities and innovation issues.

Dong-Pil Min

I would like to make one comment concerning Dr. Kishi's comments. Japan is considered to be a productive country for Nobel laureates. You have won many Nobel

Prizes. That means we must think differently about the relationship between academism and innovation issues. I think we have different views in our research activities. Collaboration is weaker than competition, but competition in research activities is quite important. On the other hand, we need some kind of collaboration for innovation. Yesterday there was one question on the meaning of “open” in “open innovation.” While listening to that question, I thought that “open” means open to participation, because if we are not open, then nobody can participate in our movement. But participants also need to share common objectives. What is our objective? What aims do we have? So sharing objectives is quite important when we discuss open innovation. So I think we must share among Asian countries the objectives of an Asian research foundation that we are going to create. And the objectives must include basic research or some kind of acquisition of new knowledge as well as the reduction of the gap of wealth among Asian countries. So these are probably objectives that we should pursue.

And today, we heard very nice examples of innovation. I would like to tell you just one example that I heard at the beginning of this week from my Canadian colleague. They had some kind of idea competition, and one African PhD student raised an idea of catching mosquitoes in dirty socks. He came up with the idea when he saw kids playing in the ground. During play, they pulled off their socks and put them in a box. Later they found that there were a lot of mosquitoes in the box. He thought that that way, he can collect mosquitoes and kill them before they bite people. He won $100,000 with this idea. The idea can be put into practice by inventing some machine that can collect and kill mosquitoes. The Bill & Melinda Gates Foundation might support the business of manufacturing hundreds of machines. So this kind of example suggests to me that we don’t have to use high level research to address local problems. I was very much touched by the talk this morning by Prof. Kobayashi in which he was emphasizing the importance of appropriate technology. I was also touched by Prof. Abe and his students with their ideas to address local problems. I hope that this kind of trial will provide good examples for the future innovation.

INTERNATIONAL POLICY DIALOGUE 2012
International Symposium on Ecosystems for Regional Innovation in Asia
October 20, 2012

Welcoming Remarks
Osamu Karatsu

Your excellency, distinguished speakers, ladies and gentlemen, on behalf of the hosting committee of this symposium, I'd like to make an opening address. My name is Karatsu, Chairman of the Takeda Foundation. I would like to thank you for sparing your time to join us here at this international symposium on "Ecosystem for Regional Innovation in Asia." Takeda Foundation has set up a committee for strategy in science and technology to facilitate cross-sectional discussion on international collaboration in science and technology inviting various policy experts from public science and technology institutions, international cooperation organizations, private nonprofit sector institutions, and universities. We make policy recommendations to governments concerning Asia-Japan science and technology collaboration as well as organize events, such as international symposiums designed to promote the public's understanding of science and technology collaboration in this region.

As a part of this effort, we organized the International Policy Dialogue on regional collaboration in science and technology in Asia last year with a grant from the Strategic Funds for the Promotion of Science and Technology from MEXT. Participants in the last year's policy dialogue discussed various subjects including the cross-border movement of human resources, new mechanisms to support regional joint research, and infrastructure for international joint research. The participants all agreed as to the importance of the regional collaboration in science and technology in Asia, and decided to continue the discussion on human resource development, and new mechanisms and infrastructure to support regional collaborative research. Thanks to MEXT, we could organize the second international policy dialogue on collaboration in science and technology this year, and yesterday and this morning, we discussed various subjects including regional collaborative initiatives, novel funding mechanisms for regional innovation in Asia, international open innovation research centers, cross-border movement of researchers and students, and an ecosystem for entrepreneurs. This year, representatives of 12 science and technology communities in Asia participated in the workshops, and after intensive discussion, all participants agreed to support the general ideas of facilitating the cross-border movement of human resources, the development of new funding mechanisms and networks of funding agencies and private charitable foundations, and the creation of international open innovation research centers in Asia. The content of the discussion will be compiled as a policy proposal and submitted to governments and relevant institutions in Asia.

In order to make the collaboration more beneficial for the region, we should not end the discussion just within the science and technology community but instead should reach out to the general public so as to build social consensus. Therefore, we decided to organize this symposium as a venue to introduce our International Policy Dialogue discussion and at the same time receive feedback from all of you. Today, leading members from the Asian science and technology community will talk about the significance of regional collaboration, and the roles of Japan and Asia, amongst other topics. During the panel discussion, the subjects addressed at the international workshops will be introduced too.

Opening remarks will be given by Mr. Shin Maruo, Ambassador for science and technology cooperation of the Ministry of Foreign Affairs, and Dr. Michiharu Nakamura, President of Japan Science and Technology Agency. After the opening remarks, Dr. Teruo Kishi, Advisor to the National Institute for Materials Science will give the keynote speech. We also have invited speakers, Director General Aung Kyaw Myat of the Myanmar Ministry of Science and Technology, President Thaweesak of the National Science and Technology Development Agency of Thailand, and Chairman Hiroyuki Watanabe of ITS Japan.

I would like to express my special gratitude to the speakers for sharing their precious time for this international symposium. This International Policy Dialogue is funded by MEXT Strategic Funds for the Promotion of Science and Technology and is supported by MEXT, METI, MOFA and the Cabinet Office. I'd like to take this opportunity to thank the ministries and Cabinet Office for their support.

I sincerely hope you will stay with us till the end and enjoy this symposium on "Ecosystem for Regional Innovation in Asia." Thank you.

Opening Remarks 1

Shin Maruo

I'm very grateful for having been invited to "International Symposium on Ecosystem for Regional Innovation in Asia." I'd like to take this moment to express my heartfelt greeting.

The first International Policy Dialogue, last December, led to today's symposium, where we have prominent participants including President Michiharu Nakamura of the Japan Science and Technology Agency, Prof. Teruo Kishi, advisor to the National Institute for Materials Science, Dr. Aung Kyaw Myat, Director General, Ministry of Science and Technology in Myanmar, Dr. Thaweesak, President of the National Science and Technology Development Agency of Thailand, and Dr. Hiroyuki Watanabe, Chairman of Intelligent Transportation Systems. They gather here to discuss how to allocate international joint research funding, how to build research hubs and how we can develop and share regional human resources to innovate this Asian region. The dialogue among all of you today will help deepen understanding of the importance of scientific collaboration in Asian region, including Japan.

Regional partnership in science and technology in Asia is a critical theme in terms

of not only the growth of Japan but also the sustainable development of Asia. It is more important when we try to address issues of global scale. Therefore, I do express my deep respect for the insight to plan such a timely symposium.

Now I would like to introduce what the Ministry for Foreign Affairs of Japan has done in this field. Japan has the highest standard of science and technology, based on which we are promoting exchanges with foreign countries to solve global challenges, such as sustainable growth, climate change, disaster prevention, infection control and energy, and water and food problems. We try to develop diplomacy to advance science and technology on both national and international levels. The Ministry for Foreign Affairs leads these efforts. Bilaterally, we have signed science and technology cooperation agreements with 46 countries including Vietnam, Indonesia, India, China, Australia and New Zealand. Intergovernmental committee meetings are also organized to facilitate joint research and exchanges of researchers. Under the cooperation agreements, joint committee meetings were held in two to three year's interval. We had the meeting with Vietnam last year, and this year several countries including China. We also promote science and technology for diplomacy as well. Japan's sophisticated science and technology is leveraged as a diplomatic tool for Japan to contribute to the international community. To this end, since 2008, we started SATREPS (Science and Technology Research Partnership for Sustainable Development) to use Japan's advance science and technologies to help developing countries tackle issues such as environment, energy, disaster mitigation and infection control. This is jointly implemented by JICA and JST.

As a diplomatic tool, what ultimately matters is people. The Ministry for Foreign Affairs is working with local embassies and consulates to send talented scientists and researchers overseas, have them give lectures and work with local people to enhance our brand image of Japan being the country with first-class science and technologies. Last year, we dispatched Japanese experts in space science and earth observation to Singapore and Indonesia. We are planning to send our specialists in disaster prevention to Malaysia and Thailand this year. Japan's administration adopted the 4th Science and Technology Basic Plan last August, which clearly states that we recognize the need to build mutually beneficial relationship with the Asian region by playing active roles to resolve common issues, such as energy, food, water, disaster prevention, and infection control. We shall initiate new work to strengthen scientific and technological cooperation with Asian countries. Our world is rapidly becoming globalized. It is therefore imperative to have an effective regional partnership to attempt together to overcome our common challenges, such as brain drain to Western countries, the undeveloped environment for research and development, natural disasters and energy shortages. However, the gap in scientific development that used to exist between Japan and Asian countries is closing. Now, we are happy to have equal partnership with some countries. One quality measure of academic papers is the number of citation. In this measure, China, South Korea and India are growing rapidly. These changes we see here indicate new opportunities for us to build mutually-beneficial relationships.

The Ministry for Foreign Affairs takes part in overseas project. With South Korea,

we are engaged in the international thermonuclear experimental reactor (ITER). We promote the East Asia Science and Innovation Area initiative with relevant ministries. On July 12 of this year, the East Asia Summit of foreign ministers was held and Mr. Gemba, Minister for Foreign Affairs, called upon participating ministers to promote this initiative designed to encourage exchanges in science and technology in the East Asian region. The history of Asian partnership in this field of science and technologies is still relatively short. The concept of partnership, as far as policy tools are concerned, is very much a work in progress. I hope today's discussion will help bear the fruit of Asian regional partnership.

Lastly, before I conclude I would like to thank the Takeda Foundation for supporting this symposium as the secretariat. Thank you very much.

Opening Remarks 2

Michiharu Nakamura

Ladies and gentlemen, I'm Michiharu Nakamura, President of the Japan Science and Technology Agency. It is my great pleasure to participate in "International Symposium on Ecosystem for Regional Innovation in Asia" and make opening remarks. First of all, I'd like to express my sincere gratitude to those who came all the way from abroad, and to the Takeda Foundation and all who have worked hard to open this significant symposium.

Science makes rapid progress day by day. It's amazing. It expands the horizon of knowledge and contributes to the welfare and wellbeing of society. Science is a power of the nation, and also valuable asset of all humanity. Our future depends on science. However, it's also true that scientific knowledge alone does not necessarily create desired societal or economic values. Many global issues that are difficult to resolve on a national basis still remain unresolved. Among these issues are climate change, aging societies, infectious diseases, food and water shortages and poverty. Japan has also been suffering from a long-term stagnation. These issues have strongly forced us to transform the science and technology policy to an issue-driven innovation policy.

In the 4th Science and Technology Basic Plan of Japan that started in August 20 of 2011, we aim for sustainable growth and revitalization by focusing on the creation of innovation. The basic plan addresses the promotion of green innovation, life innovation and reconstruction from the Great East Japan Earthquake as basic principles.

In order to resolve global issues, in particular, the innovation ecosystem should work effectively through international collaboration. Collaborative activities to tackle regionally common issues in Asia are therefore one of the prioritized action items in the Science and Technology Basic Plan of Japan. To do so, Japan is working on the promotion of joint R&D activities under the initiative of the East Asia Science and Innovation Area (e-ASIA), emphasizing the development of human resources and brain circulation.

Innovation takes place through the integrated effort of all necessary stakeholders.

A resonant movement is necessary among them. JST, one of three major funding agencies in Japan, was established to bridge the gap between academia and society almost a half a century ago. It also has related activities, such as the dissemination of science and technology information, and the support of scientific education and science communication. We are transforming to play a role such as a producer in the global innovation ecosystem. It is our desire.

In addition to bilateral joint R&D projects, JST has started SATREPS since 2008 by collaborating with JICA. Also, we have developed an e-ASIA Joint Research Program, e-ASIA JRP since June of this year. We promote multilateral joint research activities in the research areas agreed among member countries.

The Takeda Foundation has made a great contribution to the initiative of East Asia Science and Innovation Area through policy recommendation and symposium. I'd like to express my appreciation for their contribution. In addition, the Takeda Foundation has started activities of for International Policy Dialogue since last year and we are joining the second symposium today. I'm really excited to listen to the discussion on "Ecosystem for Regional Innovation in Asia" today. I sincerely wish for active discussion and fruitful outcomes of today's symposium. Japan will perform the best of its ability to create innovation in the Asian region. We'd like to ask your cooperation in all related partners. I thank you again to be here on the outstanding occasion.

Keynote Speech

Teruo Kishi

I am the head of the Advisory Committee of the international policy dialogue, and I'm wondering if I should be speaking as an insider or outsider. But allow me to talk to you about my experience. I'm an honorable advisor to the National Institute for Materials Science, NIMS, and at the same time program director of JST where Prof. Nakamura is President. Let me tell you that once you retire, you have a number of titles that you carry with you. I'm traveling here and there all the time assuming different responsibilities.

We organized the first international policy dialogue last year, and this is the second policy dialogue. Based on my experience, I'm amazed to see that we were able to focus our attention on specific issues within just one year. Such substantive discussions yesterday and this morning are what has really struck me. Now, I would like to present to you some of the discussions that have taken place yesterday and this morning. We organized the international workshops yesterday and this morning, and discussed regional development of human resources including the ecosystem for entrepreneurs, funding for regional collaborative research, and sharing infrastructure for regional collaborative research. The purpose of this regional collaboration in science and technology is the creation of regional public goods that Asian countries can freely utilize to address common problems of the region. What is most difficult when we talk about international collaboration is the sharing of information. There are various research and exchange programs, research funds including public and private

sectors, and great deal of many infrastructures that we can share in this region, but most of us don't know about them. Most of us don't know the various needs of other countries either. One of the conclusions of the international workshops is that we create and share open networks for all these information. Another conclusion is to work on the creation of international open innovation research centers, a type of hard infrastructure for the regional public goods. We believe that the networking of all necessary information, utilization of various programs, and development of open innovation research centers will create an ecosystem for regional innovation.

Today, I'd like to introduce Japan's basic policy on science and technology, and review Japan's international strategy in this field. Plan-Do-See is a very important cycle when we discuss performance of science and technology activities. The Council for Science and Technology Policy is in charge of planning (Plan) of Japan's basic policy on science and technology. Japan's basic policy on science and technology is formulated as science and technology basic plan. The first Science and Technology Basic Plan (the Basic Plan) was formulated in 1995, and after that the Basic plan has been renewed in every five years. The former Basic Plan, the 3rd Basic Plan, was in force from 2006 to 2010, and it placed high priorities on life science, ICT, environment, and nanotechnology. It also promoted four areas: energy, manufacturing technology, social infrastructure and frontier. But there has been a major change in the current Basic Plan, the 4th Basic Plan which started in 2011. The past Basic Plans were discipline-oriented; in other words, the focus was placed on various elements of technology. But in the 4th Basic Plan, an issue-driven approach is taken. In other words, the focus is placed on the solution to actual problems instead of improvement and innovation in certain technological areas. We need to keep an eye on industry and try to bring back research results to industries to help them solve actual problems. Now, the integration of science, technology and innovation becomes very important, and STI (science, technology, and innovation) becomes a very important keyword. However, if we overemphasize the "issue-driven" approach, people might overlook basic research and become worried about basic research. The current Basic Plan also emphasizes the importance of basic research as well.

In Japan there are different types of science and technologies, various scientific approaches, and various institutions. The current Basic Plan also involves the reform of all these research systems as its grand challenge. This is my personal opinion, but what is most important in research system reform is how we create melting pots in the research. How can we create a place where different mentalities, different genders, and different generations can get together to create new ideas? If competitors in different companies, researchers from both academia and industry, and scientists from different cultures can get together, there is a high possibility of producing new values. A very important ingredient of the melting pot is internationality. Some government authorities say that there should be 20% or more foreign researchers in universities and public research institutes. Open research centers can be a very good model for melting pot. In this context, the development of international open innovation research centers as discussed at the workshop shows a very important direction in producing new values.

Actually, in the research areas where expensive tools and facilities are required for experiments, the development of Centers of Excellence (COE) has been proposed as a platform where researchers from both universities and public research institutions can work together. We also need to involve more industries in carrying out the research. Forming a consortium among academia and industry can be another challenge. The involvement of more foreign researchers, forming consortium among academia and industry, and forming networks among public and private research institutes and universities are three major challenges.

The key principles of Japan's basic policy are strengthening R&D systems by being integrated with excellent research sources of the world, using outcomes of R&D for foreign countries, and strengthening the government systems to promote international cooperation. The goals and specific efforts should be building a R&D system integrated with world vitality, promoting R&D activities to resolve common issues in Asia, and developing cooperation for innovation beyond research cooperation.

Thus, international cooperation occupies a very important parts of Japan's basic policy on science and technology. Now, I am going to explain about important sources for Japan's R&D activities. Two-thirds of the science and technology budget for public institutions is provided by MEXT, and about a quarter of the budget is provided by METI. All together, about 80% of the S&T budget is provided by these two ministries. The S&T budget is delivered to institutions and scientists by three major funding agencies, JST, JSPS, and NEDO. JSPS and JST are under MEXT, and NEDO is under METI. Activities concerning human resources development and exchanges are promoted by JSPS (Japan Society for the Promotion of Science). JSPS supports joint research and seminars. It also provides international training opportunities. Students of foreign universities and graduate schools are often invited by JSPS. It also sends young Japanese researchers overseas. Recently, JSPS is supporting university internationalization. Although JSPS supports some international joint research, the major joint research is supported by JST, the Japan Science and Technology Agency. One of the very important international research projects is the Science and Technology Research Partnership for Sustainable Development, in short "SATREPS." This program is supported by both MOFA (the Ministry of Foreign Affairs) through JICA and MEXT through JST. MOFA supports foreign researchers engaged in joint research through ODA (official development aid) in the name of technical cooperation. MEXT supports Japanese researchers engaged in the joint research with developing countries. SATREPS is already well known across the world. The SATREPS research area involves the environment and energy, bioresource utilization, natural disaster prevention as well as infectious diseases control. Currently, STREPS supports 66 projects in 34 different countries in Asia, Africa, and South America. Actual research themes include energy, environment and low-carbon society.

The second pillar of this internationalization project is SICP (Strategic International Cooperative Program). In the case of SICP, the respective funding agencies adopt research topics and start implementing research exchange. JST and counterpart funding agencies write an agreement. This too is an official agreement that follows the

intergovernmental agreement. There are already 177 ongoing projects in 22 countries and one region. “One region” means either Hong Kong or Taiwan.

We also have another pillar, SICORP (Strategic International Collaborative Research Program), which was established in 2009. In the case of SICORP projects, partnering countries try to select and adopt the topic for research from the proposal stage. In SICORP, the scales of the projects are larger than in the SICP program. Currently, 14 joint research studies are underway in three countries and one region. “One region” in this case is the EU. SICIRP projects include the ICT project with France, a nanoelectronics project with Germany, superconductivity and rare metal projects with the EU, and a metabolomics project with USA. We are trying to start epigenetics research project with Canada and we have just written an agreement on energy and environment research with China. About 20 projects will be implemented in total.

Another important program is e-ASIA JRP (East Asian Science & Innovation Area Joint Research Program). A special feature of e-ASIA JRP is that it promotes multilateral joint research with foreign countries. At least three countries should write an agreement to start up a project, and each member provides the same amount of financial support necessary for one research team. Of course, we are going to introduce a little bit of flexibility using the percentage of GDP or GDP per capita to make the contribution equivalent. Nanotech, infectious diseases, biomass, disaster prevention are some of the themes selected for this program. e-ASIA JRP involves many Asian countries including Japan, Thailand, Vietnam, Myanmar, Indonesia, Philippines, Malaysia, and USA. Russia is also invited. But basically Japan and ASEAN countries are going to be global partners to promote this project. We are still waiting for three other ASEAN countries to write letters of intent to participate. We want to expand the scope eventually to 18 different countries. We already have had a pilot call and three themes of research are going to start soon. NIMS, NANOTEC from NSTDA Thailand, and IMS and VAST from Vietnam are going to work on research of corrosion mapping. NIMS, MTEC of NSTDA, and IMS are going to work on a bio-sensor project. Riken from Japan, Mahidol University from Thailand, and IAG from Vietnam are going to work on biomass projects.

NEDO, New Energy and Industrial Technology Development Organization, is also a funding agency under METI promoting joint research projects with Asia. NEDO basically provides research funds to the private sector. NEDO supports energy and environment related research with Cambodia, Myanmar and Vietnam, and the smart community research with Malaysia and Indonesia. NEDO also supports an urban solution project with Singapore, an energy conservation project with Thailand, and renewable energy projects with Lao and the Philippines. NEDO also has extended relations with the US and European countries.

As for sharing large and high functional facilities, Japan has a great deal of excellent research infrastructure including Spring-8, X-ray Free Electron Laser, the world fastest K computer, J-PARK (Japan Proton Accelerator Research Complex), and HFLSM (High Field Laboratory for Superconductivity Materials). All of these facilities will be available and open to Asian research institutions.

Now, let me talk about our consortiums with the private sector. The largest example is TIA (Tsukuba Innovation Arena). Tsukuba is located 60 kilometers northeast of Tokyo. We have 12,000 PhD doctors and researchers there. The real intention of this initiative is to invigorate the electronics industry which has not been doing well. TIA is an industry-academia joint project and involves Tsukuba University, AIST, NIMS, recently KEK (High Energy Research Institute), and Keidanren, the major association representing the whole industry. However, in reality, AIST leads the initiative. Three years ago, Tsukuba University, AIST, NIMS, and Keidanren wrote an agreement on TIA. I was the chairman of the executive board of TIA then. Later KEK joined TIA. The core research themes include nanoelectronics, power electronics, MEMS, carbon nanotubes, nano-green and nano-material safety. As you can see, nanotechnology represent major part of the research. People tend to think that nanotechnology is directly related to the manufacturing industry, but in reality it is also related to the life sciences. There are three major components to the TIA infrastructuress. They include a nanodevice research foundry, extensive clean rooms with a space of several hundred square meters, and a graduate school for nanotechnology which will be the first graduate school devoted to nanotechnology research and education. The Japanese government has already invested ¥67 billion on TIA, and about 500 researchers from industry and 130 graduate students are conducting research at TIA. TIA is aiming to be a place for open innovation. Open means international too, and I would like Asian researchers and students to pay attention to TIA as an international open innovation research center.

Another major consortium is the Four University Academic Consortium of Nano and Micro fabrication in Kawasaki which will formally open this November. The four universities include Keio University, Waseda University, University of Tokyo and Tokyo Institute of Technology. They share clean rooms and educate students in this consortium. This consortium is going to be open to Asian researchers, and one of the big advantages is the location of the facility which is only a 30-minute drive from Haneda Airport.

Japan also leads several research networks including ANF (Asia Nano Forum) and J-GRID (Japan Initiative for Global Research Network on Infectious Diseases). International Policy Dialogue is also our region-wide network. All of you gathered here are engaged in a policy dialogue that encompasses all of the science and technology and research fields. This is going to be the network that carries even more significance in the future.

Lastly, I would like to talk about science diplomacy. 2008 was a great year for science diplomacy. Japan hosted many major diplomatic meetings including TICAD IV, the G8 Ministerial-Level Meeting on Science and Technology, the Hokkaido Toyako Summit, the ASEAN Ministerial Consultation on S&T, and the Japan-Africa Science and Technology Ministers' Meeting. What is important in science diplomacy is how we create a system of science and technology diplomacy that will mutually benefit Japan and its partners. As for Japan, it needs to strengthen its global presence by promoting international scientific cooperation. We should also place stress on human resource development in the region. This international policy dialogue is also a part of Japan's

science diplomacy, and we are expected to play critical roles. In this context, I would like to put stress on the establishment of regional public goods that include open research centers in Asia by sharing information with institutional and individual human networks, reforming international funding systems, and facilitating brain circulation in Asia.

Invited Speech Current Status of Engineering Education in Myanmar

Aung Kyaw Myat

Thank you very much for allowing me to give a brief discussion in the symposium. I would like to express my gratitude to the Takeda Foundation and other co-organizer foundations for inviting me to this symposium. For more than two decades, Myanmar has been taking several steps in putting forward comprehensive initiatives towards economic and social reform. Right after the introduction of a market economy in 1988, various efforts in economic and political levels boosted foreign investment and private sector involvement in the country. However, the legacy of isolation and the sanctions from the US and European countries undercut the progress towards realizing the country's fullest potentials. Before 2011 is a transition period. From 1996 to 2011, the former government set up new technological universities and computer universities in the regional development zones all over the country. At the time quantity-oriented production of engineers and technicians took place according to the national demand. Unfortunately, the engineers and technicians produced haven't received enough education including laboratory training. The level of engineering education was not high at the time. Based on this experience, now we are laying down the future plan and innovative policy sector with the participation of all relevant organizations.

The Ministry of Science and Technology, MOST, was established in 1996. MOST carries out the development of science and technology sector with a goal toward upgrading industrialization for the enhancement of national economic development. The main tasks of the Ministry of Science and Technology include the development of human resources in engineering and the computer education sector and conducting research and developments beneficial to all kinds of industries of our nation. The Department of Atomic Energy is under MOST, and MOST supports research for the development of nuclear technology for the health and social welfare sector. MOST has nine departments including the Department of Technical and Vocational Education (DTVE) and the Department of Advanced Science and Technology (DAST) of which I am in charge. Both departments have a responsibility for human resources development. Under these departments, we have technological universities, universities of computer sciences, technical institutes, technical high schools and other training schools. We are also are setting up the National Analytical Laboratory. The rest of the departments are responsible for research and development.

From 1996 to 2006 under the former administration, we set up the Mandalay Technological University in Mandalay, which is the same level as the Rangoon Institute

of Technology, and opened special engineering training courses to produce teaching staff for the technological universities and computer universities. During this period, the special engineering training course alone produced nearly 1,000 teaching staff who hold bachelors, masters and PhD degrees. In total all technological and computer universities held 7215 teaching staff up to 2011. Out of 7215 teaching staff, 804 hold Ph.D degrees, 1842 hold Master degrees, 1996 hold Bachelor degrees, and the rest of them hold other diplomas. Up to 2011, they educated 278, 937 graduates at technological and computer universities. Out of 278,937 graduates, 1410 hold Ph.D degrees, 9099 hold Master degrees, 107,573 hold Bachelor degrees, and the rest of them hold other diplomas. You may ask why Myanmar has not been doing well in spite of all these engineers and scientists. It's not easy to answer this question, because we have no collected data for the feedback of the graduates from university. We are now trying to collect data and as far as I know, significant numbers of the bachelor and master degree holders are gone to foreign countries. We haven't confirmed this yet, but probably they are gone to Singapore, Malaysia, or Australia. Now we have changed the former human resource development strategy of quantity-oriented to quality-oriented one. Now we would like to produce high-quality professionals for our country.

The reform strategy includes the establishment of centers of excellence by selecting some universities to meet the international standards in engineering education, the provision of financial and physical supports including tools and equipment to the higher education sector, conducting special research projects in collaboration with industry, and changing the academic education programs of the higher education sectors. Yangon Technological University (YTU), Mandalay Technology University (MTU), the University of Computer Studies, Yangon (UCSY), and the University of Computer Studies, Mandalay (UCSM) have been selected as centers of excellence, and they educate graduate students. After completion of the Bachelor degree, students can take the matriculation examination to go to graduate schools. Students who scores higher than 450 points at the exam can apply for the COE, and students who pass the exam but score below 450 can apply for ordinary technical universities. In March 2012, 500 students scored higher than 450 points and 250 enrolled in YTU while the remainder enrolled in MTU.

The reform strategy has four five-year plans: the First five-year plan from 2011 to 2015; the Second plan of 2016 to 2020; the Third plan of 2021 to 2025; the Fourth plan of 2026 to 2030. Goals of the reform plans are set so that the selected center of excellence, such as YTU, MTU, UCSY, and UCSM will reach the ASEAN level at the end of 2020, and the international level at the end of 2030. Simultaneously, other universities and computer universities will be upgraded in their infrastructures, teaching facilities, laboratory facilities within the first and the second five-year plans. Some upgraded technological and computer universities will be selected as COE.

MOST will try its best to implement the new plan and program for upgrading the status of engineering and computer education system. MOST has responsibility not only in the human resources development but also in conducting fruitful research projects that are needed to uplift the nation's economy. Hands in hands among the

research departments, we believe that the reform strategy and plan can be successfully launched through the assistance of all friendship organizations from the inside the country and also from abroad.

Invited Speech ITS for Sustainable Development – Innovation from Asian Perspective-

Hiroyuki Watanabe

There is no need to say vehicles and cars extend our ability to move and travel, thus supporting the development of our industries. One statistic tells that GDP per capita of all countries is proportional to the driving millage of passengers. In other words, US, Europe, Asia, Africa, wherever you are, the longer distance you drive, the richer you get. In the 1960s, Japan had experience exponential economic growth which eventually led to a stable growth phase, and mow stagnation. However, during that time, we experienced various problems including environment, traffic safety and efficiency of fuel, and we decided to improve our infrastructure, and improve vehicle technologies.

In 1996, we started an overall vision of ITS. ITS (intellectual transportation system) is an initiative to build safer, smoother, more comfortable, and environmentally friendly traffic conditions using computers, electronics, and advanced sensing technologies. ITS has nine targeted applications including car-navigation, electronic toll collection system (ETC), advanced highway safety system, traffic control, administration of road management, public transport management, commercial vehicle operations, and emergency vehicle management. ITS has brought significant advancement in all areas. Now VICS can visualize traffic congestion information on the screen in real time, and almost 40 million vehicles are equipped with ETC in Japan.

As for traffic accidents, significant number of people died due to traffic accident in 1970s. Especially in 1970, 16,000 people died in traffic accidents. At that time, it was referred to as “traffic war.” Japan decided to reduce the number of traffic accidents by introducing new traffic regulations, improving road infrastructure, and educating children. The number of traffic accident death was significantly reduced after the introduction of these measures, but as time went on, the number gradually increased again from the late 70s to the early 90s. Then Japan introduced ITS and the number of traffic accident deaths has been decreasing ever since. Currently the number of deaths has been reduced to less than 5,000 per year. Japan is now ranked #5 in terms of traffic accident deaths per capita. In order to avoid traffic accidents, we have combined two different safety driving systems, autonomous safety driving systems such as ABS (antilock brake system) and vehicle-to-infrastructure cooperative systems. ABS will automatically stop vehicles when it senses obstacles, and vehicle-to-infrastructure cooperative systems will inform drivers of traffic conditions ahead of them. If there is traffic congestion ahead of a vehicle, the cooperative systems will provide drivers with congestion information in advance, and also inform drivers of possible short cuts. This

is called dynamic routing guidance. After introducing ITS, the traveling time has been improved by 9%, and traffic congestion and traffic accidents have been reduced by 28% and 16.8% respectively. Recently, we have developed more advanced systems. One of them is a cooperative adaptive cruise control (cooperative ACC), which enables an automatic fleet driving using vehicle-to-vehicle communication system. Young engineers of a motor company voluntarily started developing this system and now the cooperative ACC is supported by the Ministry of Land, Infrastructure, Transport, and Tourism. The cooperative ACC can ease traffic congestion, improve millage, and lessen the fatigue level of drivers. This system has already been commercialized. I use this system all the time when I go for long distance drives. I am close to 70 years old, but can still enjoy long distance driving with this system.

Last year, we had a major tragic disaster. We have learned some lessons from the last year's disaster. One of them is a GPS probe. The present traffic information is collected at fixed sensors installed on the roadside, and the collected information is transferred to the traffic control center. On the other hand, the currently developed GPS probe can send information of each vehicle's driving speed and its geological information to the computer, and then the computer processes collected date and provides drivers with the detailed traffic information. This probe system does not require the construction of fixed stations on the roadside, or large-scale traffic control centers. After 3.11, ITS Japan collected traffic information from automobile companies' probes and navigator makers' probes and released the processed information on the web. We were able to show detailed streets on which vehicles could actually drive even after the great earthquake. However, these streets involved special routes reserved for emergency vehicles. Therefore we separately showed the emergency routes as well as roads blocked and damaged by the earthquake. The information helped the government rescue disaster victims and transport emergency materials, and I was thanked by the National Police Agency, which was the first time in my life. Based on this experience, ITS Japan is trying to establish local information centers. We are requesting the government to let us use publicly owned traffic information. We can combine the publicly owned traffic information with the private sector's one, and create broad area information centers that can contribute to people's lives in case of emergency. In an emergency, it is very difficult to obtain necessary information or you cannot send information all of a sudden. So it is critically important for us to develop an information platform that can be accessed whenever you want information.

Recently ICT technology is improving dramatically, and I think it will shift the ITS paradigm. Individual probe information does not mean much for society, but the collected information of great many probes creates significant social values. The collected information of many individual probes someday can show how much we contribute to the reduction of greenhouse gas by eco-driving. It will actually allow us to visualize how we participate in our society. In the primitive days, our ancestors must know how they were connected to the community, but as civilizations progressed we lost sight of how we are connected to our society. We were lost in a great mass, but big data obtained by the progress in ICT technology will bring back visual connection of an

individual and society. Based on this expectation, ICT Japan tries to develop new traffic systems by speeding up the mobile communication networks and allowing the permeation of intellectual transportation systems in society.

Another mission of ITS Japan is to collaborate with Asia. The United Nations have established a vision of an Asian Highway runnig from Tokyo to Istanbul through various major Asian cities, and ITS will be incorporated into the Asian Highway. Asian countries have serious traffic congestion and various transportation-related problems. According to the WHO, road traffic injury is ranked 9th among the leading causes of severe disabilities and death in 2004. It is expected to rise to 5th in 2030. This is a warning. We should develop technologies and systems to build a society with no traffic injuries. Internationally there are similar initiatives, and we are collaborating together. ERTICO represents the European initiative, and ITS America represents both North and South America. ITS Japan represents the Asian region including Oceania. The three organizations annually organize several meetings and conferences. Last year, the international meeting was held in Orland, USA, and this year it was held in Vienna. Next year we are hosting the meeting in Tokyo. ITS Japan is the center of the ITS Asia-Pacific. We have 12 member countries, and two more countries, Vietnam and the Philippines, are vying to become members. We started collaboration with Asia in 1996 and we focus on not only information exchange but also partnership for resolving various traffic-related challenges. In 2010, the ITS World Congress and ITS Asia-Pacific Board of Directors' meetings were held in Pusan. We are studying various common traffic-related challenges and seeking solutions. We are collaborating with governments, financial institutions, and academic institutions as partners. Asian Development Bank is supporting us.

In order to create innovation, we need innovative science and technology. However, science and technology alone do not create innovation. In terms of transportation, we have to have an efficient transportation logistics infrastructure. We also need the permeation of vehicles with next-generation technologies. We also need next-generation ITS based on ICT. We need to enlighten citizens and corporations so that they voluntarily participate. Lastly, we need the development of proper legal systems and swift implementation of new policies. Previously, Prof. Kishi said that we need a "melting pot." ITS is the melting pot. The next ITS World Congress will be held in 2013 in Tokyo. The theme is "Open ITS to the Next," meaning that a new ITS is coming up and creating a new world for all of us.

Invited Speech Open-Innovation Ecosystem in Thailand: One Step towards Knowledge-Economy

Hugh Thaweesak Koanantakool

Thailand is a country located in the center of Southeast Asia, with a lot of sunshine, good rains and good soil.It is a place for natural biodiversity and agricultural production. We are a top rice exporter, despite our low rice productivity. We are a place where top automobile manufacturers locate their main production facilities. Thailand is a good place to do business and manufacturing, and our top investors are Japanese.

Our country is not doing well in the IMD or WEF rankings of competitiveness. We witness that our lack of science and technology infrastructure and capability are an important hindrance to country growth and competitiveness. We need to put more efforts into science, technology and innovation to make the country more resilience to economic slowdown of—in Europe and in America.

Over the past decade, many Thai governments are a worried about the country's competitiveness and how to overcome the situation. During the course, Thailand's gross expenditure on R&D stayed at a quarter percent of GDP or even less. Nowadays, the word "middle-income trap" pops up ever-so often to confirm that we—if we do not move up the food chain of productivity and innovation, we cannot compete with low-labor cost emerging economies. Therefore, managing science, technology and innovation becomes more and more serious in Thailand.

The government about a year ago launched our first strategic plan on science, technology and innovation. The plan commits on three serious targets for planting key drivers for innovation.

First, the R&D expenditure would rise from 0.25% of the GDP into 1% within the year 2016. Secondly, our research personnel would rise from 9 per 10,000 populations to 15. Thirdly, R&D activities in the private sector have to be risen from 50% of total R&D expenditure to about 70%.

There will be many measures to be taken by the government to make this happen.

I would like to go back in time and talk about the big picture of Thailand's innovation system.

R&D history in Thailand is shorter than many developed countries, like Japan. Our first university was established just about 100 year ago and the National Research Council of about half a century ago. Substantial support for R&D actually came up only 25 years ago through a cooperation project between US and Thailand to set up the Science and Technology Development Board.

After this five-year's initiative, Thailand launched the Science and Technology Development Act of 1991.The law created a new autonomous research organization called the National Science and Technology Development Agency (or NSTDA). NSTDA has mandates to set up research centers, to recruit researchers, to build state-of-the-art R&D facilities and to fund larger R&D projects. NSTDA focused on four technologies: (i) is materials, (ii) on the electronics/computer, (iii) on genetic engineering and biotechnology and (iv) on nanotechnology.

A few more research organizations and funding agencies were subsequently established after NSTDA in the areas of metrology, nuclear technology, synchrotron light, astronomy and remote sensing.

In the year 2008, NSTDA spun off the National Science Technology and Innovation Policy Office through the new STI Act. This STI Policy Office will be the key manager of our innovation system. It is also under the Ministry of Science and Technology.

As of now, Thailand has two research policy organizations: the National Research

Council of Thailand (or NRCT) for general research policy and the STI Policy Office for science and technology issues. We have about a dozen funding agencies, for example, the Thailand Research Fund is the general funding agency, and many other specialized agencies such as the Agricultural Research and Development Agency, and NSTDA on science and technology. Many ministries have—also have the research funding for themselves and for universities.

Thailand has fewer than 10 research organizations with many mainstream research activities take place in universities. NSTDA is among the largest research organizations, with 2,700 personnel. The strongest research groups in Thailand's are among doctors in medical schools, petrochemical and biotechnology.

Now, may I touch upon the work of NSTDA and our initiative to promote collaborations and open innovation?

During the '90s, research organizations in Thailand were mainly expected to build basic capacity for future serious undertakings. Thus, NSTDA was given three mandates in addition to research: (i) is on human resource development, (ii) on technology transfer and acquisition and (iii) on science infrastructure development.

In a developing country like Thailand, the mandate on research/development is linked to the other three mandates. We cannot do research without institutions and laboratories. This really mean science infrastructure. No research work can be sustained if we do not have enough researchers. I was amazed in the lack of research personnel in Thailand. As mentioned earlier, we have only 9 persons out of 10,000 populations. Therefore, human resource development is much needed.If we have big money to spend like Singapore, some top-notch scientists can be invited to work in Thailand to speed up our development. But we have only few of them.

All are important fundamentals that we need to look at them from a holistic point of view. But judging from the theme that I was invited to talk and in the interest of the time that I have today, I will center my talk around R&D activities in the public sector using NSTDA as an example, and talk briefly on the mechanism to help boosting innovation in both the public and the private sector.

Let me describe how our research and development activities respond to the need of Thai economy and society. There are often skeptics that research and development institutes like ourselves are out of touch with the country's needs and that we scientists merely pursue our science curiosity or to achieve scientific excellence. These skeptics might be more valid in the past, but at present a number of R&D institutes have taken off since the year 2000, so changes are on their way.

NSTDA made it explicit in its present five-year strategic plan that our research and development activities have to align with the national agenda, both the long-term direction and numerous short-term needs of the country. On a long term prospect, the current strategic plan have focused R&D activities in five key industrial and social clusters, namely, on the agriculture and food, energy and environment, health and medicine, resources, communities and the underprivileged, and manufacturing and service industries.

To do this, we have to really align ourselves with the national agenda and work

with the private sector on their industrial targets. We have to focus our activities in the five clusters. Then we have to make sure that our stakeholders within each cluster have access to and then apply our R&D to their activities. Without putting some good research into commercial use or social use, all research results will be doing nothing on the shelf. If that is the case, it will be difficult to justify our contribution to socio-economic development of the country. Thus our people have actively engaged with potential users or manufacturers, sometimes even before the start of the project. The arts of transferring know-how, and intellectual property licensing are critical success factors of a research institute. And these are the arts of open innovation.

An example of outstanding research achievements that has impact to Thailand's economic is the molecular breeding for rain-fed lowland rice. At present, Thailand exported around 10 million metric tons per year, value around US$ 6.5 billion. In order to maintain Thailand's competitive edge in the world's market, a research program is dedicated to integrating the latest technology that improve rice production without compromising the desirable agronomic characteristics of rice and rice products. Genomic tools have been used to discover genes underlying important economic traits such as tolerance to environmental stress and pathogen and pest resistance. Currently three elite lines have successfully passed the farmer's field trials and are in the process of officially—registration.

The key success factors to our rice breeding innovations are collaboration with Kasetsart University and the Ministry of Agriculture. Without them, research cannot be put into utilization all over the country.

Now, let me give you example of our short-term response. NSTDA were able to provide scientific solution when the country is in emergency. Let me cite the case of the flood last year as an example.

During and after the great flood of 2011, many innovations created by our research centers and partners were put into use. For example: the "magic pants" made of PVC is used for wading through deep water, bed nets which kill mosquitoes, bio-materials to eliminate flood-borne mosquitoes, an eco-friendly foul-water treatment system for broad areas, a solar-powered drinking water production unit using nanosilver and flood-resistant breed of rice for farmer.

We also mobilize many companies to join force and build a big resource pool collectively called the "Friends of NSTDA" to showcase research output that will help speeding after flood recovery process in the form of home recovery kits and many kinds of professional services, ranging from factory recovery to restoring data from flooded hard disk drive. These works might not be of scientific excellence or rocket science, but it proved, to our citizens as well as to the politicians and those skeptics, that science and technology can be so close to their lives.

We also took part in a new way for national R&D governance and management. For the past two years, key government agencies whose work related to R&D in various dimensions including research agenda setting, research funding and research institutes have united and built up a platform where they can share their work and make some common decisions together.

To complete this holistic approach, I would like to turn to another important factor, the infrastructure—hard infrastructure as well as soft infrastructure. Examples of scientific infrastructures are facilities/equipment sharing, testing laboratories and large-scale pilot plants. Soft infrastructure are policies, legal instrument and financial mechanisms, which are important to induce R&D as well as to bridge the gap between R&D and commercialization. NSTDA has been working with our peers such as the Science, Technology and Innovation Policy Office to develop a strong infrastructure for Thailand.

Finally, I would like to add the linkage between infrastructures to the private sector. We created Thailand Science Park as a location 30 kilometers north of Bangkok to host NSTDA and facilities for more than 60 private establishments. This aim is to make sure that research and development of private companies are well supported by national laboratories and testing facilities. Our newest expansion in Thailand Science Park is scheduled to open in July next year and we will have space for more than 200 companies to join open innovation area support by the Thai government. Many Japanese companies have already reserved the space and plan for their innovation activities in Thailand, in Thailand Science Park.

In addition to the physical space, the board of investment welcomes domestic and foreign direct investments through tax-free incentives. NSTDA is a key agency to provide seed funding and tax incentives for the private sector. As a special agency, NSTDA's law allow us to joint venture in technology companies. So far, we have invested in more than 13 companies, with more than 50% of them operating till now with profits. We see that the R&D in the private sector is rising considerably, and have monotonous growth.

In conclusion, may I offer two final points?

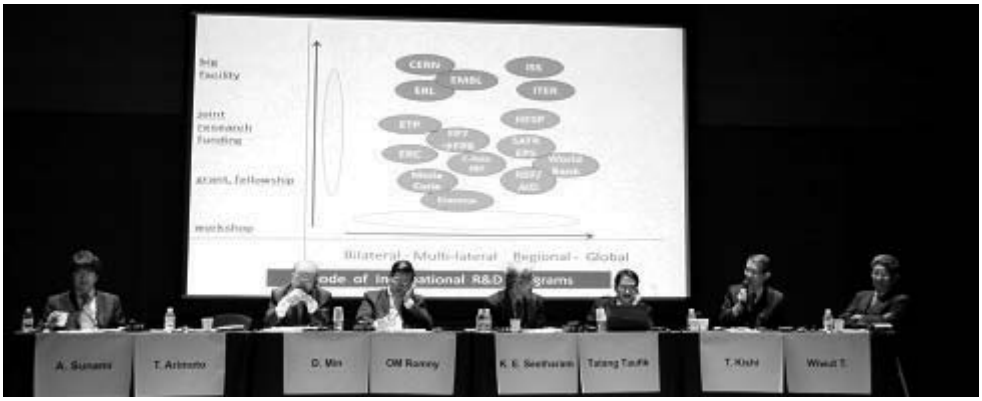
Firstly, government must be the key supporter for open innovation while the private sector should be the leader of open innovation, taking all the established research organizations and universities as part of the available resources.

Secondly, infrastructures and human resources are also key factors—which government can nurture the sustainability of open innovation.

Finally, I would like to thank the organizer once again for your invitation and I would like to thank the wonderful audience for your interest in Thailand's plan for open innovation ecosystem.

Thank you very much

Panel Discussion　ECOSYSTEM FOR REGIONAL INNOVATION



Atsushi Sunami

The panelists include Prof. Tateo Arimoto from GRIPS, Prof. Dong-Pil Min, Korean Ambassador of Science and Technology, Prof. OM Romny, Director General of the Institute of Technology of Cambodia, Dr. Seetharam Kallidaikurichi, Principal Operation Coordination Specialist of the Asian Development Bank, Dr. Tatang Taufik, Deputy Chairman of the Agency for Assessment and Application of Technology, Indonesia, Dr. Teruo Kishi, Advisor of NIMS, and Prof. Wiwut Tanthapanichakoon of the Tokyo Institute of Technology. The moderator is Prof. Sunami from GRIPS. Yesterday and today we had the International Workshops with representatives from the Asian science and technology communities. We discussed various themes, and the discussion was quite in depth. We don't have enough time to summarize the workshop discussion, so I would like to share some of the topics of discussion with the audience. We discussed three main subjects, new funding mechanisms for regional collaborative research, international open innovation research centers as venues for international collaborative research, and regional development of human resources.

As you know, three years ago, when the Hatoyama administration was elected, the East Asian Science and Innovation Area initiative was introduced. East Asian Science and Innovation Area initiative is now called e-ASIA, and the e-ASIA joint Research Program; e-ASIA JRP is one of the fruits of the DPJ administration. Yesterday, e-ASIA JRP activities were explained and funding for regional joint research was discussed. Dr. Arimoto was the chair of this funding session; therefore, I would like to ask Mr. Arimoto to talk about the funding mechanism discussion that took place yesterday.

Tateo Arimoto

The funding systems of each country are based on nation-states. They are designed to strengthen domestic research and development activities, and they cannot go over national boundaries. In other words, money from the national funding systems cannot cross national borders. This is a fundamental difficulty when we support international joint research. Perspectives of innovations are expanding. Creating domestic innovation is not enough. We should support various types of innovation to achieve sustainable regional economic growth. In order to support various types of innovation, we need flexible and sustainable funding systems. When we collect money or allocate money, peer review systems have to be based upon trust and responsible conduct, as well as the need to maintain scientific integrity. During yesterday's discussion, we have come up with two proposals. The first is about networking of various types of funding systems and private foundations. Dr. Kobayashi of JST Singapore preliminarily studied various kinds of funding programs in Asia and showed that cross-border funding is possible if we develop networks among various funding agencies and private foundations. There exist many international funding agencies such as ASEAN FOUNDATION, TEMASEK FOUNDATION, and international programs such SATREPS, Human Frontier Science Program, and SEED-Net. All of them can make grants for international activities depending on their preferred areas. If we could connect them in a seamless manner, we could support various international activities including regional collaborative research. To do so, we want to have a system—a web-based system—to glance everything at one crack, and experience and information can be shared among researchers, which will benefit them. This will also benefit funding managers. That's the first proposal.

Ultimately, we need an independent regional entity that can make cross-border grants to regional collaborative research, and that supports regional human resource development. We call this "the Asian Research Foundation". However, a regional foundation will be related to the politics of our nation-states. Therefore, we have to be very patient and take a step-by-step approach to realize the Asian Research Foundation. The establishment of an independent regional funding organization is the second proposal. That was something we discussed yesterday. So that's the starting discussion that I can share with you.

Atsushi Sunami

Thank you very much. I'd like to ask each of the panelists to share with us their thoughts. South Korea is working very hard to develop science and technology. The government is taking the initiative and the GMP ratio of research investment is higher than in Japan. They're investing in green growth too. Prof. Min Dong-Pil is working to create a research hub for Asia in South Korea. He has been discussing this for quite some time. I'd like him to talk about East Asia and creating a single network in Asia, including some funding aspects.

Dong-Pil Min

Well, as far as the funding is concerned, it was already mentioned by Prof. Arimoto that funds usually cannot go abroad due to national politics. But in order to overcome that situation, we must have some idea of international institutes like CERN in Europe, and also we could think about a regional institute in Asia. But nevertheless, its objective must be quite international. I would like to mention an important factor in the success of the CERN or any international institute. As far as I know, they have complete flexibility. It means that each country can contribute to that institute following their interest in that organization. The institute has complete autonomy to digest or to spend their research funds. Of course, there are some kinds of strings, very light strings, but anyway, compared to any other organization, this principle must be respected. However, if it is really autonomous, each country must have some kind of complaint because they cannot control their investment. But when you study big science like CERN, open cooperation and open competition can produce better results than other strategies based on national interests. I also want to stress that the main objective of that international institute must be shared by all stakeholders. That way, collaboration and competition and full autonomy will be possible. For that purpose I think that science diplomacy should play an important role in breaking through all the barriers of each country. Because science diplomacy is a diplomatic tool for science and technology, and at the same time science and technology can become a tool for diplomatic purposes. Taking into consideration the various interests of each country, science diplomacy could make a nice arrangement for international purposes. Lastly, I would like to say that clear objectives of that institute or this organization are quite important because they will direct future collaboration in science and technology in Asia.

As for the Korean situation in science and technology, Korea has been investing quite a lot. This year, national R&D investment is already 3.5% of our GDP. It is almost by 10% of the annual increase since 1995 up to now. We have invested a lot on R&D, and this is supported by society. However, Korean scientists always complain about the misunderstanding of the public, especially from the governmental side. There is the gap between the general public and the scientific society. We must make a bridge to this gap. Even though an enormous amount of money is spent for R&D, we must not stop funding on science and technology based on very short-sighted judgment.

Atsushi Sunami

I'd like to invite Dr. Romny to make a comment. Now, when you think of the availability of international funding, the availability of funds actually would have a large impact on the future of young scientists in Cambodia. Would you like to make a comment concerning funding availability in your country?

OM Romny

Cambodia has a long history and rich culture. But we lost them during the Khmer Rouge period. They destroyed everything including human resources. So we have to start from zero. We were worried about how we could build the country within this short period. We worked very hard on capacity-building and human resource development. The Cambodian government tried to support capacity building, but higher education did not have high priority, and we had to start from the bottom. It means that at first we had to build the country's education system from the primary school up to high school. Now we are thinking about putting some funding support for higher education. The government is supporting higher education, but money goes into the infrastructure, because we lost every facility during the war. We don't have much funding support for research. We are collaborating with international partners such as the French speaking university network and the part of the cooperation university for development, and they provide some funding support to the institute. These funds are very useful for building capacity.

The integration of ASEAN means a lot to Cambodia. In 2015, everything will be free flow within ASEAN, and the human resource issues will become very important. Currently, young students have been selected from the university and are sent to study abroad. When they receive their PhD degree, they come back and work for the university. However, we are worried about keeping promising young researchers because we cannot afford to offer salaries that can compete with international standards. Currently, we use university funds to compensate the salary they receive from the government. We also encourage young researchers to work with private companies and organizations so that they can receive funds and stay with us. ITC is a member of the Asian SEED-Net program, and we get support from the SEED-Net program. But seed money is borne by the member institution. It means that the university has to share certain costs during the activity. For example, we have to bear traveling and accommodation costs when we send our teaching staff or researchers to join international activities. Our other goal is to make projects more sustainable. When a project is finished, everything is gone. We want to assure that projects are sustainable and progress further.

Atsushi Sunami

Thank you very much, Dr. Romny. Now I would like Dr. Seetharam to make comments. This is your second attendance in the International Policy Dialogue. We are trying to create something specific at this dialogue. We don't want discussion for discussion. Can you make any comments on this?

Seetharam Kallidaikurichi

I will make two points, which I feel are highly relevant. In Asia, we have countries that are very wealthy and progressed, while we also have countries that are just developing and some are really struggling for even basic needs. So putting them all

together as one Asia is actually not easy. Research is very expensive for the poorer countries. The first thing that we need to do is show some concrete success stories and solve real problems for the poorer countries. This requires political will and leadership. When we take research projects, we are talking of some blue sky, high-technology research. Those are necessary but not yet for many countries. People are struggling for basic drinking water, sanitation and health. We need to solve these. Even if you look at the history of Europe and United States, they solved these first. Even Japan and Korea. They solved these basic problems by putting all the effort together. Why that is necessary is that people should feel happy first, and don't have to worry about everyday life such as the next meal and warm house. Then they can engage in scientific research. Otherwise, we are talking just ideas. So some of these projects should aggressively address those immediate problems. The United Nations set the Millennium Development Goals. Three years from now is the deadline to achieve those. Many countries have not achieved them. So we should target scientific research to expeditiously address those problems and put all the effort that is required from within the region, outside the region. Then comes scientific research as the next target. In my view, scientific research should embrace the borderless approach, and what is required is the commitment of the business sectors and governments to keep contributing to scientific activities. To engage in borderless research, we need long-term replenishment of this funding. And this could be the next way that we should move forward by solving the first problems of immediate concern expeditiously, then embrace the long-term vision where people really believe that this is contributing to the next generation of citizens who we want to give better life and a happier world and a peaceful world.

So I think that should be the paradigm shift that we need to bring when we do the research collaboration in this discussion. Thank you.

Atsushi Sunami

Thank you very much. We talk about Asian diversity. It's not just diversity of the countries, but also the needs and the objectives are diverse, and therefore funding needs to be diverse as well. As Dr. Romny has mentioned, Cambodia has its own needs for funding, whereas South Korea and Japan have different needs. We have to think about public opinion and have very flexible funding in our cases. I'd like to ask Dr. Tatang to talk.

Tatang Taufik

I personally believe that the strengthening of international STI partnership is important, as Dr. Seetharam said, not only for the advancement and utilization of STI itself, but also for the betterment of humankind to solve global issues and improve the bottom of the pyramid in society. I think science, technology and innovation (or STI) partnerships needs to be oriented to provide balanced contributions

to the advancement and utilization of STI for high economic growth, the betterment of the bottom of the pyramid (inclusiveness), and also for a green economy. The challenge is how to establish international STI partnerships to strengthen favorable ecosystems for accelerating the advancement and utilization of STI to contribute to those goals.

And secondly, we should resolve the brain drain phenomenon towards brain circulation for all of us. We need to establish an ASEAN STI diaspora network initiative. A lot of ASEAN students study abroad, and get their degrees in advanced countries such as Japan, Europe and United States. After getting their degrees, some of them come back to their countries, but many of them stay in foreign countries to get jobs. We should have connections with these talented people, and when they want to come back to their countries to make some contributions, we would like to help them to find jobs and places where they can work.

Thirdly, international STI partnership programs should not be limited to federal governments. They should be extended to local governments. Why? Because in a country like Indonesia, regional and local governments play a very important role in society. In Indonesia, about 40% of the national budget goes to regional and local governments. We should educate the local governments, the local politicians to have awareness about the importance of STI to solve their development programs. International collaborations among local governments have already started. For example, Cimahi City in West Java has started international collaboration with Hamamatsu City in Japan.

Fourthly, I would like to propose the development of Asian open innovation frameworks for all initiatives. With these open innovation frameworks, we can share our experience, knowledge, and assets to create innovation to help poor people in the bottom of pyramid. As for international open innovation research centers, we can also develop some scheme of cooperative pilot networks. For example, there are two or more open innovation research centers in several countries. We can solve problems in each particular field, and exchange experience and knowledge by the development of networks. .

Atsushi Sunami

Thank you very much. A diaspora program is an interesting idea. We will discuss that topic later.I'd like to invite Dr. Wiwut to make a comment first.

Wiwut Tanthapanichakoon

First of all, I would like to comment on funding, which is our main issue right now. Then afterwards, I might talk about the international open innovation research centers. I'm originally from Thailand. So I would like to give some pictures about research funding in Thailand. As already mentioned by Dr. Thaweesak, our investment in R&D is only about 0.25% of Thailand's GDP, which is not high when compared with Japan, which is around 3% or

even Malaysia and so on. But luckily, last year our science and technology and innovation policy has been endorsed by the Cabinet of the present government, and the Prime Minister has made a commitment to increase this 0.25% to 1% within maybe five to 10 years. Another key factor is the ratio of R&D investment among the public and private sectors. At present, we have only about 50% from the private and around 50% from the public budgets. But the aim of the new policy is to increase the share from the private sector to be more like Japan and elsewhere, which means that the private sector's investment should be around 70% and public only about 30%. So this is also another challenging target. At this international policy dialogue, we have Dr. Wilaiporn from SCG, which is one of the biggest conglomerates in Thailand. I'm glad to hear from her that they are also keen on increasing investment in R&D and that it has been expanding quite a lot over the past 10 years.

This forum of regional or Asia collaboration could be a blessing for Thailand. If you have got such a mechanisms of international cooperation, I think the government will have more incentive because it will be kind of some counterpart fund. If Japan puts in this much, then Thailand will put in this much and so on. It could create incentives for the Thai government to put more investment in science and technology. They also will feel more confident about international collaborative research, because it's a joint effort.

Atsushi Sunami

Thank you very much. This is something that we never thought of—establishing an international fund to be shared. In the eyes of ASEAN countries, how can they increase research and development investment? This is a major issue for ASEAN countries. On the other hand, we have to give incentives to governments to make further investment. This is something that seems very new, new idea, very interesting. Lastly, I'd like to invite Prof. Kishi to talk about the fund.

Teruo Kishi

Establishing an Asian fund and research centers are two major goals. Personally, I think the process will be challenging. But if we were able to establish an Asian research fund, it would change international perspectives of science and technology in Asia. So even though this seems time-consuming, we would like to make steps forward. Just one problem about funding is how to spend research and development expenses across national borders. We never talked about the amount of money that is needed. As Dr. Seetharam said, a dollar's value is different in different countries. The value varies from one country to another. We need to talk about how much we should spend. Forty or fifty years ago, there was a dialogue between Japan and US. We found out that their budget was by two digits higher than ours. That's the fact. We have to understand total amounts of investment, and then we can discuss the significance of international funding. Maybe at the next meeting, we should try to introduce the total amount in dollars or yen.

My last comment is about a win-win situation. TIA is established to develop win-win

relationships among partners. Many times I receive comments saying that there is no such relationship. When you have a winner, then there is always a loser. The phrase, "win-win relationship", is not used in the US.

Tateo Arimoto

The modes of international R&D programs are diverse. The modes range from grant or fellowship programs such as the Marie Curie and Erasmus programs to huge international programs such as CERN and ITER, which own large facilities. They are classified as bilateral, multilateral, regional, and global cooperation. There are also various supporting mechanisms and institutions involved in these programs including the Human Frontier Science Program, SATREPS, NSF, JST, the World Bank and the Asian Development Bank. Now, we have new players including the profit and non-profit sectors. A multitude of new players are joining this globalized science enterprise. So the whole picture looks completely different from what it looked like in the 1980s. We should understand this overall picture when we discuss international collaboration in science and technology. We are now trying to build a new big picture together with all of you.

Atsushi Sunami

After Dr. Yamanaka won the Nobel Prze for his work on iPS cell, I was appearing on a news program in English, and I had to explain why the number of Asian Nobel laureates was so small. I said, "It's a matter of time. We will create new regional fund, conduct international collaborative research at our open innovation centers in Asia, and produce number of Nobel laureates." If we can be very serious about creating something of that nature in Asia, then no doubt Asia will produce excellent research, which will be awarded by the Nobel Prize. In the past, developed countries were leading science by providing funds. But from now on Asia will be a new player in the world science scene. Asia will create its own networks of funding and research activities. And, as mentioned by Prof. Min Dong-Pil, we would have to solve the problem of immediate needs as well as challenge the issue of future needs. We want to gather and put the wisdom together. And if we can do so, I think Asia can be the leader in the world's science.

Now, we move to the second topic, open innovation research centers for Asia.

Wiwut Tanthapanichakoon

I would like to mention that Mr. Matsumi from ITOCHU Corporation has touched on three points of interests, one of which is the establishment of an international open innovation research center (IOIRC) for renewable energy in Thailand. Thailand and Japan have been conducting several collaborative projects in the biomass field. If we start building a brand new research center, it will take quite a long time and require a lot of budget and efforts. But if we start with existing projects and facilities, we would be able to do it quickly. Dr. Wilaiporn from Siam Cement group also touched on the general ideas of IOIRC. She expressed her endorsement of the setting up of IOIRC in

Asia and her insistence that SCG would be interested in contributing or joining the collaborations of such an IOIRC in biomass in Thailand.

Mr. Matsumi also proposed the development of a linkage between the Tsukuba Innovation Arena and Asian Research Institutes, so that the Tsukuba Innovation Arena could serve as an IOIRC in the field of nanotechnology and materials. Dr. Iwata from Tsukuba Innovation Arena introduced the main functions of TIA and also the various linkages available between Tsukuba Innovation Arena and Asian Research Institutes. Dr. Takemura from NIMS (National Institute of Materials Science) also explained the functions of NIMS, and introduced two initiatives, the World Materials Research Institute Forum and the Asia Nano Forum.

Atsushi Sunami

With respect to open innovation research centers, we would like to have some comments from the members of the panel. First, Prof. Tatang. Earlier you made some proposals. An STI regional network was one of such proposals you made, I think, and also an Asian open innovation network was another one. So for Indonesia, from the perspective of Indonesia, what kind of concrete idea do you have for the creation of center? And what would be the use or benefit of having such a center? Can you elaborate on the two proposals you made earlier, please?

Tatang Taufik

From the Indonesian perspective, we would like to have this kind of instrument. We want to develop an open innovation research center. First, we would like to advance our STI capability to support our industrial potential, including in energy and so on. But at the same time our developmental challenges also cannot be postponed to help most of our Indonesian people to improve their lives. For example, we would like to have people who live outside Java have better access to electricity and then affordable energy. If we are able to have an open innovation center, we should optimize the utilization for various areas. In Indonesia, it is too luxurious to have good STI laboratories or centers for a particular industry. We would like to optimize the utilization of such centers.

My second idea is Asian networks for all initiatives. For example, in energy, various technologies have been developed by Thailand, Vietnam, Indonesia, and other Asian countries. However, there is no framework to let us share all these technologies and know-how. We should build Asian science and technology networks with which we can share experience, knowledge and information. We can strengthen our complementary competencies using regional collaboration frameworks. Also, we can work on the IPR models that can benefit most of the people of Asian countries.

Seetharam Kallidaikurichi

I want to build up on the previous comment that I made, because I think it is relevant for open innovation and I want to reflect on Prof. Kishi's excellent keynote presentation, in which he mentioned "issue-driven" science and technology and

innovation.

I think we must humanize open innovation. What I mean by that is today in a globalized world most of the developing countries, all the Asian countries, they are part of the global trade networks—the networks that influence the global economy. So they are part of the cog in the wheel of global production chains and so on. And they are already experiencing the impacts of that. And one visible impact is urbanization. Cities are growing in all developing countries, and many countries will become highly urbanized without a plan or without their choice. They are going to face huge problems of pollution, problems of energy constraints, waste management. A trust mechanism should come where the developing countries will feel this research is really benefitting their common citizens; this it will motivate their governments to contribute significant resources and commitment. The first trust-building projects can be this kind of open innovation. Rather than straightaway talking about the technology of nanomaterials and superconductors, I think we need to bring the human aspect of open innovation to the front. Many Asian countries have huge road traffic accident problems. Can we bring ITS to solve these problems? I think people will like that.

OM Romny

I think maybe the situations in Cambodia are not much different from those in Indonesia. People who live in the countryside need energy for daily life. As for the international open innovation research center on biomass, I think that the idea is acceptable because actually most countries are focusing on renewable energy and biomass development. To develop new energy we have to use the existing laboratories or facilities. And if we need more advanced equipment or facilities for the research, then researchers can visit the more modern equipped facility, which is the international open innovation research center, IOIRC.

Dong-Pil Min

Well, I totally agree with Dr. Seetharam's idea because as far as this innovation is concerned, I think one should look at the whole world. I cannot just look at one poor person without looking at the other side of world. So I totally agree with that argument, that is, one must think about world citizenship. However, if it is open innovation, then one should look at local issues rather than many global issues. If we do not look at these local issues of a poor country or some people who need that help the most, then very quickly we must lose our objectives.

I think this issue is quite liquid because it is strongly related to each country's interest. One must think about what kind of funds we should prepare. Is it ODA funds or grants from each country's research funds? So that's very delicate issue and one must think about that. I think one must be very careful. But nevertheless, I think this is a quite important issue. As it is mentioned already, in the MDG goal, the primary concern was the eradication of poverty and I think Asia still has that problem very severely. So I do hope that this should be solved, even with we take some time, and move slowly. But one thing I want to stress on is that this program will bring a very serious problem of

brain drain also. So we must be very careful and we must very clear so that we can wait for success. But it's important success.

Tateo Arimoto

What struck me most about biofuel is that Thailand and Indonesia are very different in terms of weather and resources. When we talk about international open innovation research centers, we have to think about the local conditions. We are addressing common challenges, but we have to focus on the local needs and the different situations. We should design a structure that will enable us to work on common challenges together, and, at the same time, work on the specific problems of each country. When we address specific problems, I think it important to develop appropriate technologies in combination with indigenous technologies based on the social conditions. Also we have to think about what impact this will have on local societies. Therefore, in parallel, we have to look at the social impact while we work on the technology.

Teruo Kishi

Now, the creation of such a center is something that we need to keep in mind. But at the same time, we have to think about whether we are going to use existing institutions or build new institutions. Another important thing is brain drain. Now, the biggest challenge Japan faces is university activities. The university activities are dependent on the graduate school student capabilities. Half of those students are Asian students these days. We need to enhance the quality of these students. This is our major challenge. However, if we succeed in this challenge, then, we will have brain gain from the developing nations. This is difficult. The other day, I attended a dean conference of world-leading universities including American universities. American universities have a number of Asian students including Japanese, Chinese, and Indian students. At that conference, American participants were complaining that many of the Asian students go back to their home countries after graduation. They want foreign students to stay in the US at least until they turn 40. If foreign students go back before they turn 40, the US would not get a return on its investment in foreign students. When we discuss the regional development of human resources, we should look carefully for directions where we can build win-win situations.

Now, lastly, I'd like to just raise one thing. This international open innovation research center is a just too long a name. "Open" usually means international. TIA uses the word this way. Right now, we use the whole name just to be sure that we are discussing international collaboration, but at the next policy dialogue, we should consider whether the current naming is the best.

Dong-Pil Min

When you are educated in some laboratory or some university with some given project, the experience will somehow direct your life. For example, when a student comes back to his country after his training, he is not quite able to change his subject. I

hope that young researchers should tackle new issues, but his past training would not let him confront new situations. This is related to the human resource development of how we could train young students with flexibility. That is what I worried about. It's a kind of problem that we should think about.

Atsushi Sunami

Now I would like to discuss diaspora projects. In Asia, human resource development is critical and human networks are very important. I'd like to introduce Dr. Myint Wai from Myanmar. He is the chairman of the Myanmar Association of Japan Alumni. For many years in Myanmar there has been this group of Myanmar students who studied in Japan, MAJA, and Dr. Myint Wai is leading MAJA. He has been expanding this group to more than 1,400 members. So this is really the basis of a researcher network. We try to gather excellent researchers in the region. If they stay inside the region, it may not be a problem. But we should have a discussion as to how we are going to share human resources.

Tatang Taufik

Brain drain occurs not only between countries, but also between rural areas and large cities. In Indonesia, people keep moving into large cities. The rural areas are losing human resources, and it is difficult for us to develop the rural areas without talented people there. Human resource is the key for the development of rural areas. The situation is also similar to international brain drain. If educated people move from one country to another, the country will lose its human resources. I think the regional collaboration initiatives need to consider this kind of human resource flow in the region, and try to take some measures to improve the condition of countries that will lose their human resources.

As for diaspora networking, our ambassador to the US has started to improve Indonesia diaspora networks among Indonesians who have received degrees, live and have careers as citizens in United States. His initiative is to create linkages with Indonesian diaspora and Indonesian partners to increase their contribution to the development of the knowledge-based society. It doesn't mean that they have to return to our country physically. But we would like to strengthen linkages between Indonesian diaspora and Indonesian society and activate exchanges between them.

Seetharam Kallidaikurichi

I'll make a very short comment about the movement of people and the diaspora. About three years ago, IITs (the Indian Institutes of Technology) were criticized for a big brain drain from India. But very interestingly, the independent assessment by the alumni of IITs showed that actually there was a net positive benefit in terms of their own intellectual formation. It was a long-term return. It takes maybe 15 or 20 years. By the time they reach 45 or 50 years of age, they want to come back to their country because their parents have grown old or they have children who have grown bigger or they do not enjoy living in the States or Europe anymore. So they come back. And when they

come back, they bring back all of their networks, their contacts—I'll call it "the wealth." So it is actually a net overall positive benefit. But it depends on the country's own mechanism to use this new talent. When they come back, they are not looking for the same salary or positions. They're quite happy in their home country. They want an environment where they can now share their knowledge, their experience and operate in a manner to contribute to their country. In India they've created a specific minister who deals with nonresident Indians. I have met him many times outside India. He listens to your comments. Some of them may be trivial but he does listen. He has created a lot of positive enthusiasm. This is the direction to go. I heard that Ibu Mari Pangestu is chairing Indonesian diaspora initiatives.

But diaspora networks may not contribute to research and innovation. They are just networks of people who have gone and come back. When they come back, perhaps some of them are too old to really do anything new. We need to find new ways of engaging them. They're not young anymore to do the things that they did when they were outside the country. I think that is the conversation we need to have: how to involve them in real contributions to their societies to build the next generation of leaders. Real human capital formation is a long-term project. It cannot be done in a mass production. It is one-to-one project. Each individual has to be nurtured and inspired. Human resource development needs one-on-one exchange and constant contacts. We should put a lot of long-term effort into that. It is not the quantity, but it is the quality. It is the motivation and the inspiration and a commitment to a common cause. But it needs long-term efforts made by various actors including governments, NPOs, academic institutions, and research networks. All these have to be supported by an infrastructure that we could create. I think that should be our goal.

Atsushi Sunami

Thank you very much. Human resource development is not quantity but quality. It applies to our country too. We tend to focus on numbers and quantities. However, quality matters, and we should think about the impact of quality on people. That's a very insightful comment. In Japan, the Liberal Democratic Party often states we should use GNI rather than GNP, which means that we should count the impacts of Japanese who are active and successful outside Japan. For example, we have a famous Major League Baseball player, Ichiro. He makes a lot of money, and contributes to Japan. That should be included in GNI. So that's part of the globalization discussion that takes place here in Japan as well. What counts in human resource development is not the volume of people who move. We have to consider the quality of people who are internationally active.

Tateo Arimoto

Honda Foundation has been supporting young students from Asian developing countries for six years, and the number of supported students amounts to 140. Dr. Sunami here has been playing a major role in this project. This is a philanthropic activity of a private foundation and it's very flexible. When we look at Japanese public

funding mechanisms, they are very rigid. They are based on an innovation model that was built in the 1980s. Back in the 1980s, we were leading the world economy, and placed at the head of flying geese, a group of rapidly growing countries. However, we have never changed this model, although the whole structures have been changed. Politicians, government and citizens, they all have to recognize the change of the structures.

Atsushi Sunami

Two years ago, I came back to the METI research institute, and found out that they were discussing version 2.0 of the flying geese model. Now we have to look at situations with a new mindset.

Audience 1

I am from Indonesia and study environmental energy at Waseda University. I just want to bring up my two biggest concerns as a student who's studying abroad. First one is about a gap of what we learn at university and reality. In the university we are taught what is ideal and what is right, but once we are out, there are so many other stakeholders who are bringing other interests. The real world is not necessarily in line with what I was being taught. There is also a gap between the values that I bring from my own country and the society I am trying to adjust to. I really have a big hope that the creation of this open innovation research center this could facilitate this problem.

My second biggest concern is that if I could use my knowledge gained here in my home country. If I go back to Indonesia, will my knowledge be applicable to the current situation in Indonesia? What I have learned here is advanced technology, but could it be localized easily? Again I really hope that this innovative research center could make it easier for us students and researchers to find proper directions to use our knowledge.

Atsushi Sunami

Prof. Kishi, the audience member is studying energy environment, and wanted to know whether what she learned at the university can be applicable to the actual situation where there are multiple stakeholders.

Teruo Kishi

In the past, those who graduated with doctor's degrees were having difficulties in companies, and they did not join private companies for a certain period. But recently I think this problem has been solved, especially for graduates from the engineering department. If you have a doctor's degree, I think you're able to find a job in a private company or elsewhere. However, there is very big gap between industry and academia in the same country. I think and that's something you have to be aware of. When you have studied advanced technology but work with low tech instruments or facility, the gap between the two will be very difficult to overcome. I think that the key is basic knowledge and understanding. If you have basic knowledge or basic academic understanding of certain areas, you'll be able to find ways to overcome this gap.

Countries with vast numbers of basic researchers are about to take the lead in the science world. Take the US. The US has a vast population of basic researchers, and they lead the world in science and technology. If you have basic academic skills, your skills will be applicable wherever you go.

Tatang Taufik

Some 20 years ago, most of us who graduated from schools in developed countries such as Japan, the US, and Europe faced the same question. They did not have strong networks with Indonesian society and did not know what was happening in the country. In the current Indonesian university system, students have to spend at least three months doing fieldwork during the undergraduate period. They can face the real world and get to know local problems. But I think these kinds of problems can be handled if we can improve human networks among Indonesian students who study abroad. The networks should involve universities, the business community, and public R&D institutes. In many cases we collaborate with graduate students and undergraduate students studying abroad. A long time ago, some of our colleagues moved from our organizations because they thought that when they returned to Indonesia they would have facilities similar to those in Japan or United States. In fact, we did not. So again, we have to adjust our situations to the real-world situations back there. We have to adjust our ability to utilize the existing facilities and also to try to improve ourselves. But in certain fields, we have good facilities. We have seven national priority fields where the government puts some money and which the business community supports. They include new and renewable energy, food security, information and communication technology, transportation, defense, heart and medicine, and advanced materials. So your field will be, of course, very useful.

Audience 2

My name is Ken Soetanto, originally from Indonesia. I'm now at Waseda University. I have stayed in Japan for almost 40 years. Dr. Seetharam mentioned very important things in human resource development: motivation and inspiration. These are very personal. I have been teaching at Waseda as well as another university in Yokohama for almost 10 years. The important thing is that just understanding certain knowledge is not enough. We should lead students to grow as people who actually think for themselves. I agree with the inspiration and motivation. Nowadays, students always look for the short way, the easy way. They tend to think that there must be some solutions in books. I think that they should struggle and suffer in search of their own solutions. I believe there can be no greatness without suffering. I also think that education is not the only way. Knowledge should be neutrally taught. Students should find their own way from neutral knowledge. I am lucky that students are very good at Waseda. Still, they sometimes take a nap during classes. This never happens in American universities. That is the environment of Japan. It's too loose. You need to inspire students one-by-one. We are the ones who can change them.

Audience 3

I am from the Philippines. I was listening to all your discussions and I agree with Dr. Min and Dr. Seetharam. I think that it is critical for us to revisit the objectives we set forth in our science and technology programs to evaluate if we are on the right tract or we need to change direction so as to achieve our main goal of sustainability. We have to re-evaluate the path we are into. Are our objectives more on profit oriented or people centered? Are our objectives really focused in the well-being of billions of people living in the bottom of the pyramid? Dr. Min mentioned this morning that appropriate technology should be based on indigenous knowledge which I agree with. There's myriad of indigenous knowledge we can found in the rural area, all it needs is for it to be developed into a technology that can benefit the whole populace. We sometimes think that we know more but as always, why does the sustainability of our plans and programs put into question at the end. One thing in mind is because we seldom consider our major stakeholder – our main clients in the rural area who are the ones playing the major role of sustainability. I believe that letting them really feel that they are included in our plans will make a difference. They are our very important stakeholders that should be given priority

Tatang Taufik

Based on our experience in Indonesia, most of the problems faced by the bottom of the pyramid of society are derived from marginalizing them from time to time. We should reform the current systems, and improve their situations, but sometimes their own culture forces them to think that they cannot lift themselves up. So in many cases, they work for other people as laborers. So we try to improve the education system so that everybody has the same opportunity to excel. This is one of our challenges. Our culture of public service also needs to be reformed. For a long time, we used to think that the government should be served by the people. Not only the federal government but also regional governments used to think that they should be served by people. But now this paradigm has shifted. Now, we, the governments need to serve people, including those at the bottom of the pyramid. However, I think it takes time to improve the situations of the bottom of the pyramid, because we need to reform our culture, political systems, social welfare, and so on. To some extents, I think we need to develop some kinds of affirmative action to give opportunities to the bottom of pyramid. We usually take competitive mechanisms when we select students and hire public servants, but people who live in rural areas cannot compete with urban people. If we provide rural people with a good education, sooner or later, they will be more competitive and will find opportunities to develop business or start social innovations.

Audience 4 (Kayashima)

I have two comments and questions. My name is Kayashima. I'm working for JICA in the area of higher education. For us, the most challenging situation is to send Japanese professors to African countries for technical cooperation. We talked about the brain gain earlier to Japan, but it's a different—reverse flow.

Sending Japanese professors to African countries is very difficult. Maybe the source of the problem is the same. In academic world, people tend to move to better universities. This is a natural flow. But in the international cooperation field, we still need to send excellent Japanese professors to developing countries. And it has been quite difficult. We have been supporting the SEEDNet program. It's an academic network among top ASEAN technological universities and cooperating Japanese universities. With this program, students from ASEAN study in more advanced ASEAN countries and Japanese professors will go there as co-advisors. During three years of doctoral study, the students come to Japan and study for eight months under Japanese co-advisors. So this is multilateral cooperation, not bilateral. We designed the program to make it multilateral. The academic research community is globalized. For example, an Indonesian student comes to Japan for post-graduate study on the theme of Indonesian issue and may often go back to his home country for data collection. So it's not really a simple brain drain. It is not simply one country to another country. It is more complex. That's one comment I'd like to make.

And secondly, we still have to make a shift from brain drain to brain circulation. But water always runs to lower places. It is quite difficult to shift this natural flow. So we need to actually empower developing countries so that there will be an equivalent power balance. Some time ago, it was difficult to send Japanese professors to Asian universities, but this situation has been changed. Now, many Japanese academicians are interested in academic activities of leading ASEAN universities because they have become stronger than before. Since top universities of the leading ASEAN countries have been improved, one of the next targets of the SEEDNet program is universities of CMLV countries. If top universities of CLMV countries are equally improved, there will be brain circulation in ASEAN countries. Then how can we empower them? We had better consider this challenge in the context of international development such as empowerment of faculty staff or investment of university facilities in cooperation with international organizations and donors. And this way we can facilitate brain circulation in the region.

About ten years ago, a group of top 10 Japanese universities was ranked higher than a group of top 20 ASEAN universities. Recently, some of the top ASEAN universities are ranked higher than some of top Japanese universities. The situation really makes me think that Asian university levels are flattening to allow brain circulation in the region.

Seetharam Kallidaikurichi

I use a metaphor for this human capital formation of the coconut tree. I'm not a biologist, so if I made a mistake, forgive me. But I was taught that unlike a mango tree or other tree, you cannot graft the coconut tree. You have to plant each tree from a coconut and it will take 10 years for the coconut tree to grow into a plant. And only after 10 years will give the first coconut. So you have to wait. It's a long-term investment.

You see nothing coming up concretely. But after 10 years, it becomes a coconut tree and for the next 20, 30 years it will give coconuts. As for human capital development, I use the coconut tree story as a very inspirational metaphor to motivate myself in my work. And the challenge that we are facing is that even if we understand the time lag, unfortunately the budget cycles and the financing programs do not allow this kind of long-term output, because we want results in the next two or three years. Human resource development produces no obvious results in two or three years. But it will produce significant output after 10 years. So we need a long-term program. And I'm very happy programs like SEED-Net have the patience to wait for that long-term impact.

I told you that in the IIT diaspora there was the long-term impact. But, unfortunately, I share the same concern as Dr.Tatang. Some of the developing country policymakers do not have that long-term ability. They don't have the policy window to accept theses kinds of long-term projects. So they mostly will miss the ball. A lot of universities and academic centers in developing countries have been trying to persuade these highly qualified, motivated diaspora members to come back and contribute to society, but they have not succeeded yet. If we can draw a big plan to produce global citizens through innovative ways such as Fulbright scholarships or Honda Foundation YES Awards, then we can make significant contributions to the well being of developing countries.

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Teruo Kishi, Advisor, the National Institute for Materials Science
Aung Kyaw Myat, Director General, the Department of Advanced Science and technology, the Minister of Science and Technology, Myanmar
Hiroyuki Watanabe, Chairman, ITS Japan (Senior Technical Executive, Toyota Motor Corporation)
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