

# PART FIVE

## SESSION V CONCLUSIONS AND RECOMMENDATIONS

### CHALLENGES AND OPPORTUNITIES IN FOSTERING NATIONAL INNOVATION SYSTEMS

## I STATEMENT OF ISSUES AND PANEL DISCUSSION

Mr. K. Ramanathan opened the Concluding Session by saying that the focus of the session would be on the challenges and opportunities in fostering National Innovation Systems (NIS) in Countries with Special Needs (CSNs). The purpose of the discussions is not to recommend comprehensive solutions to all the NIS-related issues in CSNs but to find some steps that CSNs could adopt to foster an NIS in their countries. This could also help APCTT to plan a sustainable programme of work on NIS in collaboration with CSNs.

Making some general observations on the day's session, Mr. Ramanathan stressed on the need for all delegates to understand and use the term "National Innovation System" in the same context. The term is popularly used to refer to the broad collection of policies and institutional infrastructure that a country has for utilizing science and technology (S&T) for national development. He said that if this definition is accepted as a starting point, then all the delegate countries have an NIS, as made clear by their presentations; strengthening the NIS and making it more effective are the tasks at hand.

There are many notable differences among the delegate countries in terms of NIS. At the same time, it should be remembered that the NIS of one country cannot be just transplanted into that of another to make the latter's NIS more effective. While best practices and lessons gathered from a successful NIS setting are very useful, their implementation in another country must fit the specific context of that country. Skills are therefore needed among policy-makers to adapt best practices for local application.

All the delegate countries have certain policies related to the usage of S&T for development. However, in many countries, these policies are not functional to any desirable degree. The relevant questions therefore are: How can one breathe life into those policies to make them functional? What instruments and infrastructure are required to implement those policies? What conditions have to be created to make those policies effective?

Mr. Ramanathan said it must be accepted that every small and medium enterprise (SME) cannot, and in many instances should not, start its own research and development (R&D) unless the level of S&T development in the country has reached a level where such efforts can be nurtured effectively. There might be some sectors in which R&D by SMEs is feasible, but by and large SMEs in CSNs would be better engaged in improving product quality and variety as an initial step in their strategy for strengthening their technological capabilities

Turning to the current challenges that CSNs are facing in terms of using S&T in development, Mr. Ramanathan listed the major issues that have emerged from the presentations. The first is the creation of a critical mass of quality skills and its retention in the country. The second major challenge is related to the conduct of R&D. There is a current debate on whether governments need to continue spending on R&D establishments, or whether a part of the government's R&D budget should be earmarked to encourage the private sector to carry out R&D, at least in certain key areas.

Continuing the discussions on NIS-related issues in the delegate countries, Mr. Lee summarized five salient aspects that emerged from the country presentations.

The first problem is that, despite having the necessary S&T institutional infrastructure, plans and scientists, such as in the case of Bangladesh, a country is not able to commercialize research results. Hence, the issue is mainly that of an appropriate operational principle that could trigger the system to work efficiently.

The second issue is about the appropriate strategic industries for a small-sized economy, like Bhutan, and what might be the strategies and programmes that could support such industries. This would be applicable to Nepal too.

The third question is what action-oriented strategies, plans and programmes could be adopted to address the lack of certain critical mass of research activities and R&D capacities, such as in the case of Lao People's Democratic Republic, and help in the capacity building process to help implement the S&T plan among the R&D institutions.

The next issue is about industry-university relationship, which is restricted to small scales, such as in Myanmar. For sustaining and expanding such a relationship, what goals could be set to develop the critical mass required to drive innovation.

The fifth issue is about an appropriate strategy that would boost the industries of a country, such as Nepal, in order to retain the S&T human resources in the country.

## II RESPONSES FROM DELEGATES

### A. Bangladesh

Mr. Dilip Kumar Basak said aspects related to NIS would be incorporated into the National Science and Technology Policy that the country is formulating. The next step would be to introduce need-based research by identifying the areas, where focus is required, with special attention to utilizing the national resources and adding value to them. It would also be necessary to create awareness among the public and policymakers about the need to raise the quality of Bangladeshi products. Entrepreneurs need to be motivated to improve the quality of their products. The indigenous knowledge of the country has to be compiled and put to good use.

### B. Bhutan

The creation of awareness in the country about the role of S&T in national development would be the starting point for promoting NIS in Bhutan, said Mr. Karma Wangdi. He expressed his agreement with Mr. Lee that a small country like Bhutan would need to find niche areas where the nation can focus its efforts and then establish systems and facilities to support those areas. Once this is done, the move to promote NIS would gather its own momentum, he felt.

Touching on the issue of non-accession to the WTO, Mr. Karma said that it was a well-considered decision by Bhutan, as the country was not yet ready to fulfil the obligations of membership. However, it was not a closed chapter and could be reviewed at a later stage. He also pointed out that the way Bhutan measures its development is different from traditional approaches. In that context, there is a question whether it would be

feasible for Bhutan to get into S&T innovation because of its small size. He wanted to know from the panel the chance of success for Bhutan if it does not explicitly focus on the deployment of S&T in economic development, particularly since economic development is considered to be only one of the four national priority areas.

### **C. Lao People's Democratic Republic**

Mr. Xayaveth Vixay said at the onset that he would like to ensure that there is a clear understanding about the various components in the NIS in his country and how they can be integrated into an effectively functioning system. There are still some unclear areas that need to be clarified in terms of science, technology, innovation and development. In this regard, he said, his country would look forward to hosting a national workshop, as mentioned by the Head of APCTT.

The current Science and Technology Policy of Lao People's Democratic Republic, which was initiated in 2003, is drawing to a close in 2010 and the following policy period would be up to 2020. Drafting of the new policy would soon commence and that would be the time to consider innovation and its importance in S&T development for incorporation as a strategy into the new policy. A coordination mechanism for S&T agencies and activities is very much required, and the existing S&T Council could be restructured to serve that role effectively. Before that, a person would need to be identified in each sectoral ministry as the coordination point.

### **D. Myanmar**

According to Ms. Kay Thi Lwin, while Myanmar has more or less all the key components required for an effective NIS, many of those components are weak. Hence, strengthening them would be one of the initial tasks. At the same time, it is essential that those connected with the NIS, particularly the top policymakers, have a good understanding of the issues involved. For this, a national workshop on NIS is needed.

### **E. Nepal**

Mr. Sanu Kaji Desai also expressed the necessity for a national workshop on NIS. He said he would strive to introduce the term "innovation" into the title of the recently drafted S&T policy to highlight the importance of that aspect. He said that he would urge the S&T Ministry to involve different sections to draft an NIS policy at the earliest. Such a policy document would clearly identify the priority sectors. The creation of a national innovation centre would be a useful initiative; however, the feasibility of this needs to be assessed by the government.

## **III RESPONSES FROM RESOURCE PERSONS**

Commenting on the CSN country presentations, Mr. Shyamal Kumar Chakraborty stressed on the need for the top leadership in the country to encourage innovation. He cited India's case, where the President had declared 2010-2020 as the "Decade of Innovation", which helped to foster a series of innovation-related actions in the country.

A dedicated mechanism to synergize the relationship between academic/institutional R&D and industry would help commercialize research results. An incentive/tax exemption regime to investors and industry is another policy measure that CSNs could try out. Innovation zones/parks have had some success in India. There could be an infrastructure development fund to finance the development of the SME sector. India has found collaborative R&D to be a useful mechanism.

Ms. Wang Yan said that while there are notable differences among the countries in terms of NIS, there are also problems that are common. She listed lack of funds, lack of adequately trained S&T human resources, absence of coordination among the different actors involved and the low level of R&D institute-university-industry linkages as the problems common to CSNs. While different countries would address these issues in different ways, some things could be kept in mind. The first, going by China's thinking, is that development is the most important thing; with development, more funds would come in to raise the level of the R&D sector and make it more attractive to investors. The second is to have a coordinated development vision since the development of the S&T sector cannot happen alone; it has to happen within the development of a knowledge-based society. The third is to weave S&T development strategy into the nation's development strategy; if all can agree on common goals, since outputs are as important as inputs, one could follow different paths to reach them. The fourth is that coordination requires senior managers in charge of programmes to have good negotiation skills. Another important thing is that development should take into consideration national cultural and historical aspects and leverage these to gain advantage.

Mr. N. Srinivasan, while recapitulating the two presentations from APCTT, emphasized that technology innovation has been a continuous and evolving human activity in the quest for socio-economic development. At the beginning, harnessing and exploitation of natural resources were a major factor of innovation. Subsequently, with the advent of science and technology, enhancing the quality of living conditions became a major factor of innovation, which resulted in mass production of products and development of new processes. At present, in the era of modern science and technology, technology innovation has taken centre stage in all the spheres of socio-economic development, wherein competition and globalization have become the major driving factors.

In the national context, government is the main actor that can induce and regulate competition among industries to meet the national developmental goals. Competition in a country could be due to the presence of a large number of industries in one sector, or due to influx of foreign companies that operate in the same sector as that of national companies. In the latter instance, there could be resistance, particularly from SMEs, to compete due to well-known and legitimate reasons. However, there are several success stories to demonstrate that SMEs could innovate under both situations, provided the government plays a constructive and supportive role. In the recent past, competition has led to globalization of technology development, manufacturing and the market itself. In addition, many countries are signatories to the World Trade Organization (WTO) and therefore are obliged to adhere to rules-based trade, which gradually eliminates or limits tariff-related advantages. International obligations of WTO and other global treaties have necessitated countries to develop national capabilities in the area of technology innovation by evolving or strengthening a national innovation system that is relevant and suitable to each of them.

Mr. Ramanathan clarified the issues associated with organizing national workshops in CSNs. He invited the countries to write to APCTT formally expressing interest in such

workshops. He added that the costs that have to be borne by the host country would be limited to local expenses. There could be some leeway in this too, which could be discussed directly with interested countries.

To the theoretical question that the Bhutan delegate raised – whether it would be possible for small and resource-poor nations to not take up costly S&T development, but still achieve a reasonable level of economic development – Mr. Ramanathan responded that S&T is already part of the day-to-day life; for example, in the fibre optic network used for telecommunications or medicine used in healthcare. The question could therefore be rephrased to: instead of attempting the S&T development approaches adopted by larger countries, can a small country develop its own unique approach in using S&T to achieve national aspirations? The response would be that such unique approaches can be adopted within the overall national vision.

In response to the statement by the Bangladesh delegate about mobilizing R&D activities towards contributing to value addition to the country's natural resources, Mr. Lee said such a priority should be reflected in the NIS policy. For this, two major policy tools would need to be developed: one is to provide adequate incentives in national programmes to induce research entities to focus more on value-adding R&D in natural resources; the other is to induce research institutes and universities to have institutional schemes to mobilize researchers to engage in value-adding R&D activities. There is a need to create success stories of these activities and disseminate them among the research entities to motivate researchers.

In the case of Myanmar, to strengthen the various components of NIS, there is a need for certain stimulus. However, the critical mass for this will not come without intentional public intervention. For example, Myanmar can establish a national science park to mobilize the resources to create success stories, which can then be the stimulus for strengthening the NIS.

For Bhutan, it is very important to have employment generation. With focus on ICT, the country may strategically position itself as an off-shore site of global IT companies. This could create some employment in the country. Once employment generates wealth, the country needs to develop the next-generation industry, which would provide quality employment for more people. Such thoughts on the next-generation industry would also provide the answer to what could be the S&T policy.

Mr. Chakraborty expressed the view that the innovation policy of any country should be customer-driven and need-based, and the results should reach the masses. The Council for Scientific and Industrial Research (CSIR) of India has a programme titled CSIR-800 through which it aims to reach its research results to the 800 million common people in the country. The technologies in focus under this programme cover areas of need such as low-cost housing and potable water. In Bhutan, food processing technologies could reach more common people easily, and more people would understand the usefulness of technology development. Another area that Bhutan could apply innovation is the use of biotechnology in agriculture. As tourism is a key revenue-earner for the country, innovations can be tried out also in the tourism sector.

Ms. Wang said for a small country like Bhutan with low population, the services industry could be a focus area. In this respect, the tourism sector is a good candidate for innovation, as it offers a global market. Encouraging foreign direct investment in the

education sector could also be a good policy initiative worth considering, as this would help the services industry. It is not necessary that every country should emphasize the manufacturing sector, she added.

Mr. Srinivasan reiterated that application of science and technology is not a modern phenomenon; technology was applied by our ancestors in, for example, agriculture, that too in a very environment-friendly fashion. The term 'technology' took a different connotation after the industrial revolution because of its application in mass production. The key question, therefore, is about the way each country deploys technology in its context. Referring to Bhutan's unique way of measuring development in terms of gross national happiness, he opined that such uniqueness itself has a brand value that is marketable. Application of S&T could add value to Bhutan's natural resources, and there are several ways of doing this. As Mr. Lee said, it is essential that Bhutan creates employment. One key question would be how Bhutan can apply S&T for job creation. It could do this by adding value to its natural resources through the application of technologies, which need not be developed in Bhutan.

Mr. Ramanathan concluded the session by thanking the delegates, the resource persons and the invited speakers for their contributions towards making the workshop a fruitful one. He also thanked the Ministry of Science and Technology of Thailand for the warm hospitality and excellent support extended to the conduct of the workshop.

## IV RECOMMENDATIONS

1. While all the CSNs that attended the workshop have many key elements of NIS, these need to be duly strengthened and/or properly organized into an efficient system. Detailed studies need to be undertaken for assessing these elements and to ascertain the suitable features that the NIS should have.
2. The political leadership and the top administrative functionaries need to be made aware of NIS and its vital role in national development. National-level workshops may be organized with the help of APCTT-ESCAP to meet this need.
3. The importance of S&T in national development is not well understood. Hence, there is a need to create awareness about the role of S&T in national development.
4. There is a need to popularize S&T so that careers in S&T become more attractive among the youth.
5. There needs to be a relationship between quantity and quality in human resources development. The issue of quality also applies to institutional infrastructure – quantity needs to be accompanied by quality in research institutes, universities, etc.
6. The feasibility of importing people with skills – by either directly hiring skilled people from abroad or inviting foreign investments along with foreign experts – and hiring local people to work with them till a critical mass of skills is created locally could be explored in the context of developing skilled human resources in S&T.
7. It is essential for a country to identify the S&T areas that are either essential or offer a relative advantage, and build R&D capacities in these areas, either by developing such capacities within the country or by ensuring access to such capacities available elsewhere.
8. While it is necessary to have well-defined S&T policies, it is equally necessary to have the support mechanisms (such as infrastructure, incentives, disincentives, etc.) that these policies require for their effective implementation.

9. Despite having the necessary S&T institutional infrastructure, plans and scientists, some CSNs are not able to commercialize research results. Such CSNs need to adopt appropriate operational principles to make the S&T system in the country work efficiently.
10. CSNs with small-sized economies need to determine appropriate strategic sectors and adopt suitable strategies and programmes to support them
11. Action-oriented strategies, plans and programmes need to be adopted to address the lack of certain critical mass of research activities and R&D capacities, and in helping R&D institutions to build capacity to implement the S&T plan.
12. National-level goals may be set to develop the critical mass of resources required to drive innovation and thus sustain and expand industry-university linkages and relationships.