

Basic Information Survey for
ASEAN University
Network/Southeast Asia
Engineering Education Development
Network Project

Summary

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1. Outline of the Study

(1) Background and Objective of the Study

1) Background

Japan is currently conducting the ASEAN University Network/Southeast Asia Engineering Education Development Network (AUN/SEED-Net) Project, aiming to activate internationally competitive personnel in leading engineering educational institutions in the region. The Network consists of 19 leading Member Institutions from 10 ASEAN countries with the support of 11 leading Japanese Supporting Universities. The main objective of the project is to achieve sustainable social and economic development in ASEAN countries through training/producing competitive personnel.

During the Phase 1 (2003-2008), the AUN/SEED-Net Project aimed to enhance educational and research capacities of Member Institutions with the following expected outputs:

1. Faculty qualifications are upgraded through acquisition of graduate degrees
2. Host graduate programs are enhanced
3. Joint activities and human linkage among Member Institutions are promoted through networking activities
4. Information dissemination system, activity management system, and communication network are established.

At the end of Phase I, the project objectives were mostly achieved through active exchanges of resources among the Member Institutions and stronger relationship with the Japanese Supporting University Consortium. Currently Phase II of the project is in process.

Phase II of the AUN/SEED-Net Project (2008-2013) has been built on the achievements of Phase I and the expectations towards the future of the Project by the Member Institutions. The goal of this phase is to establish a sustainable framework of human resource development network in engineering field, aiming at contributing to the ASEAN region's development, under the ownership of the member countries. Four outputs expected in this phase are:

1. Capacity enhancement of the member institutions
2. Collaborative research for industry and community
3. Further strengthening of engineering network
4. Preparation for the Japan-ASEAN Graduate School Consortium of Engineering

Phase II of the project will end in March 2013 and it is necessary to review the future cooperation framework by Japan in order to further develop engineering education in ASEAN countries.

2) Objective

The objective of the study is to gather the basic information to review cooperation framework

for future cooperation between Japan and ASEAN countries in order to enhance the engineering education in the region. In order to achieve this objective, the Study team has collected information regarding present situation and challenges regarding development of competitive personnels in engineering fields. The Study team also analyzed the present situation of internationalization/ globalization of higher education sector (mainly the higher education institution) in ASEAN and Japan.

3) Study areas

This Study covers ASEAN region, mainly focusing on 8 countries: Malaysia, Thailand, Indonesia, the Philippines, Vietnam, Cambodia, Laos and Singapore. It also looks at cases in Japan.

For the field study, the Study team has visited Thailand, Indonesia, Vietnam and Singapore. Thailand and Indonesia were selected since they have more Japanese companies' local offices and those countries likely to have higher demand for competitive personnel to achieve further industrialization. Vietnam was selected as an example of an emerging economy in ASEAN region and Singapore was selected for the high presence of regional headquarters of Japanese companies.

Furthermore, the Study team has conducted questionnaire survey in Thailand, Indonesia and Vietnam and gathered raw data for quantitative analysis with regard to the demand for competitive personnel in the industry. The questionnaire was distributed to local and Japanese companies (approximately 100 companies in total) which operate in these three countries. Questionnaire was also sent to member institutions of AUN/SEED-Net in Laos, Cambodia, and the Philippines to capture the current programs which are designed to develop skilled engineers in higher education level.

(2) Content and Methodology of the Study

1) Content of the study

Content of the Study is shown below. Chapter number shown in the blanket indicates the chapter in the report which describes each topic.

- ① Activities and Achievements of AUN/SEED-Net Project (Chapter 2)
- ② Analysis of the industrial development in ASEAN (Chapter 3)
- ③ Demand for high-skilled personnel from the industries in ASEAN (Chapter 4)
- ④ Government initiative for the development of high-skilled human resources in ASEAN; present situation, needs and challenges (Chapter 5)

- ⑤ Activities by Universities for the development of high-skilled human resources in ASEAN; present situation, needs and challenges (Chapter 6)
- ⑥ Collaboration between academics and professionals in ASEAN; present situation, needs and challenges (Chapter 7)
- ⑦ Addressing regional issues in ASEAN; present situation and challenges (Chapter 8)
- ⑧ Higher education sector internalization in ASEAN and Japan; Present situation, challenges and needs (Chapter 9)

2) Process of the Study

Process of the Study is as follows;

① Process of the Study: Preparation for the field study

- Data and information collection for each topic
- Review of study methodologies
- Preparation of the inception report and questionnaire

② Process of the study: Field study

- Interview and questionnaire survey for government agencies, universities and related organizations in Thailand, Vietnam, Indonesia and Singapore
- Interview and literature review in Japan
- Interview to academics
- Interview to Japanese universities
- Interview to Japanese companies

③ Process of the study: After the field study

- Analysis of information based on field study and literature review
- Preparation of the Draft Final Report
- Review of the Draft Final Report
- Preparation of the Final Report

2. Activities and Achievements of AUN/SEED-Net Project

In Chapter 2, as a preliminary step in considering the future direction of SEED-Net, activities, achievements and challenges of SEED-Net in the past are analyzed. Based on these analyses, the future prospects of member institutions will be clarified.

(1) Activities of the SEED-Net

SEED-Net is an international human resource development program aimed at promoting the development of engineering human resources that contributes to the sustainable and steady economic growth in ASEAN countries. The full operation of SEED-Net started in 2003 based on the cooperation between 10 ASEAN countries and Japan. During the Phase 1 (2003-2008) and Phase 2 (2008-2013) of the project, following three outputs were expected; “educational and research capacity enhancement of member institutions”, “collaborative research for industry and community” and “further strengthening of engineering network”. Following specific activities or programs were conducted to realize these outputs.

Programs on educational and research capacity enhancement of member institutions
<ul style="list-style-type: none">• Master’s Degree Program• Doctoral Degree Sandwich Program• Short-term Study Program in Japan (for Sandwich students)• Doctoral Degree Program in Japan• Doctoral Degree Program in Singapore• Short-term Visit Program in ASEAN• Short-term Research Program in Japan• Research Program for Alumni Members
Programs on collaborative research for industry and community
<ul style="list-style-type: none">• Collaborative Research• Japanese Professors Dispatch
Programs on further strengthening of engineering network
<ul style="list-style-type: none">• Regional Conference

(2) Achievement of the SEED-Net

Through the programs mentioned above, following outputs were achieved.

Programs on educational and research capacity enhancement of member institutions
<ul style="list-style-type: none">• Faculty's quality in member institutions were improved (increase number in the acquisition of graduate degrees, etc)• Quality of post-graduate research and education programs in member institutions were improved (promotion in English programs, increasing in the number of research projects and academic papers, etc.)• Autonomy of member institutions were promoted (enhancement of the network with other universities, promotion in getting external funding, etc.)
Programs on collaborative research for industry and community
<ul style="list-style-type: none">• More than a thousand academic reports were created from 700 projects. Many of them contain number of cross-border issues including disaster prevention and environmental protection.
Programs on further strengthening of engineering network
<ul style="list-style-type: none">• Network building between member institutions were promoted (operation of seminars in different field, researchers' exchange visits between universities, sharing of regional issues, etc.)
Others
<ul style="list-style-type: none">• SEED-Net operation system was established (monitoring activities by secretariat, regular distribution of newsletters, establishment and management of website, etc.)

(3) Challenges of the SEED-Net

For each programs, following challenges are being addressed.

Programs on educational and research capacity enhancement of member institutions
<ul style="list-style-type: none">• Further enhancement on independence and sustainability (securing of external resources, promotion of knowledge transfer from Japan, etc.)• Research support for Alumni (equipment transfer, utilization of research funds, etc.)• Setting up deadline for the Sandwich Ph.D enrollment (age setting in accordance with actual conditions)• Continuous collaboration with host universities during the enrollment in the Doctoral Degree Program in Japan (seminars, joint research, short term visit to Japan by professors, etc.)• Expansion of the number of exchange students within ASEAN region and to Japan (cost sharing, utilization of external funds, etc.)

Programs on collaborative research for industry and community
<ul style="list-style-type: none"> • Appropriate theme setting for joint research (through the consultations between participants, etc.) • Human resource development for practical applied research (development through the collaboration with industry, etc.) • Enlargement on the fund support (utilization of the matching funds, etc.)
Programs on further strengthening of engineering network
<ul style="list-style-type: none"> • Redefine the purposes and functions of seminars (reorganize by the consultations between participants, etc.) • Responses to the expanding demands from member institutions (support for spillover effect to other universities through member institutions, etc.) • Clarification of partnership principles (setting up of common ground for university network, etc.) • Further development of output system (publishing high quality and internationally recognized journals, etc.) • Gap between universities in ASEAN region (quality assurance among universities, etc.)
Others
<ul style="list-style-type: none"> • Clarify advantages of SEED-Net compared to other study abroad programs and improvement in publicity (strengthening of educational and research capacity of member institutions, active publicity to the universities sending out students, etc.) • Increase number of professors sent from Japanese supporting universities to member institutions. Make sending term longer for those professors. (Expansion of opportunities, etc.) • Balance enthusiasm among host universities (review of the roles between universities, etc.) • Decentralization of secretariat functions (transfer of function based on the situation of each university, etc.)

(4) Future perspectives of the SEED-Net

Figure 2-1 shows the result of the questionnaire survey which asked the SEED-Net member institutions about their future perspectives of the SEED-Net project. Most institutions show high expectation for “promotion of university-industry collaboration (joint researches, personnel exchanges, etc.)” (83.3%), followed by “improvement of research activities in universities” (66.7%), “functional enhancement on development and production of human resources in graduate” (58.3%), and “promotion of joint research among universities in ASEAN” (58.3%). 50% said “strongly agree” for “Construction of system for joint degree or education programs with Japanese universities”, while only 8.3% said the same for ASEAN universities. It shows the high expectation from member institutions to enhance collaboration between Japanese universities.

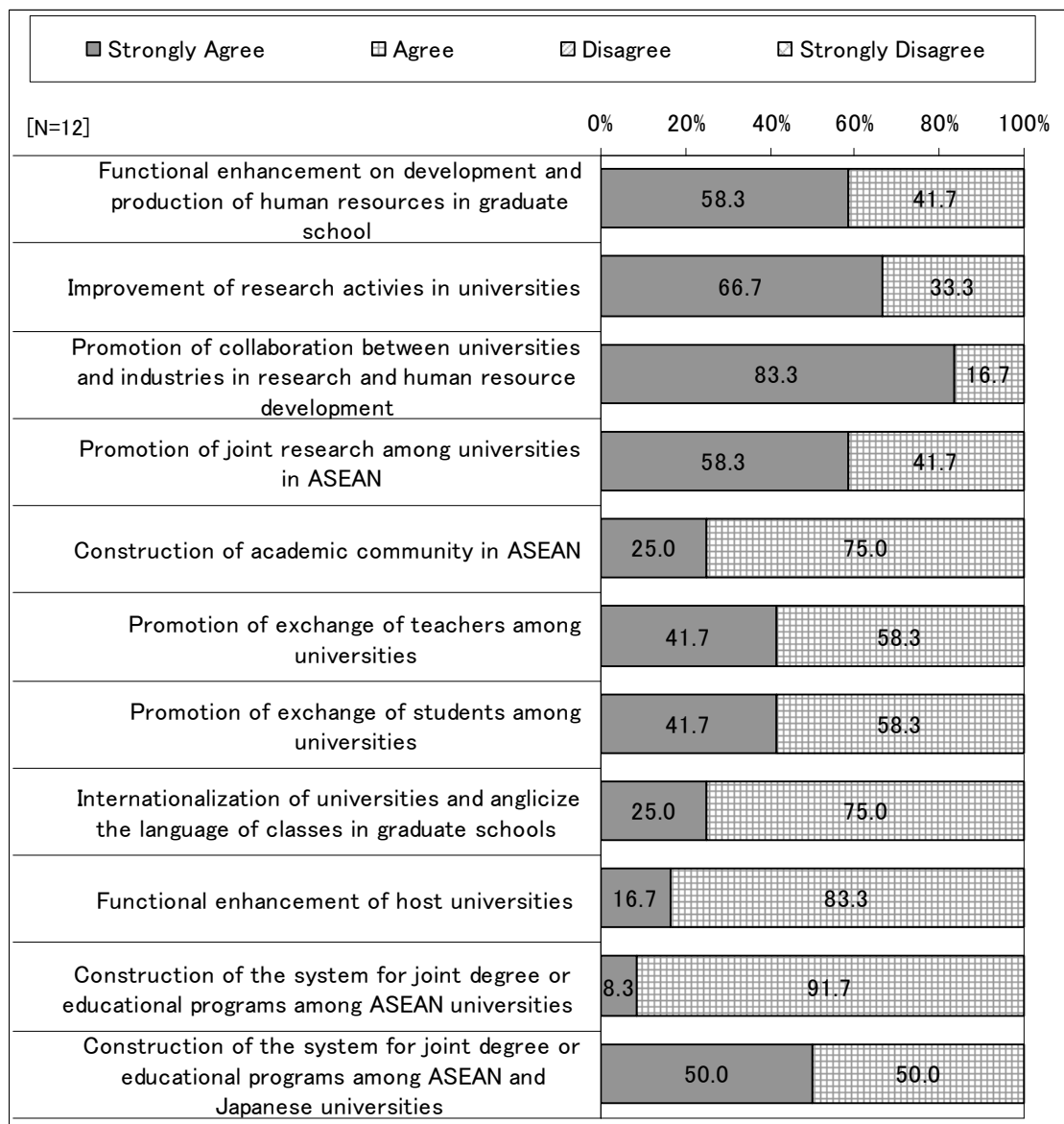


Figure 2-1: Challenges in high-skilled engineering human resources of the SEED-Net member institutions

3. Analysis of the industrial development in ASEAN

In Chapter 3, the present situation, challenges and needs for industrial development in Southeast Asia will be examined. ASEAN countries have been experiencing rapid upgrading of industries, and its traditional position as Japanese companies' "production base" is now shifting to the new "gateway to emerging market".

(1) Changes in economic/industrial structure of ASEAN countries

1) Present situation of ASEAN's economy

In 2009, the overall GDP per capita of ASEAN countries were 2,533 USD. While in 2009, original members of ASEAN countries reached 3,204 USD, while the GDP per capita of late-comer ASEAN countries was only 823 USD, or about one fourth compared to that of the original members. Although the 1997 Asian Financial Crisis significantly damaged the economic growth of ASEAN countries and dramatically decreased the overall growth rate of ASEAN countries by -7.4% in 1998, its impact on new members was relatively slight, as these new members achieved economic growth rate of +5.7% in 1998.

2) Changes in economic/industrial structure in ASEAN countries

① Changes in the composition of GDP and working population by industrial sector

The GDP share of secondary industries in all ASEAN countries is expanding. This trend can especially be observed among the new members, which have been rapidly industrializing. While the composition of industry changed only slightly in original members of ASEAN countries, new members of the ASEAN experienced obvious shift towards the manufacturing industry.

② Trends in industrial development

a. Trends in innovation

ASEAN countries are experiencing rapid industrial development and advancement and Gross Domestic Expenditure on R&D (GRED). Demand for R&D is also increasing. Therefore, it is expected that there will be an increasing need for higher education to support R&D and industrial development. World Bank's "Innovation Index" also demonstrates a similar trend. For the second group (Malaysia, Thailand, the Philippines) and the third group (Indonesia, Vietnam, Laos and Cambodia) to join the first group (Singapore) in the next 10~20 years as expected, it is an urgent task for these countries to develop high-skilled human resources.

b. Trends in trade

Previously, ASEAN was regarded as regional production network, which provide final project to developed countries while dividing production process among member countries. However, there's a growing trend that ASEAN region is becoming production and distribution network. Considering these changes, it is believed that R&D on local demand-oriented products will become more important.

(2) Trends in policies in response to changes in economic/industrial structure

1) Political trends in more advanced ASEAN countries

① Malaysia

“The New Economic Model” (NEM) and the “Tenth Malaysia Plan 2011-2015”, announced in June 2010, are basic policy documents regarding economy and industry in Malaysia. Policies established by the government, including these two plans, highlight the importance of science and technology in industrial development and advancement. The budget for the Ministry of Science Technology and Innovation is increasing steadily.

② Thailand

The government has set the industrial structure reform as one of its goals in its “Tenth National Economic and Social Development Plan”. According to the “National Science Technology Development Plan 2004-2013”, the government aims to develop a knowledge-intensive and innovation-based manufacturing industry by 2013. In terms of actual budget provision, except in 2009 when the global economy fell into recession after the Lehman Shock, the Ministry of Science and Technology’s budget has grown gradually since 2007, showing that science and technology oriented policy has been steadily put in effect in Thailand.

③ Indonesia

According to the “Long-term Development Plan” (RPJP) of The National Development Planning Agency (BAPPENAS), science and technology are considered one of the priority areas, and development and promotion of science, technology and R&D are essential to Indonesia’s economic growth. However, spending on R&D has been decreasing since the financial crisis in the 1990s. Indonesian Government is planning to increase the R&D budget to sufficient level.

④ The Philippines

In the “Mid-term Philippine Development Plan 2011-2016” (MTPDP 2011-16) established by

the National Economic and Development Authority (NEDA), the Philippines have set the goal of strengthening the manufacturing and service industries. They also have a plan to focus on nurturing industries which possess the highest growth potentials and generate the more jobs, such as tourism, BPO, mining, agri-business, ship building, housing, electronics, and infrastructure. Based on these policies, budget of the Department of Science and Technology (DOST) has also been steadily increased.

2) Political trends in new members of ASEAN countries

① Vietnam

Based on the “Five-Year Socio-Economic Development Plan 2011-2015”, Vietnam has set up the “Innovation Partnership Programme” (IPP) to promote scientific and technological innovation. It has also been strengthening industry-academic collaboration and public-private partnership. Vietnam’s science and technology budget has also been increased, and in 2010 reached about 23.7 billion yen, which nearly doubled that of 2006.

② Cambodia

The Supreme National Economic Council, which is an affiliate of the Ministry of Economy and Finance and is the policy-making center in Cambodia, aims to develop the industries through advancement of existing industries and industrial diversification. Regarding the latter, the government of Cambodia considers 1) cutting-edge technology (technological development), 2) heavy industries (supply of oil in ASEAN etc.), and 3) creative industries (cultural and art hub of ASEAN) as “high potential sectors” to be strengthened.

③ Laos

Under the “Sixth National Socio Economic Development Plan 2006-2010”, while Laos retains its current policy of industrialization promotion, it also aims to graduate from its Least Developed Country (LDC) status by 2020.

(3) Movements of China and Korea in ASEAN

In response to political movements in ASEAN countries, China and South Korea, which have been increasing their presence in the region, are actively offering scholarships and accepting foreign students from ASEAN. In addition, they are also playing an active role in promoting cooperation and partnership with higher education institutions in ASEAN.

China is placing emphasis on strengthening its relations with ASEAN in both political and

economic terms. Partnership in the field of higher education is regarded as one of the important factors which can contribute to strengthen the relationship with the region.

South Korea had been actively sending their students abroad until 2000. However, since 2001, the South Korean government has changed their policy and started to focus on accepting foreign students.

(4) Trends of Japanese companies in ASEAN

According to the study conducted by Japan Bank for International Cooperation and Japan External Trade Organization, activities of Japanese companies in the ASEAN can be described as follows.

1) Basic trends in Japanese companies in ASEAN

As for the business operations in the next 1~2 years, most Japanese companies are considering expanding or maintaining their overseas bases. In the medium term, promising countries by business are 1) Vietnam, Indonesia and Thailand in chemical sector, 2) Thailand, Indonesia and Vietnam in automotive sector, 3) Vietnam, Thailand and Indonesia in electrical and electronics sector, and finally Vietnam, Indonesia and Thailand in general mechanics sector.

2) Recruitment and development of high-skilled human resources

Many companies pointed out “recruitment of executive candidates” and “training of local staffs” as difficulties when localizing their operation. 40% of the interviewed companies answered that they are recruiting and developing human resources globally.

3) R&D centers

Although only 2.1% of the interviewed companies have established basic research centers in overseas (emerging countries) at present, this ratio increases to 6.2% in applied research, 16.0% in plan/design and 22.7% in product development/trial manufacture. More companies are engaging in development in overseas (emerging countries).

4) Trends in strategic overseas advance in the future

① Policies on the local market-oriented sales rate

Regarding expanding/maintaining/reducing local market sales in the total overseas sales, it was revealed that 50%~70% of the interviewed companies plan to increase the ratio of local

market-oriented sales in all sectors in the future.

② **Functional changes of overseas bases**

Functional changes of overseas bases of Japanese companies over the past year (2009-2010) are as follows.

a. Production

There was a relatively strong growth in Thailand and Indonesia in production. In contrast, there was a slight reduction in Vietnam.

b. R&D

R&D is being strengthened in Malaysia, Thailand and Singapore, while in Indonesia, the Philippines and Vietnam, it is being reduced.

③ **Direction for expansion of Japanese companies by country**

Regarding the expansion of the overseas bases in the next 3 years in terms of 1) sales, 2) production and 3) R&D, most companies in the 6 countries (Malaysia, Thailand, Indonesia, the Philippines, Singapore and Vietnam) consider strengthening the sales. In addition, a trend to strengthen production and R&D can be observed in Thailand and Singapore.

④ **Summary**

Japanese companies always plan to increase its sales aimed at local markets in their overseas operations, and a similar trend can be observed with companies operating in ASEAN countries.

Among functions of overseas bases in the last year, the R&D has been enhanced in Malaysia, Thailand and Singapore. In the next three years, with enhancing sales as the core, Japanese companies are expected to actively expand its operation in the local markets in all ASEAN countries. In other words, the role of overseas bases is beginning to shift from its current “production base” and to put stronger focus on meeting the demand of the local markets.

4. Demand for high-skilled personnel from the industries in ASEAN

In Chapter 4, the needs, especially present situation of the quality and quantity of high-skilled human resources in each country and sector of ASEAN will be analyzed and classified based on the results of the field and questionnaire survey. Besides, the present situation, challenges and required skills of engineers are also examined. Industrial requirements for local/Japanese government and universities in ASEAN will also be discussed

(1) Overview of the field and questionnaire surveys

1) Overview of the field study

The field study was conducted in Thailand, Vietnam, Indonesia and Singapore. Through interviews with Japanese companies which operate in these countries, present situation, challenges and needs of high-skilled human resource development (HRD) were analyzed. Specifically, study team visited Japanese enterprises and local conglomerates, and interviewed about their needs and difficulties in acquiring high-skilled human resources. The research team was divided into two teams, and conducted the survey from late July to early August.

Companies interviewed: Japanese enterprises and local conglomerates engaged in electronics, IT, mechanical manufacturing, material chemistry and civil engineering.

Main questions: company attributes, present situation of the demand and supply of human resource and HRD, present situation and difficulties in acquiring engineering human resources, present situation of industry-academia collaboration, expectations toward higher education institutions and the governments.

2) Overview of the questionnaire survey

In order to obtain more detailed information about the needs of industrial human resource development as well as the present situation and needs of industry-academia collaboration, questionnaire survey was conducted with Japanese enterprises and local conglomerates in Thailand, Indonesia and Vietnam. In total, around 70%~80% of the surveyed companies are Japanese enterprises, and the rest 20%-30% are local conglomerates. In terms of company selection, four prioritized fields, electronics /IT / telecommunication, mechanical manufacturing, material chemistry, and civil engineering, were covered. The balance among each sector was also taken into consideration. As for the questionnaire collection, responses were received from 100 companies in Thailand, 107 in Vietnam and 101 in Indonesia. The questionnaire items are

as follows.

- Type of human resources with high demand
- Whether human resources with soft skills and engineering expertise of high standards have been produced since the introduction of the SEED-Net project
- Request for the supply side of human resources (universities)
- Request for the government's policies on highly-skilled human resource development
- Present situation and challenges of industry-academia collaboration
- Changes in human resources requirements along with the industrial development in ASEAN and the emergence of India/China
- Expectations for the SEED-Net's next project

(2) Present situation, challenges of the demand and supply of high-skilled human resources

According to the field and questionnaire surveys conducted in 3 countries, it was found that while human resources with basic skills and manners that are essential as a business person (such as reporting, discussing and consulting), the problem-solving ability, (especially the ability to analyze present situation and find solutions), soft skills (particularly the communication skills), and teamwork ability to cooperate with other employees to perform their tasks. These attributes are required by the enterprise side but still insufficient at the present.

At the present, engineering human resources at graduate level is needed for R&D and subordinates supervising positions. For these positions, together with the high-level expertise, the expected attributes include leadership ability, innovation capability, project execution capability, and a business mind. In particular, these capabilities are most strongly demanded for employees in charge of R&D in the field of material chemistry. It was also revealed that in order to secure the manpower for R&D, big companies have already started to strengthen their R&D human resource backup system, by introducing their own training programs to improve on the insufficient skills, or providing curriculums aiming to strengthen the employees' business mind through cooperation with universities overseas, etc.

(3) Present situation and challenges of engineering talent

1) Recruitment situation and skills required

As for the recruitment situation of electrical electronics, machinery manufacturing industries in Thailand, Indonesia and Vietnam, most enterprises usually recruit engineers of undergraduate level from local universities and they do not differentiate between graduates and higher education graduates. At this stage, since many companies do not possess R&D capabilities, most engineers needed for enterprises are production engineers who can perform steadily based on their technology skills. However, for enterprises which are considering about cooperating with foreign counterparts, advancing overseas, and transferring R&D function, there is an obvious need for high-skilled human resource of graduate level. Similarly, enterprises in material chemistry industry, especially the large conglomerates, are actively cooperating with universities overseas as well as local universities in order to secure the required manpower for research and product development.

2) Present situation of engineering employees and recruitment intention in the future

According to the result of the interview in Thailand, major local conglomerates in material chemistry industry are satisfied in the basic technological skill level of their employees. At the same time, regarding human resource in the fields of mechanics, manufacturing, electrical and electronics, cutting-edge technology is often required, while for material engineering talent, more general topics is preferred.

In Vietnam, the demand for graduates is not very significant. But as some enterprises indicated that they would recruit graduates with practical experiences, technical and soft skills, it is possible to say that there is an increasing trend of recruitment of high-skilled human resource in the future.

The interview result in Indonesia also reveals that enterprises in material chemistry industry are satisfied with the basic technological standards of their employees.

3) Vision of recruitment after five years

Regarding the vision for recruitment of engineering human resources in both electrical electronics and material manufacturing sector, enterprises which are likely to advance overseas or cooperate/merge with foreign firms are also likely to recruit engineer undergraduates.

On the other hand, regarding recruitment of human resource in the filed of chemistry in Thailand and Indonesia, as some enterprises have already started to secure their manpower

through cooperation with universities overseas as well as local universities and utilization of Ph.D holders' network, it is expected that the needs for high-skilled human resource in material chemistry will increase.

4) Human resource at graduate level needed by enterprises

In Thailand, a number of major chemistry enterprises indicated that they lack employees acquired with soft skills including communication, leadership, language ability, expertise as well as those who can lead research development in the future. According to the questionnaire survey results, it was also found that there is a great need for human resource with both technological and soft skills.

For the IT industry in Vietnam, as needs for human resource on R&D and graduates acquired with technological and soft skills have been recognized, recruitment demand of high-skilled human resource is likely to increase gradually in the future.

For Indonesian enterprises which are considering expanding their business domains and enhancing their R&D function in the future, along with the increase of employees, it is expected that the demand for high-skilled human resources with technological skills will also increase. Particularly, there is a great demand for Master and Ph.D graduates in material chemistry industry. Human resources with soft skills including communication, leadership, language ability, expertise and those who can lead research development are also needed.

(4) Expectation for toward local universities and governments on industrial human resource development

In Thailand and Vietnam, main expectations include improvement of local universities in various aspects, including strengthening all resources within universities, expansion of cooperation framework and enhancement of collaboration with other local universities. On the other hand, in Indonesia, although expectation for expansion of people, goods, and money resources within universities is high, the ratio of enterprises that desire enhancement of intra-ASEAN and cross-ASEAN framework is not significant.

In terms of policies, there is high expectation toward the government of Thailand in various aspects, including the improvement of faculties, facilities, equipments and enhancement of intra-ASEAN and cross-ASEAN framework. On the other hand, in Indonesia and Vietnam, although there is high expectation for resources enhancement support from the public sector, the ratio of enterprises that desire enhancement of intra-ASEAN and cross-ASEAN framework is not so obvious.

5. Government initiative for the development of high-skilled human resources in ASEAN; present situation, needs and challenges

Chapter 5 looks into higher education policies of ASEAN countries to understand the present situation of high-skilled human resource development policies by governments of the Southeast Asia Region, and further clarifies issues that need to be addressed in the future.

(1) The Situation of Governments in High-Skilled Human Resource Development

1) ASEAN Countries : Original Members

Malaysia has achieved economic growth from an early stage among the ASEAN countries and has adopted advanced policies for intellectual activities and higher education. The Malaysian Government has placed production of high-skilled human resource as one of the major roles of higher education institutions and has facilitated collaboration between industry and academia. The Ministry of Higher Education formulated the National Higher Education Strategic Plan (PSPTN) in June 2007, which stipulates the principle for strengthening higher education with the aim of establishing itself as a developed country by 2020. This plan divides the term from 2007 to 2020 into four phases and has set target goals for each phase.

Thailand has been active in promoting economic reform to recover from the economic crisis in 1997. Upon facilitating such industrial renovation, the Government of Thailand regarded development of high-skilled human resources as a national policy agenda as well as strengthening higher education. The Second 15-Year Long-Range Plan on Higher Education of Thailand sets the policies to be implemented in the 15-year period from 2008 to 2022, which sets its goals as enhancing the quality of higher education to support employment of graduates, as well as leveraging Thailand's international competitiveness through accumulation of knowledge and innovation, and ultimately achieving sustainable development.

In Indonesia, former-Minister of the State Ministry of Research and Technology (RISTEK), B.J. Habibie (the third President of Indonesia), installed in 1998 the Indonesian Strategic Industries policy to cultivate key industries for economic development in order to make the transition from an industry structure reliant on natural resources to a knowledge economy. In this process, through the Master Plan for the Acceleration and Extension of Indonesian Economic Growth (MP3EI), the Indonesian Government regards human resource development in the field of Science and Technology (S&T) as a vital policy for achieving innovation. The Government has also formulated in 2003 the Higher Education Long-Term Strategy 2003-2010, which indicates the principles of high-skilled human resource development through improving the quality of higher education. This strategic plan especially focuses on enhancing

independency of public higher education institutions, to increase autonomy of research institutions as well as to diversify means of funding for higher education that centered on public expenditure in the past. The Government is currently undergoing the formulation of Higher Education Long-Term Strategy 2011-2020 that shall serve as the long-term strategy until 2020.

The focus of the Government of the Philippines rests on industrial development for increasing employment and economic development, especially transition into a knowledge-based economy. The Midterm Development Plan—the Government’s national development plan—sets its goal to advance its manufacturing and service industries by attracting foreign investment, developing human resource to reinforce international competitiveness, and supporting small and medium sized companies. The Philippine’s main policies regarding higher education are set forth in the Second National Higher Education Research Agenda that came into effect in 2009. Its goals are to enrich the research capacity of higher education institutions to strengthen global competitiveness and linking research findings to industrial application. It plans to provide scholarships and grants for presentations abroad and research activities, as well as enriching graduate programs in key fields of study.

2) ASEAN Countries: New Members

Aware of the need to reform domestic industrial structure and attract foreign investment for maintaining high economic growth, establishing a system to promote innovation and research and development (R&D) in S&T is an urgent issue for the Government of Vietnam. Under this circumstance the Cabinet has in 2005 decided upon the Higher Education Reform Agenda (HERA) 2006-2020—a long-term strategic plan for higher education reform—and under this agenda, aims to increase enrollment rates by three to four times by improving higher education both in terms of quantity and quality, thereby making research that meet the international level possible. The Cambodian educational policy document—2009-2013 Education Strategic Plan—aims to achieve improvement in the quality of education through developing human resource that contribute to advancing industry by investing on educational methods and curriculum, besides infrastructure of higher education institutions. The agenda also sets the target to increase enrollment from 137,000 in 2008-09 to 195,617 in 2013-14 apart from setting the goal to increase enrollment in graduate natural science programs by 15~20% by 2013-14. The Government has been promoting scholarships to ensure access to higher education, aiming to increase the amount to 40,568 million Cambodian Riels, ten times the amount of 2010. The Government also supports study-abroad programs for Cambodian students to provide them with high-quality learning experience.

The Laos Government has set its goal to depart from its Least Developed Country status by

2020 through achieving an annual growth rate of 8% in the period 2011-2015. To realize this goal, the Laos Government aims to first secure the supply of labor force equipped with basic skills and therefore places emphasis on skill development and vocational training, besides enhancing access to elementary and secondary education to reduce poverty. As demand for poverty reduction and social development still looms large for Laos, specific policies for high-skill human resource development are yet to be formulated. As for the expansion of higher education, the draft document of the Seventh Socio-Economic Development Plan 2011-15 provides that policies to support talented students for paths in research and managerial positions should be formulated, besides enhancing the capacity of universities to promote learning activities in fields of S&T and foreign languages, both of which are vital in economic growth.

(2) Issues and Needs of Human Resource Development from Governments

The common issue for ASEAN countries in high-skilled human resource development is developing human resource that meets the demands of the industrial sector. All governments regard providing adequate human resource for developing domestic industries as a crucial role of higher education institutions and aims to reflect human resource development needs of the industrial sector through industry-academia collaboration. For example, Malaysia has put in effort to promote industry-academia collaboration taking into account the needs of the industrial sector, apart from strengthening ties with prestigious foreign universities and research facilities and actively engaging in attracting foreign firms to accelerate high-skill human resource development. Thailand and the Philippines have similarly set forth policies to strengthen collaboration between industry and academia.

Human resource development in the field of engineering is also a pressing issue. In Thailand and the Philippines, higher education graduates of engineering are few in number relative to social science graduates, and it has been pointed out that this may be one of the reasons why the needs of the industrial sector have not been sufficiently addressed. In these countries, human resource development for engineers is recognized as important for supporting industrial development.

For the less-developed ASEAN countries, the main issue involving higher education is providing infrastructure and securing funds for R&D. Especially in Cambodia and Laos, primary and secondary schooling has been the main socio-economic focus for governments, and policy formation for higher education lags behind.

6. Activities by Universities for the development of high-skilled human resources in ASEAN; present situation, needs and challenges

In Chapter 4 and 5, needs and directions to develop high-skilled human resources of industries within the Southeast Asia region are explained. Based on these results, Chapter 6 will analyze efforts, outcomes and challenges in high-skilled engineering human resources development of local universities, especially those in the AUN/SEED-Net

(1) Trends in high-skilled engineering human resources development in ASEAN region

So far, ASEAN countries have continuously increased the number of students/graduates in higher education institutions. This can be viewed as an index which suggests the possibility that high-skilled engineering human resources are successfully produced. However, in terms of developing/producing human resources with knowledge/skills/productivity demanded by industries, it is difficult to consider that universities in Southeast Asia region are properly functioning, both in quantitative (number of graduates with required knowledge) and qualitative (levels of knowledge/skills of graduates and education/research of institutions) aspects.

In fact, in Southeast Asia, the ratios of companies that consider the standards of employees' skills as a major issue for their business deployment are in single digit in Indonesia, the Philippines, and Vietnam, which are 5%, 8%, and 9% respectively. On the other hand, this ratio is around 15% in Cambodia and Laos, more than 20% in Malaysia, and slightly less than 40% in Thailand. This suggests that universities are not yet sufficiently responding to the high needs for the human resources with adequate skills¹.

According to the World Bank (2011), one of the major background factors of such situation is a disconnect between universities and employers². That means, a certain number of companies consider the employees' skill standards as an issue, because the education methods, curriculums, and degrees provided by universities do not sufficiently contribute to build skills that are demanded by employers. Specifically, education methods are teacher-centered (one-way knowledge transmission type), curriculums are not built based on demanded abilities, students are unevenly-distributed in departments/classes. For example the ratio of students is high in social sciences, while it is low in natural science and engineering which are the growth fields. These are the issues that need to be addressed.

As stated above, universities in Southeast Asia in general are not necessarily developing high-skilled engineering human resources at a satisfactory level, but member institutions of the

¹ World bank Enterprise Surveys (<https://www.enterprisesurveys.org/Custom/Default.aspx>)

² World Bank, "Skills and Innovation for Productivity and Growth: Higher Education in East Asia", 2011 (Background Briefing for East Asia Summit Education Ministers Meeting, Bali, Indonesia)

AUN/SEED-Net indicate a strong desire to develop/produce the high-skilled engineering human resources that match with the needs of industries.

(2) Efforts by universities to develop high-skilled engineering human resources in ASEAN region

Regarding efforts to develop high-skilled engineering human resources, among the 12 AUN/SEED-Net universities that took part in the questionnaire survey, 11 (92%) are making efforts to understand the industries' needs (through interview with companies etc.), promoting internship at companies for their students, and encouraging students to study abroad. 10 universities (83%) are revising their curriculums to reflect the needs of industries, and providing lectures with lecturers from the industries. In addition, 7 universities (58%) are increasing the number of students who advance to master courses, and 6 universities (50%) are employing staff members from the industries.

(3) Achievements through efforts by universities to develop high-skilled engineering human resources in ASEAN region

Regarding efforts to develop high-skilled engineering human resources, among the 12 AUN/SEED-Net universities that took part in the questionnaire survey, all consider they have produced master course graduates with necessary basic academic capacity required by the industries, as well as produce graduates with expertise to be able to be success in the industries. On the other hand, only 3 universities (25%) strongly agree that they are producing master course graduates global sense, i.e. cross-cultural understanding, language capacity, etc.

(4) Challenges in high-skilled engineering human resources development of universities in ASEAN region

Regarding challenges (aspects to be improved) in high-skilled engineering human resources development, 12 AUN/SEED-Net universities were asked about the challenges they are facing. According to their answers, the most common challenge is securing fund for high level education/research, with strong agreement from 8 universities (67%), followed by "securing facilities/equipments for high level education/research" with 7 universities (58%), and "increasing the number of students who advance to master courses" with 6 universities (50%). However, 3 universities (25%) disagree to consider "increasing the number of students who advance to master courses" as a challenge, indicating a gap in problem recognition among member institutions. Finally, challenges which are stated herein do not necessarily reflect the

current standards of high-skilled engineering human resources development, but originate from their high expectation for improvement. To put it another way, it should be noted that some actual challenges were probably not mentioned due to a lack of interest from the universities.

7. Collaboration between academics and professionals in ASEAN; present situation, needs and challenges

With increasing income level in ASEAN region, a shift in consumption trend from low-end to high-end products has been observed. To be able to take advantage of this shift, the industries are required to build production systems which meet the demand of the market and be more technologically innovative. Collaboration between university and the industry is one important way to drive technology innovation forward. From this viewpoint, Chapter 7 examines university-industry collaboration practices, analyzes the present situation, challenges and needs, and shows the importance of this collaboration in the region.

(1) Main collaboration practices in ASEAN countries

The SEED-Net member institutions have recognized the importance of university-industry collaboration and have been taking action to promote activities in this area. There are various instances of this type of collaboration

(2) Challenges and needs of industries and universities

1) Challenges and needs of industries

① Challenges and needs of industries in Thailand

According to questionnaire results, in Thailand, there are many companies which not only manufacture, but also develop products tailored to meet the local demand. Regarding the direction in the next 5 years, companies show a willingness to expand business in all the concerned areas and to collaborate with universities. Their biggest aim by collaborating with universities is “human resources development”, followed by “technology seeds generation”, “research collaboration” and “contract research”. Regarding collaboration with universities, industries in Thailand not only hope to develop human resources, but also expect to conduct research and development. In the next 5 years, with “human resources development” at the core, many companies hope for “technology seeds generation” or “latest information/technology introduction”, demonstrating that the industry is willing to engage in product development through collaboration with universities.

② Challenges and needs of industries in Indonesia

In Indonesia, currently the most important function of interviewed companies is “production/manufacturing”. Other main functions are “modification, localization of existing

products”, “new product development and design for local demand” and “introduction/modification of existing production line”. On the other hand, the ratio of companies which consider collaboration with universities as a major function is low. Regarding the direction for the next 5 years, it was revealed that most companies’ priority is to enhance “production/manufacturing”. In addition, many companies show a willingness to intensify their function as a production base, as well as promoting modification and development of production line technology. Finally, a large ratio of interviewed companies expressed their desire to increase collaboration with universities in the near future.

The biggest aim of interviewed companies for collaboration with universities is “human resources development”. When asked about their direction for collaboration in the next 5 years, the most common answer is “human resources development”, followed by “building of personal contact: internship acceptance” and “latest information/technology introduction”.

③ Challenges and needs of industries in Vietnam

In Vietnam, the most important function of interviewed companies at the present is “production/manufacturing”. However, research functions such as “basic research”, “applied research” and “development research” and collaboration with universities are not prioritized. In the next 5 years, more than half the interviewed companies chose “production/manufacturing”, demonstrating their emphasis in increasing the capacity as production bases. Besides, many companies also chose “basic research”, “applied research” and “development research”, showing a focus not only on improving production function, but also on R&D function. In the near future, most companies hope to increase collaboration with universities, including companies that are currently being inactive in this area.

The interviewed companies’ biggest aim for collaboration with universities is “human resources development”. However, the number of companies with other aims such as “technology seeds generation”, “research collaboration” or “contract research” or “latest information/technology introduction” is relatively low. However, when asked about the direction of collaboration with universities in the next 5 years, although “human resources development” still retains its place as the biggest purpose, more companies show expectation for “technology seeds generation” or “latest information/technology introduction”, “research collaboration” and “contract research”.

2) Commitment of the SEED-Net members to university-industry collaboration

Many SEED-Net’s member institutions have set up organizations to promote collaboration with the industries. These organizations can be divided into 2 types: those that manage

collaboration activities of the whole university as seen in National University Singapore or Chulalongkorn University, and those that manage collaboration activities of particular fields such as in Hanoi University of Technology. Universities in more developed ASEAN countries mostly have organizations of the former type, and those in less developed counties mostly have organizations of the latter.

3) ASEAN and the SEED-Net's policies regarding university-industry collaboration

More developed countries in the ASEAN region have recognized the importance of university-industry collaboration and have been taking action to promote activities in this area. On the other hand, from the industry side, there have been signs of willingness to expand R&D function and collaboration with the universities as a means to fulfill this purpose.

At the moment, the industry's needs have matched with policy needs. In order to be able to catch up with this increasing need, universities are also required to be more proactive. However, current collaboration between universities and industries are mainly conducted domestically. In order to expand and take full advantage of the resources in ASEAN countries, it is very important to build a cross-border network in the region. Against this background, it is considered that SEED-Net's role is to accelerate its action to ensure this importance is recognized within the region.

8. Addressing regional issues in ASEAN; present situation and challenges

In Chapter 8, regional issues that are being faced by ASEAN countries as well as actions that the SEED-Net member institutions have been taking to address these issues are summarized. In addition, achievements through collaboration among universities in ASEAN region along with challenges are summarized and analyzed in this Chapter.

(1) Present situation of addressing regional issues in ASEAN region

ASEAN region recently has been going through many changes such as the globalization of economic activities, expansion of regional economic integration, and the occurrence of cross-border issues such as environmental problems or natural disasters. It has now become very difficult for a single country to tackle the regional issues by itself, thus resulting in increasing needs for concerted efforts among countries to address these issues. During recent years, there have been various issues in areas considered to be of great interest to the region, i.e. disaster prevention, environment, and logistics, transportation and planning. The ASEAN Secretariat has also recognized the importance of addressing these issues, and has been organizing meetings at the highest levels, such as environmental ministers' meeting, to discuss about countermeasures to the issues. Particularly, themes include environment protection, disaster prevention and transportation and logistics are actively discussed.

1) Result of literature review

Against such background, present situation of addressing regional issues in ASEAN region is reviewed. It is understood that some member institutions of the SEED-Net have recognized the needs to tackle these issues, and have been taking action to address them through activities such as research collaboration.

2) Result of interview and questionnaire survey

In addition to literature review, interview and questionnaire survey were also conducted with the SEED-Net's member institutions. According to these surveys' results, inter-university network building and human resources development have been achieved to tackle the regional issues. The establishment of lectures or courses related to regional issues was also been mentioned as an accomplishment. Besides, according to answers from member institutions, there have been improvements in addressing regional issues in important areas to ASEAN

region, i.e. disaster prevention, environment. In addition, other achievements such as seamless human resource integration and membership acquisition of regional organizations.

(2) Challenges in addressing regional issues in ASEAN region

Although the SEED-Net's member institutions have been taking action to address the regional issues, the scope of their efforts has been somewhat limited. Furthermore, there have been few instances where their research achievements were applied to resolve actual issues. Efforts from the SEED-Net's members to counter with the emergence of cross-border issues such as forest fire or treatment of waste have been considered insufficient.

The biggest challenge according the SEED-Net member institutions is the insufficient budget to implement efforts to address the regional issues. Other challenges include a big gap in research standards, absence of consensus on division of roles among universities in the region, lack of knowledge and skills required for addressing these issues and shortfall in human resources. Other issues that were also mentioned by member institutions include conquering the language barrier and constructing mechanisms to simplify or promote access to experts from oversea universities and industries.

Proposals regarding future approach to tackle the regional issues from member institutions are summarized as follows. First, ASEAN countries' governments are expected to engage more actively in organizing conferences for experts to exchange opinions on addressing regional issues on a regular basis, or increasing support to promote large-scaled research on basic technologies. Besides, as fossil fuel resource within the region is limited, in order to ensure the region's sustainable economic growth, it is important to decrease the region's dependency on this energy source. The region should be more focused on finding a solution to this issue. Some universities called for efforts to promote collaborative research within the region to develop alternative renewable energy sources to replace fossil fuel.

(3) Summary

Result of the literature review as well as interview and questionnaire survey show that, the SEED-Net member institutions have been making various efforts to address the regional issues. However, although positive results from these efforts have been accomplished, there still exists a gap among departments and member institutions in the SEED-Net. Active collaboration is particularly conducted in areas such as disaster prevention, environment and transportation, which are consistent with ASEAN Secretariat's focus agenda.

Furthermore, the survey revealed that there still exist many obstacles in addressing the

regional issues, such as insufficient fund, lack of consensus among countries and member institutions, and lack of human resources with sufficient knowledge and skills. In the future, it is important to organize emerging issues that ASEAN countries are facing, and build a mechanism to efficiently and effectively tackle them, especially in areas such as disaster prevention and environment. In order to realize this aim, key factors such as technological improvement, introduction of Japan's technological experience and know-how, enhancement of collaboration among local residents, communities and the industries should be considered.

9. Higher education sector internalization in ASEAN and Japan; Present situation, challenges and needs

In Chapter 9, present situation of internationalization in universities in the region is reviewed, and challenges that should be addressed in order to promote collaboration and integration in higher education between ASEAN region and Japan are examined.

Interview was conducted with 10 universities in Japan, including the SEED-Net members, to understand the situation in domestic universities. Furthermore, interview with Japanese companies operating in ASEAN region was also conducted to understand the needs for internationalization of ASEAN and Japan's universities from the industry's viewpoint.

(1) Background

Amid the ongoing shift to knowledge-based economics, production and distribution of knowledge and information are becoming the driving forces of each country's economic growth. In particular, being faced with the ongoing decline of birthrate and aging population, many developed countries have become very active in acquiring high-skilled human resources (knowledge workers) who can contribute to companies or the society especially by means of knowledge or information.

In this context, countries, mainly developed ones, are increasing acquisition of gifted foreign students as reserved high-skilled human resources. In ASEAN region, more developed countries such as Singapore, Malaysia and Thailand are also actively working to attract foreign students. Japan itself started to implement various measures in order to internationalize higher education institutions since the 1980s.

Looking at the current global flow of foreign students, the mainstream is the movement of students from Asia to other countries from around the world. Even among these students, they tend to prefer to go to study in Europe or America rather than Japan in spite of its geographical advantage. Besides, the number of foreign students from ASEAN countries to Japan is not only relatively low compared to those who go to Australia or China, but the number of Japanese students who go to ASEAN region to study is by far lower when compared to other countries. Therefore, it is difficult to say there have been sufficient exchanges between Japan and the ASEAN region. Moreover, universities in ASEAN region have been intensifying their exchanges with many counterparts from Europe, America or China, to an extent that in fact, it is assumed that in the future Japan's universities will find themselves more and more in the position of "to be selected".

(2) Present situation, challenges and needs of internationalization

1) Present situation, challenges and needs of internationalization in ASEAN region

According to questionnaire survey results with the SEED-Net member institutions, main challenges in internationalization of universities are “large costs for teachers and students to study abroad”, “shortage of accommodation for students from abroad”, “insufficient facilities and equipments for high quality education and research”, thus revealing a strong awareness among member institutions of their infrastructure weaknesses.

On the other hand, only a few among member institutions considered the construction of international networks of teachers and internationally compatible systemized education programs, and the existence of systems to ensure/review/improve the standards of education programs as challenges to be addressed. It can be interpreted that many member institutions assume that their soft infrastructure is up to standards.

When asked about their vision for internationalization in the future, universities in ASEAN countries, especially in more developed ones, expressed a willingness to intensify personnel exchanges and research collaboration with oversea universities.

2) Present situation, challenges and needs of internationalization in Japan

According to interview conducted with 9 universities in Japan, the main form of collaboration between Japanese universities and ASEAN region is still limited to one-way exchange, i.e. acceptance of foreign students from Southeast Asia. Although each university has been strengthening their efforts to welcome foreign students, such as expansion of English lectures or short-term programs, increase of research collaboration opportunities, however it could be said that the environment set up to accommodate foreign students such as dormitories, scholarships or support for foreign students' daily lives is sufficient. Besides, there are many universities in Japan in which the percentage of foreign students is lower than that of European and American universities, and there are few exchanges between them and Japanese students.

In order to promote the mobility of human resources between ASEAN region and Japan, it was pointed out that key factors include not only the acceptance of foreign students, but also the willingness of Japanese students to go to the ASEAN region. However, difficulties such as disparity in the standards of basic education and research among ASEAN countries, differences in formulation of curriculums are considered to be impeding efforts to improve the mobility of human resources.

Nevertheless, some universities have mid and long-term plans to strategically collaborate

with counterparts in the ASEAN region. The aim is not limited to short-term student exchanges, but is also extended to multilayered development such as the realization of dual-degree/joint-degree system. In the future, it is expected that they will form a consortium of universities with a credit transfer system, conduct collaborative research based on a shared problem awareness and exchange personnel at faculty member level.

The newly-formed collaboration between Japan and ASEAN region should be promoted from mid and long-term standpoint. In terms of enhancing human resources mobility within the region, much is expected from the AUN/SEED-Net. As mentioned above, to intensify the mobility of human resources from Japan to ASEAN, the continuous improvement of the standards of higher education and research activities in local universities is essential. Furthermore, it is desirable to strengthen collaboration at graduate level, considering the fact that the SEED-Net is an engineering network, and because the Japanese educational system of graduate school is relatively designed flexibly.

In the future, it is important to actively introduce the advantages of Japanese universities. Some possible activities are the export of Japanese “laboratory education system” and “manufacturing (mono-zukuri) culture”, and development of regional basic curriculums by categories, in which the region’s shared interests are taken into account.