

APEC Center for Technology Foresight

Annual Report 1998

National Science and Technology Development Agency

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Message from the Director

“ The start-up of a new venture is always an exciting event: in the case of the APEC Center for Technology Foresight, it has been doubly exciting since it has involved a new dimension of Foresight. While national Foresight studies have been carried out in various forms for many years, the Center represents the first extension to multi-economy studies.

Unfortunately the launch of the Center coincided with the economic crisis in many of the Asian economies and thus the resources available were less than had been anticipated in the planning phase. Nevertheless the generous contribution from the Government of Thailand in difficult economic circumstances plus the support of the APEC Central Fund has enabled the Center to commence with a reasonable financial base. However without the continued support of the Director and staff of NSTDA, it would not have been possible to achieve so much in such a short time. I also acknowledge the support and cooperation of the APEC member economies which is so vital to the success of the Center.

The Steering Committee of Thai officials has provided valuable advice while the generous contributions of time and effort from the members of the International Advisory Board are gratefully acknowledged. Without their inputs the multi-economy studies would have been much more difficult to plan and carry out.

The first year of operation has focussed on creating an awareness of the Center and its capabilities through four activities: the creation of a web site on the Internet; the conduct of training workshops (unfortunately limited in number by the economic crisis); public lectures and visits; and a Foresight study on Water Supply and Management. This study received considerable support across the APEC economies and has proved to be a valuable learning experience for all concerned. I trust that the results of the study will contribute to a better understanding of water issues in APEC economies and will be of assistance to policy makers.

I have been privileged to be the first Director of the Center and wish to acknowledge the strong support from my Co-Director Dr Chatri Sripaipan and the dedicated staff of Ms Monthida Sitathani, Ms Tamsin Jewell, Ms Mayuree Vathanakuljarus and Ms Nalinrat Sirikantraporn. “

Professor Greg Tegart

Introduction

Establishment The APEC Center for Technology Foresight was launched on 3rd February 1998, with the approval and generous support of the Royal Thai Government. The office is in Bangkok, Thailand but it operates as a virtual Center, serving and involving all APEC member economies. Its establishment followed a comprehensive feasibility study, initiated by Thailand and subsequently endorsed at the first APEC Ministers Conference on Regional Science and Technology Cooperation in Beijing in 1995. Financial support for the feasibility study was obtained following the 10th meeting of the Industrial Science and Technology Working Group of APEC in Jakarta in 1996. During the study, the concept of the Center was developed by the National Science and Technology Development Agency of Thailand (NSTDA), with the help of international experts, and an APEC Technology Foresight Symposium with over 100 participants from 16 different economies was held in Chiang Mai, Thailand. The study found widespread support for the establishment of the Center from APEC member economies and from foresight experts around the world.

The APEC Center for Technology Foresight is the first APEC Center to be established in Thailand and is a significant development in the International Cooperation work of its host organisation.

Why foresight? Technology Foresight provides a mechanism for exploring technological, economic and social futures and helps APEC member economies to identify areas of mutual interest and concern. Technology Foresight offers a powerful tool for understanding and managing technology development and for wider strategic planning on both a national and regional basis. Applied on a regional basis, foresighting can also improve the interaction between economies, increasing understanding of each other's strengths and constraints and helping to identify common technology-based development opportunities. The Center expects to make a significant contribution to the policy and planning of science and technology within member economies and throughout the region

Summary of activities In 1998, the Center aimed to encourage and support foresight efforts throughout member economies. This was achieved in a variety of ways, including the organisation of public events, through visits by the Center Director and Co-Director, and through publications. The Center also conducted a technology foresight research study into an issue of immense regional concern – the Future for Water Supply and Management - through ground-breaking 'multi-country' foresight research. As the study progressed, it became clear that considerable development of existing foresight techniques would be required to carry out such research effectively.

The education and training of researchers, who must combine science and technology understanding with an appreciation of important societal trends, was intended to be a significant aspect of the Center's work. This aim was addressed by the organisation of a very successful training workshop on "Using Technology Foresight" which attracted 30 participants from 6 APEC members. However, the ability to offer further training workshops was sadly restricted by the advent of the economic crisis in Asia, which has also affected other APEC members, since funds were rarely available to pay training fees.

The Center continued to develop and update its APEC technology foresight web site. Discussion facilities were added, in association with the APEC ISTWG science and technology web site, to allow member economies to obtain and exchange information about technology foresight.

In order to carry out all these tasks, it has been important for the Center to recognize the substantially different characteristics and requirements of economies at different stages of economic development, levels of infrastructure and science and technology capability.

Definition Discussion at the inaugural meetings of the Steering Committee and International Advisory Board resulted in the adoption of the following:

◆ **Definition of technology foresight –**

Foresight involves systematic attempts to look into the future of science, technology, the economy and society, with a view to identifying emerging generic technologies and the underpinning areas of strategic research likely to yield the greatest economic, social and environmental benefit.

Objectives ...and

◆ **Objectives of the APEC Center for Technology Foresight – to**

- ***Promote the adoption of technology foresight across APEC member economies***
- ***Provide a means for comparison of technology foresight exercises and implementation in APEC member economies and across the world, with a view to stimulating Best Practice in appropriate methodologies for Foresight in APEC economies***
- ***Conduct technology foresight exercises on an APEC-wide basis, and between relevant member economies***
- ***Improve the quality and effectiveness of technology-related planning and development and priority-setting for research, across APEC member economies***
- ***Develop a technology foresight research and application capability available to APEC member economies and international agencies***

Steering Committee

The **Steering Committee** met four times in 1998 to oversee the work of the Center: February 2nd 1pm-4.30pm, May 6th 10am-1pm, August 21st 10am-1pm and November 3rd 2pm-4.30pm.

The roles of the Steering Committee, as formally agreed at the inaugural meeting, are:

- to oversee the operation and management of the Center
- to approve the work plan and projects undertaken by the Center
- to monitor the progress of the Center
- to monitor the outputs of the Center's studies, and their implementation
- to assist in identifying opportunities to obtain additional resources

Steering Committee members were appointed on the basis of position, and thus some changes in membership took place during the year. In July, Professor Pairash Thajchayapong replaced Prof Yongyuth Yuthavong as the Director of NSTDA and therefore took over the Chairmanship of the Committee. At the end of the year, Mr Sunthad Somchevita became Permanent Secretary at MOSTE and will therefore be acting as advisor to the Committee in 1999. Some Steering Committee members chose to send representatives to the meetings.

Steering Committee in 1998	<i>Position</i>
Advisor - Mr Kasem Snidvongs Na Ayuthaya	Permanent Secretary, Ministry of Science, Technology and Environment, Thailand
Chairman – Professor Yongyuth Yuthavong (until July) / Professor Pairash Thajchayapong (from July)	Director of the National Science and Technology Development Agency, Thailand
Dr Suvit Vibulsresth	Deputy Permanent Secretary, Ministry of Science, Technology and Environment, Thailand
Mr Thamarak Karnpisit	Chief Executive Planning Advisor, National Economic and Social Development Board, Thailand
Associate Professor Songkram Luangtongkum	Deputy Permanent Secretary, Ministry of University Affairs, Thailand
A representative of...	Permanent Secretary, Ministry of Industry, Thailand
Dr Somkiati Ariyapruachaya	Director-General, Dept of Economic Affairs, Ministry of Foreign Affairs, Thailand
Professor Montri Chulavatanatol	Department of Biochemistry, Mahidol University, Thailand
Mr Khemadhat Sukondhasingha	Secretary General, the Federation of Thai Industries, and President of the SIKOR Group of Companies, Thailand
Dr Krissanapong Kirtikara	Chairman, Thai Foresight Unit, Thailand

International Advisory Board

The **International Advisory Board** of the Center met twice in 1998: on February 2nd 9am-12noon, and on November 2nd 2pm-5pm. They also joined with the Steering Committee for combined meetings on February 2nd 3pm-4.30pm, and on November 3rd 2pm-4.30pm.

The roles of the International Advisory Board, as agreed at the inaugural meeting, are:

- to provide guidance to the Center by establishing the broad strategies, identifying opportunities and ensuring relevancy
- to act as an extension of the Center by promoting the role of the Center, providing outreach and advocacy
- to monitor the progress of the Center against the work plan, and provide advice
- to provide insight into Technology Foresight activities in the member economies
- to promote the participation of the APEC members in the activities of the Center

International Advisory Board members were appointed for 2 year terms on the basis of their expertise in foresight, or in science and technology policy and planning more generally.

International Advisory Board members	Position
Prof Yongyuth Yuthavong (Chairman) THAILAND	Director, Thailand Graduate Institute for Science and Technology
Prof Sipphanondha Ketudat THAILAND	Chairman of the Executive Board, Office of the National Economic and Social Development Board
Dr Arthur Carty, CANADA	President, National Research Council (represented by Mr Jacques Lyrette, Vice-President, Technology and Industry Support, and Dr Sadiq Hasnain, Senior Policy Advisor, International Relations)
Prof Ron Johnston AUSTRALIA	Executive Director, Australian Centre for Innovation and International Competitiveness Limited, University of Sydney
Dr Taeyoung Shin KOREA	Head, S&T Indicators and Analyses, Science and Technology Policy Institute
Mr Terutaka Kuwahara JAPAN	Director, Technology Forecast Research Team, National Institute for Science, Technology and Environmental Policy

Staff

Director: Prof WJ McG (Greg) TEGART (AUSTRALIA)

Co-Director: Dr Chatri SRIPAIPAN (THAILAND)

International Coordinators

Ms Monthida SITATHANI

Ms Tamsin JEWELL

Ms Mayuree VATHANAKULJARUS

Ms Nalinrat SIRIKANTRAPORN

The staff all work part-time for the Center, since all have other job responsibilities to varying degrees. They have at times been supported by other staff of NSTDA, for example on the occasions of the public seminars when additional assistance was required to register the attendance of participants.

The division of responsibilities between the Director and Co-Director was modified slightly as the year progressed. The following roles were not, therefore, formally adopted until the combined Steering Committee and International Advisory Board in November.

Role of the Director

- to be responsible for the operation of the APEC Center for Technology Foresight
- to search for financial resources available in other APEC member economies
- to prepare an operational plan of the APEC Center
- to oversee budget allocation
- to oversee administrative affairs
- to formulate strategies to encourage and motivate involvement of APEC member economies
- to initiate and strengthen linkages among APEC member economies
- to set up corporate networking among key players
- to be accountable to participating advisors and researchers

Role of the Co-Director

- to assist the Director in monitoring the operation of the APEC Center for Technology Foresight
- to be Acting-Director when the Director is not on duty
- to supervise administrative affairs
- to implement the programs and activities of the APEC Center
- to be financially accountable for that part of the budget that comes from NSTDA
- to manage and facilitate budget allocation
- to be accountable to participating advisors and researchers

Multi-Country Foresight Research

1) The Future for Water Supply and Management in the APEC Region, to the year 2010

2) Planning for and Initiation of Research Studies for 1999 / 2000

1) The Future for Water Supply and Management in the APEC Region, to the year 2010

In tackling a multi-country research project, the Center broke new ground in the foresight field. The research proved to be a challenging but fascinating project, providing a new perspective on this topic of immense concern to countries throughout the region.

◆ Background to the Project

Prior to the selection of topics for multi-economy study, the Center developed a number of criteria:

- ◇ the issue must be of concern to most economies, with at least 4 agreeing to participate in the study;
- ◇ the issue must transcend national boundaries, so that it can go beyond anything that might be achieved by a national or bi-lateral study;
- ◇ there must be potential for sharing the results with all the APEC members;
- ◇ the issue is likely to be of general, public concern/ benefit and not one that is likely to be dealt with by the private sector; and finally,
- ◇ the issue will have important technological components but not necessarily 'high-tech' ones.

The topic of water supply was one of the three highly rated projects identified in a wide survey of opinions for possible topics for the APEC Center for Technology Foresight prior to the APEC Symposium at Chiang Mai, Thailand, on 10-13 June 1997. The background paper for the opinion survey stated:

"Beyond 2000 there will be great need of supplies of water for domestic, agricultural and industrial uses while excessive water supplies cause seasonal flooding and global warming may start to increase the sea level causing flooding of low lands. Clean water will become ever-increasingly more scarce. Technologies include water management, remote sensing, irrigation with environmental concerns, and recycling and conservation technologies. Other technologies to purify water such as membrane filtering are needed."

The topic was then discussed at a Group Discussion Session at the Symposium and a number of further issues were identified. To quote from the record of the discussion:

"On water supply, the Group discussed differing view points when viewed from differing perspective such as: industrial vs human usage, application of best practice vs developing new technology, agriculture (where mis-use pattern may be of particular importance) vs urbanization (over treatment of water notably when only 5% treated water is used for drinking). The group also discussed the following issues and topics; conservation, management protocol, valuation of water (as with crude oil), effect of climate change on water supply/distribution, membrane technologies, desalination technologies, potential for APEC-wide standards, flood management/control, regulatory issues as incentive to encourage proper management, and monitoring pollution."

At their initial meeting on 2 February 1998, the International Advisory Board of the APEC Center identified this topic for early study and broadened it to "Water Supply and Management" to reflect the issues raised above. This was endorsed by the Steering Committee. Further issues were identified in the Workshop held in Bangkok on 4-6 February 1998 when the topic was used in the session on Delphi techniques.

This topic was considered to meet all the criteria outlined above for a multi-economy study. Its importance and relevance to the region cannot be disputed. Water problems are not limited to developing countries:

Current patterns of water use in developing countries, countries with economies in transition and industrialised countries alike are often not sustainable. There is mounting evidence that the world faces a worsening series of local and regional water quantity and quality problems, largely as a result of poor resource management, including ill-adapted allocative mechanisms, wasteful use of the resource, unregulated effluent disposal and weak institutional frameworks. There is also a close interaction with declining biodiversity, desertification and pollution of the marine environment. (UN Economic and Social Council, Geneva, June 1997, cited in the Issues Paper)

...and cannot be addressed only at national level:

Of more than 200 international river basins, 148 are shared by two countries, 30 by three countries and 22 by four or more... apart from island countries, almost all countries are involved in the problems of international river basins to some extent...Over a third of these major international river basins are not covered by any international agreement...Pollution, impoundment and diversion of water by upstream nations is likely to be a growing source of international tension and insecurity (Union of International Associations, April 1998, cited in the Issues Paper)

◆ **Objectives**

The objectives of this first multi-country foresight study in APEC were defined as:

1. To develop a strategic and coherent view of the challenges, threats and opportunities associated with water supply and management in and across APEC economies
2. To provide an APEC-wide demonstration of the application and value of technology foresighting techniques in addressing an issue of great and long-term significance.

◆ **Methodology**

The approach used was to have an issues paper prepared by a Consultant and then to draw together a group of experts from across APEC to analyze the issues and develop scenarios. Based on these scenarios, the experts produced a set of inputs for a Delphi study among a wider group of experts in the region. The results of the Delphi study were combined with the scenarios to produce a report in January 1999. This will be widely distributed and a presentation will be made at the ISTWG meeting in Hong Kong in March 1999 to report the findings. Other presentations will also be made in those APEC member economies that participated most fully in the study.

◇ **The Issues Paper**

The paper reviews the supply, management and use of the world's water resources, and identifies key issues and policy options. A case study of a technology foresight study of one highly relevant technology – desalination – was also presented. Following discussion with the water experts at the scenario-building workshop, two further issues were added, producing the following final list: quantity, quality, demand, technologies, economic development, market forces, environment, infrastructure including structural safety, human health, resource assessment, integrated resource management across the full water cycle, geo-politics, enforcement and energy costs. The paper also suggested a framework for considering policy options.

◇ **The Scenario-building Workshop**

All APEC members were invited, through APEC channels, to send one water expert to this workshop, which was held in Hua Hin, Thailand in May. Experts offered brief presentations about water issues in their own economy which allowed issues of common concern, such as the fragmentation of water management or the recognition that water was already becoming a highly commercial issue, to emerge clearly. The scenario-building process was then carried out over one and half days. Having identified 15 'uncertainties', and rated them according to their likely impact and degree of uncertainty, experts were divided into three groups, with each group being assigned a different set of scenario logics. The groups explored these logics from the point of view of people looking back from the year 2010, at the events that had led to 'present' situation. The outputs of these group discussions were then drafted into scenarios by the facilitator, and

subsequently refined by the groups. Each group contained experts from a variety of economies, along with a small-group facilitator with greater understanding and experience of foresighting and scenario-building. Finally, topics for a Delphi survey were identified.

◇ **The Delphi Survey**

The list of topics produced by the APEC water experts at the workshop was refined into clear and concise topic questions by the Center, with the assistance of a group of Thai water experts and in consultation with the APEC experts and both Consultants. The first round questionnaire contained 58 topics, covering technology, resource and policy issues. Respondents were also asked for comments and suggestions. Additional topics were added to the second round on the basis of these comments, so that the final questionnaire contained 64 topics. For each topic, respondents were asked about a number of parameters, such as their rating of the importance of the topic and the year in which they expected it to be realized in their own economy and in a majority of APEC countries. Their assessment of the need for APEC-wide cooperation in order to achieve the topic was also elicited. This number of topics and parameters resulted in a complex survey covering over 40 pages. Its development, in consultation with many water experts APEC-wide and with the foresight Consultants, represented a significant achievement in itself, since the topics themselves can be regarded as one important outcome of the study. In addition, the work of producing, sending out, following-up and recording all the responses for two separate rounds was considerable. Although it had been hoped that the questionnaire could be sent electronically, in practice, two-thirds of the experts did not have access to email and so post was mostly used. Even where experts did have email, email response rates were very low.

The sample of Delphi experts was obtained through the APEC experts that attended the workshop, through the APEC Industrial Science and Technology Working Group, and through other contacts of the Center and its Consultants. For some economies, co-nomination was also attempted to increase the sample size. Again, developing the list of over 600 experts was quite time-consuming and challenging. The response rate to the first round was about only about 21%, despite active follow-up. The second round questionnaire was returned to respondents along with a simple summary of the first round results and an anonymous report of all the comments and suggestions that were made. The response rate to the second round was approximately 53%, yielding a final sample size of 67 experts who completed two full rounds of the Delphi survey. All those who completed the survey in full have been promised a copy of the full final report.

◇ **The Research Meeting**

A research meeting was held with the Consultants and the Center staff in November. The meeting reviewed both the process and outcome of the study, and began to draw out some conclusions. This helped with planning the final report, and was also useful for planning the next studies to be undertaken in 1999.

◆ **Consultants details**

<p>Professor Ron Johnston - Australia Executive Director Australian Centre for Innovation and International Competitiveness (ACIIC), University of Sydney,</p> <p>Professor Johnston prepared the Issues Paper, facilitated the Experts Meeting including the scenario-planning process, and wrote Volume 1 (the Executive Summary) of the Final Report of the project. Professor Johnston also advised on all other stages of the project.</p>	<p>Dr Taeyoung Shin - Korea Head, S&T Indicators and Analyses Science and Technology Policy Institute (STEP)</p> <p>Dr Shin supervised the Delphi study, analysed the results after each round of the survey, and prepared a final report of the Delphi. He also contributed to the Experts Meeting and Research Meeting</p>
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◆ **Outline Schedule**

Stage	Methodology	Key Actors	Timing 1998
1i	Project Planned and Issues Paper commissioned	Center staff	Feb - April
1ii	Issues Paper received	Consultant	May

2	'Core' experts and 'Delphi' experts identified - all member economies were invited to participate	Center staff	April – July
3	Expert Meeting held to review issues paper (1-day), followed by 2- day scenario development workshop with experts	Center staff and Consultants APEC 'core' experts attended 3-day meeting	12-14 May (Hua-Hin, Thailand)
4	Issues Paper and Meeting Report published and distributed	Consultant and Center staff	May - June
5	Delphi survey prepared, based on issues emerging from the scenario-based expert meeting	Center staff, both Consultants, Thai water experts and APEC 'core' water experts	June - July
6	Identification of Delphi experts concluded (final total 600+)	Center staff	July
7	Double round Delphi survey conducted	Center staff, in liaison with both Consultants	August - November
8i	Research meeting held to discuss progress and outcomes	Center staff, both Consultants and the rest of the IAB	November
8ii	Preliminary analysis of Delphi	Consultant	December
9i	Final report produced	Consultants and Director	December – January
9ii	<i>Final report published</i>	<i>Center staff</i>	<i>February 1999</i>
10	<i>Public presentation of report to 16th ISTWG Meeting in Hong-Kong</i>	<i>Center staff</i>	<i>March 1999</i>
11	<i>Other post-foresight activities</i>	<i>Center staff</i>	<i>to be arranged</i>

◆ **APEC 'core' Experts**

The APEC 'core' experts attended the Experts Meeting, and assisted with the Delphi survey. Some of the experts also provided very active (and valuable) follow up of the Delphi survey in their own economy and are likely to help with post-foresight activities to encourage implementation of the research outcomes.

Australia

Dr Alan Wade, Principal Water Quality Advisor, ACTEW Corporation, Canberra

Canada

Dr. Robert Gillham, Professor and NSERC Industrial Research Chair, University of Waterloo

Chile

R. Alejandro Lopez Alvarado, Executive Director, National Institute of Hydraulics, and Associate Professor at the University of Chile in Santiago.

Hong Kong, China

Ku Chi-chung, Damien, Chief Engineer, Water Supplies Department

Korea

Dr Ig-Hwan Sung, Principal Hydrogeologist, Korea Institute of Geology, Mining and Materials (KIGAM), Seoul

Malaysia

Ir Azuhan Mohamed, Senior Assistant Director, Planning and Evaluation Division, Department of Irrigation and Drainage, Kuala Lumpur

Mexico

Dr Oscar Monroy Hermosillo, Environmental Microbiology Laboratory of the Biotechnology Department, Universidad Autonoma Metropolitana, (Autonomous Metropolitan University) in Mexico City

Chinese Taipei

Dr Cy C Chen, Deputy General Director, Energy & Resources Laboratories, Industrial Technology Research Institute, Taipei

Thailand

Mr Pramote Maiklad, Director-General, Royal Irrigation Department, Bangkok
Dr Jesda Kaewkulaya, Vice-President, Kasetsart University, Pathum Thani

◆ **APEC-wide Participation**

1) member economies represented at the Experts Meeting: total - 9 economies

	<i>financial support for</i>	<i>international travel</i>	<i>- local expenses</i>
Australia		self-funded	APEC TF Center
Canada		self-funded	self-funded
Chile		self-funded	APEC TF Center
Hong Kong, China		self-funded	self-funded
Korea		APEC TF Center	APEC TF Center
Malaysia		self-funded	APEC TF Center
Mexico		self-funded	self-funded
Chinese Taipei		self-funded	self-funded
Thailand		-	APEC TF Center

2) member economies participating in the Delphi Survey: total - 16 economies

Australia	Malaysia
Canada	Mexico
Chile	Papua New Guinea
China	Philippines
Hong Kong, China	Singapore
Indonesia	Chinese Taipei
Japan	Thailand
Korea	USA

2) Planning for and Initiation of Research Studies for 1999 / 2000

In 1998, the Center also began to develop research plans for 2 new projects on **Technology for Learning and Culture** and on **Megacities**. These two topics had been selected at the initial Steering Committee and International Advisory Board meetings, based on the same criteria as the first study. Again, these topics had been rated highly by participants at the Chiang Mai symposium and during the APEC-wide consultation survey.

The **Technology for Learning and Culture** project recognizes that the convergence of telecommunications, computer technology and software is having a profound effect on the way we work, entertain ourselves and educate our present and future generations. The new wave of technology impacts on all economies and it is essential to ensure that the technology is properly used as a tool for development and promotion of individual values and cultures. This is particularly true in the APEC economies which vary widely not only in terms of physical information infrastructure but also in terms of culture and language. This project seeks to assess the situation in the APEC economies and to draw out the critical issues to be addressed by policymakers, educators and the information industry.

With regard to **Megacities**, the Center intends to divide this enormous topic into four component parts: Sustainable Transport, the Healthy City, the Intelligent City, and the Eco-Energy City. It aims to assess the problems and technological possibilities for, say, the next 30-50 years in transport, health, communication, and energy.

For both these projects, the Center intends to collaborate with strategic partners from other APEC member economies. For the project on **Technology for Learning and Culture**, the Center will be working closely with the National Research Council of Canada. The Director of the NRC is a member of the International Advisory Board of the APEC Technology Foresight Center and has consistently supported the Center's establishment and subsequent activities. This already excellent relationship was enhanced by a visit to the NRC by the Director, Professor Tegart, when an outline agreement to collaborate on this project was established. Mr Lyrette, Vice President of the NRC and Dr Sadiq Hasnain, Senior Policy Advisor for International Relations visited Bangkok in November to continue

planning for the project. Mr Lyrette also presented an Issues Paper on the topic at a public seminar. This paper sets the framework for the study and is being used to stimulate debate and encourage other economies to get involved. It was sent to all the ISTWG contact points in each economy in late

Reception – 2 February

A reception was held at NSTDA for representatives of all the APEC member economies and other persons interested in foresight, along with all NSTDA executives, to celebrate the launch of the new APEC Technology Foresight Center. The reception was also graciously attended by the Deputy Minister for Science, Technology and Environment, Mr Pornthep Techapaiboon, who expressed great interest in and support for the Center.

Program:

16.45-16.55	Welcome address: <i>Professor Yongyuth Yuthavong, Director, NSTDA</i>
16.55-17.05	Introduction to the APEC Center for Technology Foresight: <i>Professor Greg Tegart, Director of the APEC Center for Technology Foresight</i>
17.05 –17.30	Launching Address: <i>Professor Sipphanondha Ketudat, Chairman of the Executive Board, Office of the National Economic and Social Development Board of Thailand</i>

Opening Ceremony – 3 February

The Opening Ceremony, presided over by H.E. Mr Yingpan Manasikarn, Thai Minister of Science, Technology and Environment, was attended by over 150 guests, including representatives of 13 different APEC member economies: Australia, Canada, China, Indonesia, Japan, Korea, Malaysia, Mexico, Peru, Singapore, Chinese Taipei and Thailand. Mr Shin, Program Director at the APEC Secretariat in Singapore also attended as the representative of the Lead Shepherd of the Industrial Science and Technology Working Group, Dr Rogelio Panlasigui (the Philippines). It was held in the Siam City Hotel on 3rd February, and was combined with a one-day public seminar to promote the concept of technology foresight to the Thai public, and to representatives of the APEC members. The program was as follows:

Program:

08.00-08.45h	Registration
08.45-08.50h	Welcome <i>Dr Chatri Sripaipan, Co-Director, APEC Center for Technology Foresight</i>
08.50-09.00h	Opening Ceremony <i>Mr Yingpan Manasikarn, Minister for Science, Technology and Environment, Thailand</i>
09.00-09.10h	Opening Address Impacts of Rapidly-Changing Technology on Social and Economic Development in APEC Region <i>Mr Pithaya Pookaman, Ambassador Designated to Bangladesh, Dept of Economic Affairs, Ministry of Foreign Affairs, Thailand</i>
09.10-09.20h	Opening Remarks I <i>Professor Yongyuth Yuthavong, Director, National Science and Technology Development Agency, Thailand</i>
09.20-09.30h	Opening Remarks II <i>Mr Shin Jhong-Weon, Program Director, APEC Secretariat, Singapore</i>
09.30-09.40h	Opening Remarks III <i>Professor Greg Tegart, Director, APEC Center for Technology Foresight</i>
09.40-10.00h	Coffee and other refreshments

Public Seminar - Introduction to Technology Foresight 3 February

As part of the launching activities, a public seminar was organized to introduce technology foresight and its recent applications. It was attended by over 150 people. While these were mostly Thai people, a total of 13 APEC member economies were represented on the day: Australia, Canada, China, Indonesia, Japan, Korea, Malaysia, Mexico, Peru, Singapore, Chinese Taipei and Thailand. The presentations were subsequently compiled into a book entitled "Applications of Technology Foresight".

Program:

08.00-10.00h	Registration, and Opening Ceremony Plenary Lectures Chair: Dr Chatri Sripaipan
10.00-10.40h	I. Technology Foresight: Philosophy and Principles <i>Professor Greg Tegart</i> <i>Director, APEC Center for Technology Foresight</i>
10.40-11.20h	II. An Outline of the Sixth Technology Forecast Survey in Japan <i>Mr Terutaka Kuwahara</i> <i>Director, Technology Forecast Research Team,</i> <i>National Institute of Science and Technology Policy, Japan</i>
11.20-12.00h	III. Priority Setting for Science and Technology in the Public and Private Sectors in Canada. <i>Mr Jacques Lyrette,</i> <i>Vice-President (Technology and Industry Support), National Research Council, Canada</i>
12.00-13.20h	Lunch
13.20-14.00h	Plenary Lectures (continued) Chair: Dr Krissanapong Kirtikara IV. Application of Technology Foresight to the Formulation of Science and Technology Policies: the Korean Experience. <i>Dr Taeyoung Shin,</i> <i>Policy Advisor, Ministry of Science and Technology, Korea</i>
14.00-14.40h	V. Technology Foresight Applications in the Private Sector <i>Professor Ron Johnston,</i> <i>Director, Australian Centre for Innovation and International Competitiveness Limited, University of Sydney, Australia</i>
14.40-15.00h	Break
15.00-15.15h	Panel Discussion: Technology Foresight Exercises in APEC Chair: Professor Ron Johnston Foresighting in the Thai Private Sector <i>Mr Khemadhat Sukondhasingha,</i> <i>Deputy Secretary-General of the Federation of Thai Industries, and CEO of Sikor Co. Ltd</i>
15.15-15.30h	Information Technology in Thailand in 2010 - a view from 'Delphi' <i>Dr Pichet Durongkaveroj,</i> <i>Director of the Secretariat Office of the National IT Committee</i>
15.30-16.20h	questions from the floor and discussion
16.20-16.30h	Closing Remarks <i>Professor Greg Tegart</i> <i>Director, APEC Center for Technology Foresight</i>

Public Seminar - *Technology for Learning and Culture* 4 November

The second public seminar was organized in November, had an excellent attendance of over 250 people. The morning session was conducted in English and the afternoon session, in Thai. It was arranged in order to:

- ◆ begin to assess the impact of new and emerging information and communication technologies on learning and culture in the future, and to
- ◆ initiate technology foresight projects on the future for learning and culture, both in Thailand and across APEC

The opening ceremony was presided over by Professor Sipphanondha Ketudat, Chairman of the Executive Board of the National Economic and Social Development Board, and he also offered the key note address. In this speech, he shared his vision of education in Thailand in the 21st Century, promoting the concept of life-long education for all. The day's activities were jointly organized with NSTDA, the Thai Foresight Unit and the Bangkok Forum.

Program:

08.00-09.00h	Registration
09.00-09.20h	Opening Ceremony <i>Presided over by Professor Sipphanondha Ketudat, Chairman, Executive Board, Office of National Economic and Social Development Board</i> <i>Report, by Professor Pairash Thajchayapong, Director, NSTDA</i>
09.20-09.50h	Keynote Address: Education in the Next Century. <i>Professor Sipphanondha Ketudat,</i>
	Plenary Lectures (in English) Chair: Professor Greg Tegart Director, APEC Center for Technology Foresight
09.50-10.30h	An Issues Paper on Technology for Learning and Culture <i>Mr Jacques Lyrette</i> <i>Vice-President (Technology and Industry Support)</i> <i>National Research Council of Canada</i>
10.30-10.45h	break
10.45-11.15h	Learning in the Global Knowledge Economy <i>Professor Ron Johnston</i> <i>Director, Australian Centre for Innovation and International Competitiveness Ltd, University of Sydney, Australia</i>
11.15-11.45h	IT for Education <i>Dr Pichet Durongkaveroj</i> <i>Advisor, Secretariat Office of the National IT Committee</i>
11.45-12.15h	Open Discussion
12.15-13.15h	lunch
	Plenary Lectures (in Thai) Chair: Professor Yongyuth Yuthavong Director, Thailand Graduate Institute of Science and Technology
13.15-13.45h	The Future of Thai Society – Towards a Thinking Society <i>Dr Chai-Anan Samudavanija</i> <i>Executive Director, Vajiravudh College</i>
13.45-14.15h	Education and Future Society <i>Dr Amornwich Nakornthap</i> <i>Director, Center for Policy Research in Education</i> <i>Faculty of Education, Chulalongkorn University</i>
14.15-14.45h	Culture and the Learning Community <i>Mr Chaiwat Thirapantu</i> <i>Coordinator, the Bangkok Forum</i>
14.45-15.05h	Open Discussion

15.05-15.20h	break
15.20-15.30h	The Thai Foresight Unit of NSTDA <i>Dr Krissanapong Kirtikara</i> <i>Chairman, the Thai Foresight Unit</i>
15.30-16.00h	A Technology Foresight Study for Agricultural Development in Thailand <i>Dr Sutat Sriwatanapongse</i> <i>Deputy Director, National Center for Genetic Engineering and Biotechnology (BIOTEC), NSTDA</i>
16.00-16.30h	A Technology Foresight Study on the Importance of Science and Basic Research to the Future of Thailand. <i>Professor Montri Chulavatanatol</i> <i>Department of Biochemistry, Faculty of Science, Mahidol University</i>
16.30-16.40h	Closing Remarks <i>Professor Pairash Thajchayapong</i> <i>Director, NSTDA</i>

Training Workshop – Using Technology Foresight 4,5,6 February

A 3-day workshop was arranged to provide training on how to use technology foresight techniques. It was facilitated by members of the Center's International Advisory Board and the Center Director:

◆ **Facilitators:**

Professor Greg Tegart Director, APEC Center for Technology Foresight
also: Visiting Professor and Director, Australian Network
for Research and Technology Policy (NEXUS), University of
Canberra, Australia

Professor Ron Johnston Executive Director, Australian Centre for Innovation and
International Competitiveness Limited (ACIIC), University of
Sydney, Australia

Dr Taeyoung Shin Policy Advisor, Ministry of Science and Technology, and Senior
Fellow, Science and Technology Policy Institute, Korea

Mr Terutaka Kuwahara Director, Technology Forecast Research Team, National
Institute of Science and Technology Policy, Japan

◆ **Workshop Program**

Participants had already attended an introductory session foresight the previous day, at a public seminar. The first day of the workshop continued in lecture style format, reviewing the topics in more detail, and allowing participants to ask questions and to check their understanding. Professor Tegart began with an overview of the foresight process, followed by Mr Kuwahara's description of how to select foresight topics. Professor Johnston went on to explain about how to identify critical technologies and the key social and economic trends that may affect them. In the afternoon session, Dr Shin provided a comprehensive survey of technology foresight methodologies. Finally, Mr Kuwahara explained some of the ways in which foresight findings have been prioritized and implemented in Japan.

Days 2 and 3 of the workshop provided 'hands-on' experience of two key foresight techniques, Delphi and Scenario-based Planning. The program was extremely interactive, with small group work, followed up with larger group discussions. All the facilitators were available to advise and encourage participants throughout the program. The workshop used topics which the APEC Center for Technology Foresight planned to explore in future research. These were the topic of *Water Supply and Management* during the Delphi training and the topic of *The Use of Technology for Learning and Culture* during the Scenarios training.

◆ **Attendance**

There were 30 participants from 6 APEC member economies: China, Indonesia, Malaysia, Singapore, Chinese Taipei and Thailand. The workshop was limited to this number in order to maximise the learning opportunities of each participant.

◆ **Workshop Evaluation**

Evaluation Forms were distributed to the 30 participants and 26 were returned. The rating results, displayed in full in the table below, show that the workshop was extremely successful.

		Absolute Numbers / <i>Percentages (of 26)</i>				
		Very good	good	fair	poor	no answer
I	Program of the workshop					
1.1	Contents of the program	10 38	15 58	1 4	-	-
1.2	Appropriateness of the program	8 31	15 58	3 12	-	-
1.3	Time-schedule of the program	2 8	20 77	4 15	-	-
1.4	Materials provided in the workshop	5 19	14 54	6 23	1 4	-
1.5	Your opportunity to participate in the group discussion or to provide opinions	7 27	15 58	3 12	-	1 4
1.6	Information/knowledge you obtained from the workshop	7 27	16 62	3 12	-	-
1.7	Expected future utilization of the Information/knowledge obtained From the workshop	5 19	18 69	2 8	-	1 4
II	Communication					
2.1	Communication between you and the facilitators during the workshop	9 35	12 46	5 19	-	-
2.2	Communication between you and the organizers	10 38	13 50	2 8	-	1 4
III	Other					
3.1	Environment	15 58	10 38	1 4	-	-
3.2	Meals	10 38	13 50	2 8	1 4	-
3.3	Other facilities	9 35	12 46	2 8	-	3 12

Participants also offered the following suggestions for future workshops, and future activities of the Center.

Suggested Future Workshop Themes:

- ◇ comparisons of every country's experiences of Delphi and Scenario methods
- ◇ technology and development
- ◇ creative thinking
- ◇ innovation practices
- ◇ experiences in implementing technology foresight / application of technology foresight results - successes and failures
- ◇ science and technology in 2020 / technology for Thailand and APEC in 2015
- ◇ technology foresight for Small and Medium Enterprises
- ◇ science education
- ◇ technology trade in APEC
- ◇ environmental management
- ◇ other foresight methods (besides Delphi and Scenario), such as relevance trees and cross-matrix index
- ◇ deeper training on scenarios - another 2 days

Suggested Future Center Activities

- ◇ consultation for agencies, on request
- ◇ develop and publish guidelines about the philosophy, concept and methodologies
- ◇ technical support for countries undertaking Delphi programs
- ◇ support for individual personnel exchanges between key experts to help technology foresight projects in specific countries, for example a Japanese expert to visit and assist China (x2)
- ◇ exchange of information about technology foresight, through e-mail and web site / periodic brochure/ newsletter, including the progress of foresight exercises within APEC and the progress of the Center itself (x2)

- ◇ establish a Foresight Forum - a periodic meeting to exchange ideas and practices
- ◇ seminar by Professor Ben Martin of the Science Policy Research Unit, University of Sussex, UK
- ◇ annual recall of Thai participants to exercise foresight together and foresight future technology
- ◇ annual public seminar
- ◇ regular joint conference of the APEC Center with APEC member governments (say, bi-annual)

◆ list of participants

China

Dr. Xi Xiaolin
Director, Technology Foresight Division of the National Research Center for Science and Technology Development, The State Science and Technology Commission

Indonesia

Ir Jaizuluddin M
S&T Policy Analyst, BPP Teknologi (Agency for Assessment and Application of Technology)

Dra. Nadirah
S&T Policy Analyst, BPP Teknologi (Agency for Assessment and Application of Technology)

Malaysia

Mohd Kairual Adib Abd Rahman
Assistant Director of S&T, Ministry of Science, Technology and Environment

Mohd Zakwan Mohd Zabidi
Project Executive, Malaysian Industry-Government Group for High Technology (M.I.G.H.T), Office of the Science Advisor, Prime Minister's Department

Singapore

Dr. Lee Kink Ting
Manager of Policy and Planning Division, National Science and Technology Board

Chinese Taipei

Dr Benjamin Yuan
Assistant Professor, Institute of Management of Technology, Chiao-Tung University

Dr Vincent Wu
Associate Professor, Graduate Institute of Technology and Innovation Management, National Chengchi University

Thailand

Dr. Boonchuay Srithammasak
Researcher, BIOTEC, NSTDA,

Mr. Chaiwat Thirapantu
Coordinator, Bangkok Forum

Dr. Chatri Sripaipan
Co-Director, APEC Center for Technology Foresight, NSTDA

Dr. Krissanapong Kirtikara
Deputy Director, NECTEC, NSTDA

Ms. Nara Phatharanavik
Chief of Planning Subdivision, Department of Science Service, Ministry of Science, Technology and Environment

Miss Navarat Thamviharnkhun
Policy and Planning Analyst, NSTDA

Miss Panpaka Chalermisrachai
Scientist, Mahidol University

Dr Pirmpoon Keerati-Kasikorn
Associate Dean for Research, Faculty of Agriculture, Khon Kaen University

Dr. Porpan Vachajitpan
Advisor to the Deputy Minister, Ministry of Science, Technology and Environment

Dr. Prakin Suchaxaya
Assistant President, Chiang Mai University

Dr. Prasong Praneetpolgrang	Director MS Program (IT), Sripatum University
Mr. Pun-Arj Chairatana	Policy Analyst/ TGIST Coordinator, NSTDA
Dr. Saran Poshychinda	Researcher, MTEC, NSTDA
Ms. Saowanee Musidang	Policy and Planning Analyst, Ministry of Science, Technology and Environment
Mr Somchai Tiamboonprasert	Policy and Planning Analyst, Ministry of Science, Technology and Environment
Mrs. Supawan Tantitanawat	Senior Industrial Technical Officer, Department of Industrial Promotion, Ministry of Industry
Ms. Surat Chumjit	Policy and Planning Analyst, King Mongkut Institute of Technology, Thonburi

Executive Seminar and Video-Conference - 3 November

This event focussed on the topic of *the Digital Economy*. Its purpose was two-fold. Firstly, the seminar aimed to promote understanding of the potential for new information and communication technologies to revolutionize many sectors of society, from education to business and commerce. Secondly, participants were introduced to the concept of *foresight* which can be applied in this field, as in many others, to assess and plan for the impact of new technologies.

The seminar was hosted by the United States Information Service, and included a special **Video-Conference** between the USA and Thailand. From America, APEC Ambassador John Stern Wolf, whose special area of interest is electronic commerce, gave his views and answered questions. The expert panel in Thailand included Prof Pairash Thajchayapong, Director of NSTDA, and Prof Ron Johnston and Mr Lyrette of the APEC Center International Advisory Board. The video-conference was followed by a wide-ranging discussion between experts and invited executives on the implications of the Digital Economy for business, government and society in Thailand. This included both potential threats, such as the shortage of skilled staff in this field or the danger of excluding people and organizations without the necessary training or equipment, as well as potential opportunities for developing new businesses or carrying out existing business and services in new and exciting ways.

Co-organizers of this event included NSTDA and the National Information Technology Secretariat of the National Electronics and Computer Technology Center of Thailand.

Program:

07.45-08.00h	Registration
08.00-08.45h	Video-Conference, between the USA and Thailand
08.45-09.00h	Break
09.00-10.30h	Discussion between expert panel and invited audience

Expert speaker in the USA:

Ambassador John Stern Wolf,
Ambassador to APEC

Expert Panel in Thailand:

Professor Pairash Thajchayapong,
Director, National Science and Technology Development Agency, Thailand

Mr Jacques Lyrette,
*Vice- President (Technology and Industry Support), National Research Council,
Canada*

Professor Ron Johnston,
*Executive Director, Australian Centre for Innovation and International
Competitiveness Ltd, University of Sydney, Australia*

Visits

During 1998, the Director and Co-Director visited many public and private sector organisations to explain the role of the Center and promote participation in its activities.

1) The Director's Trip to Canada, the USA and Mexico in July 1998

While on a visit to Canada and the USA, largely funded by the Australian Academy of Technological Sciences, Professor Tegart was able to add on several days to deal with issues related to the APEC Center.

◆ Canada

Prof Tegart discussed the issue of co-operation on the project proposed for 1999 on "Technology for Learning and Culture" with Mr Jacques Lyrette, Vice-President of the National Research Council of Canada and Dr Sadiq Hasnain, Senior Policy Advisor for International Relations at the NRC. Mr Lyrette offered to consider the preparation of an issues paper by November and the possibility of holding an experts meeting in Vancouver early in 1999 to discuss the issues paper and identify issues for a Delphi study was explored. Prof Tegart also visited several NRC research institutes.

◆ USA

Prof Tegart met with Dr Phyllis Yoshida, Director of the Office of Technology Policy, US Dept of Commerce who is the US representative on APEC ISTWG and encouraged her to help identify US experts for the Delphi study on "Water Supply and Management". She indicated there could be a problem because of government rules on privacy and contacting people in large numbers – however, the Center subsequently received a list of 160 experts. In view of the problems raised by Dr Yoshida, Prof Tegart also met with the National Academy of Engineering and sought their assistance in identifying NAE Fellows with experience in water matters. Subsequently another list of possible participants was sent to the Center. Both NAE and NAS (National Academy of Sciences) expressed an interest in supporting the work of the Center by the provision of material and identifying experts.

◆ Mexico

Prof Tegart met with a number of officials from the National Council for Science and Technology (CONACYT) who were supportive of the activities of the APEC Center. Through CONACYT, a national technology foresight exercise was being planned, to start at the beginning of 1999 and last for 18 months. Detailed planning was in progress. Prof Tegart suggested that the APEC Center could assist by carrying out a workshop in Mexico which could involve participants from Chile and Peru (which became an APEC member late in the year). CONACYT officials were enthusiastic about this possibility. He also met with officials from the Center for Prospective Studies of the Javier Barnes Sierra Foundation (a private organization) which will be assisting with the CONACYT study. They were keen to work with the APEC Center. Prof Tegart also visited several CONACYT institutes.

2) The Director's Trip to Europe in September and October 1998

During a visit to Europe, Prof Tegart took the opportunity to visit several institutions engaged in foresight studies.

◆ European Union

Prof Tegart visited the Institute for Prospective Technological Studies, Seville, Spain, on 10-11 September 1998. This is a large institute, working for the European Commission in Brussels on a wide range of studies involving energy and climate change, new technologies, regional development and social change.

◆ UK

Prof Tegart met with leading foresight expert, Professor Ben Martin, Director of the Science Policy Research Unit, Sussex University on October 26. He raised the possibility that Prof Martin might find time to visit Bangkok on his way to some meetings about foresight in Australia in 1999. If so, a half day public seminar would be arranged. Prof Tegart also held discussions with Mr Gordon McKerron, of the Energy Group which is linked with the UK Foresight Programme, and with Mr Stephen Spivey, Director of Foresight, on the UK Programme and its future course. Prof Tegart collected some manuals on Foresight, and suggested that the Center produce some similar publications.

3) The Co-Director's Trip to Vietnam in October 1998

◆ Vietnam

Dr. Chatri Sripaipan attended and presented a paper in the Scientific Conference on Science and Technology Infrastructure and Resource Development (SCIRD) in the Fifth ASEAN Science and Technology Week in Hanoi, Vietnam during October. The paper entitled "Technology Foresight as a Tool for Strategic Science and Technology Planning and Policy Development" was co-authored by Professor Yongyuth Yuthavong and Dr. Chatri Sripaipan. It aimed to stimulate policy makers in the ASEAN countries to think about using technology foresight as a strategic science and technology planning tool both nationally and ASEAN-wide.

Dr. Chatri also visited the National Institute for Science and Technology Policy and Strategic Studies (NITPASS) to discuss possible cooperation between the APEC Center for Technology Foresight and NITPASS. He was received by Dr. Le Dinh Tien, Deputy-director of NITPASS and Director of Research And Post-Graduate Education (RAPOGE) project and staff. Possible cooperation between NITPASS and the APEC Center for Technology Foresight was discussed, starting from information exchange to personnel exchange to joint research projects. NITPASS was interested in technology foresight because it was working on "National Project on Formulation of Science and Technology Strategy to the Year 2000" (STS2000). Further discussions on possible activities like lectures or workshops on technology foresight in Hanoi were planned to take place during Dr. Le Dinh Tien's visit to Thailand in January 1999.

4) The Co-Director's Trip to India in November 1998

◆ India

Dr Chatri presented a paper about the ***Water Supply and Management*** project to the IATAFI (International Association of Technology Assessment and Forecasting Institutes) conference in New Delhi in November. The paper was co-authored by Ms Tamsin Jewell. The conference was organised by TIFAC (Technology Information, Forecasting and Assessment Council of India) on behalf of the IATAFI, and included participants from all over the world, many of whom were foresight experts. It was thus an opportunity to promote the work of the Center and make new contacts.

Budget Report

Throughout the year, regular meetings were held to educate Center staff and other interested persons about technology foresight and related issues. Participants from throughout NSTDA attended, including the 3 national Centers, with occasional visitors from other institutions such as Mahidol University and the Ministry of Science, Technology and Environment. The style of the Forum was kept fairly informal in order to encourage debate and discussion amongst participants.

No	Date	Speakers	Topics
1	21-Nov-97	Ms. Monthida Sitathani	a case study: the German experience
2	28-Nov-97	Ms. Tamsin Jewell	the UK foresight program
3	12-Dec-97	Ms. Mayuree Vathanakuljarus	planning ahead in the USA
4	19-Dec-97	Dr Pichet Durongkaveroj	foresight techniques: Delphi
5	26-Dec-97	Dr Chatri Sripaipan	foresight techniques: Scenario-construction
6	9-Jan-98	Ms Jane Zhang	Foresight in China
7	23-Jan-98	Professor Montri Chulavatnatol	Foresight in New Zealand
8	30-Jan-98	Professor Yongyuth Yuthavong	Possible Futures of Thailand
9	13-Feb-98	Professor Greg Tegart	Future Shape of the World Economy
10	20-Feb-98	Dr. Krissanapong Kirikara	UK S&T policy, including Mechanisms for Implementing Foresight Findings
11	27-Feb-98	Ms Usapan Swasdio	Foresight in Australia
12	6-Mar-98	Dr. Yada Mukdapitak	A facilitator' s guide to running a Foresight workshop
13	13-Mar-98	Mr. Pun-arj Chairatana	Why do firms do basic research, with their own money? (but not in Thailand)
14	20-Mar-98	Dr. Chatri Sripaipan	Report on Taipei Trip
15	27-Mar-98	Miss Navarat Thamviharnkhun	Foresight in Industry
16	3-Apr-98	Mr. Brian Lee	The Whitehall Report (UK Foresight)
17	10-Apr-98	Dr. Chatri Sripaipan	The Millennium Project
18	24-Apr-98	Ms. Monthida Sitathani	Prioritization of R&D
19	1-May-98	Ms. Monthida Sitathani	Prioritization of R&D II
20	22-May-98	Ms. Nalinrat Sirikantraporn	Future Scenario on Water Supply and Management
21	29-May-98	Professor Peter Douglas	Demographics and Foresight
22	5-Jun-98	Mr. Anan Wattanakuljarus	Agro-Industrial Route (AIR) of Thailand
23	19-Jun-98	Ms. Tamsin Jewell	Consultation and Foresight
24	3-Jul-98	Dr. Chatri Sripaipan	Legality, Credibility and authority of an APEC Foresight Study
25	17-Jul-98	Mrs. Darunee Edwards	Thailand Science Park Project
26	31-Jul-98	Dr. Montri Chulavatnatol	Relevance of Basic Science and Research to the Future of Thailand
27	14-Aug-98	Ms. Nalinrat Sirikantraporn	Small Business Foresight
28	28-Aug-98	Ms. Tamsin Jewell	Multi-Country Foresight
29	11-Sep-98	Dr. Chatri Sripaipan	Preliminary Comparison of the Key Characteristics of the Delphi studies between the APEC one on Water Supply and Management and that of the Thai Foresight Unit on Technologies for Agriculture.
30	9-Oct-98	Mr. Brian Lee	Future Materials

Publications

The Center worked towards the goal of making all its materials available in its own web site, and most can now be downloaded. However, 'hard' copies of its books and leaflets were also sold and distributed free around the region.

- (book) – **Proceedings of the APEC Symposium on Technology Foresight**, held in Chiang Mai, Thailand in July 1997. (Available in hard-copy only.)
- (book) – **Applications of Technology Foresight: Proceedings of the First Public Seminar**, held in Bangkok, Thailand in February 1998. (Available in hard-copy and on the web.)
- (article) – **Technology Foresight as a Tool for Strategic Science and Technology Planning and Policy Development** by Prof Yongyuth Yuthavong and Dr Chatri Sripaipan. Presented to the 5th ASEAN Science and Technology week in Hanoi, Vietnam, in October 1998. (Available on the web.)
- (article) – **Multi-Country Foresight – Issues and Challenges**: a paper based on a foresight study in progress on the Future for Water Supplies and Management in the APEC Region to the year 2010, by Ms Tamsin Jewell and Dr Chatri Sripaipan. Presented to the 3rd International Conference of the International Association of Technology Assessment and Forecasting Institutions, in New Delhi, India, in November 1998. (Available on the web.)
- (Issues Paper) – **Water Supply and Management in the APEC Region**, prepared for the Center by Professor Ron Johnston, Executive Director of the Australian Center of Innovation and International Competitiveness, University of Sydney, in April 1998. (Available on the web, and in future also in hard-copy in Volume II of the Final Report of the research project)
- (Issues Paper) – **Technology for Learning and Culture**, prepared for the Center by Mr Jacques Lyrette, Vice-President Technology and Industry Support, National Research Council of Canada, in November 1998. (Available on the web).