
A N N U A L R E P O R T 2 0 0 2

APEC Center for Technology Foresight
Bangkok, Thailand



Asia Pacific Economic Cooperation

National Science and Technology Development Agency

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PREFACE

The APEC Center for Technology Foresight has regularly issued the Annual Report since its establishment in 1998. The purpose is to present the data and records of activities that might be of the interest to the public. It is the hope that the book could also update the individual scholars, researchers, academics, S&T and policy planners, and other organizations on the important subject of foresight as applied to policy planning, development, and recommendation. It is also a record of key activities completed in each year by the Center.

The Asia-Pacific Economic Cooperation (APEC), through its working group of ISTWG, has realized the significant contribution of foresight as a tool for long-term planning and strategic decision-making process ranging from organizational, sectoral, national, and regional levels. Thus, the Center has been established with the important mission to diffuse foresight knowledge and capability throughout the APEC region.

Five types of key activities were completed by the Center in 2002. They were activities relating to foresight projects, consulting activities, international training and workshops, the APEC TFN, website, and others. We invite you to study the details as provided in the following pages and wish to receive your feedback and suggestions that would later enable us to perform better and get closer to the needs and demands of institutions in the APEC region.

The APEC Center for Technology is a small center, operating as a virtual center for all APEC economies with the base office in Bangkok. The scale of our operation is in complete contrast with our core staff of six people. All of us work hard trying to serve various needs on foresight in the APEC region. At the close of the year 2002 we also recorded our thanks to the ISTWG in-kind contribution and to the excellent cooperation and assistance from our International Advisory Board and the Steering Committee. The governing bodies that have constantly provided us with hindsights and foresights, enabling us to reach our goal of operation.

A special note of thanks goes to our advisors: Dr. Chatri Sripaipan, Vice President of NSTDA and Professor Greg Tegart, Executive Advisor, for their unfailing notes of suggestions. We also thank Mr. Kaname IKEDA, the Honorary Director, and Dr. Malee Suwana-Adth, for their spirit of support in many of our initiatives. I also wish to acknowledge the strong support of NSTDA and the dedicated staff of the Center. Together we shall continue to play a key role as “the Center of Foresight” in enhancing cooperation among the APEC region.

Dr. Witaya Jeradechakul
Executive Director

A. BACKGROUND

The APEC Center for Technology Foresight is a project of the Industrial Science and Technology Working Group of APEC (ISTWG). Through this establishment origin, the Center has been chartered with a mission to promote foresight knowledge and capability throughout the APEC region. The Center fully participates in the biannual ISTWG meetings and holds a side meeting in order to keep the ISTWG members informed of its ongoing activities and to seek the opinions, suggestion, and support from all ISTWG members. The Center was set up through the support of the Thai government and as a unit in the National Science and Technology Development Agency (NSTDA) with the important mission to serve all APEC economies. Currently it has two committees to guide and advise the overall plan and activities: firstly, the International Advisory Board (IAB), consisted of nine members, are nominated from a pool of local and international experts with the advisory function to the Center; and secondly, the Steering Committee (SC), which also comprises nine members, are invited from senior administrators, business representatives, and other relevant government organizations. The Steering Committee has a specific function of providing guidelines on the overall management and activity plan for the Center.

Objective, Core Competencies, and Scale of Operation

The Center's activities and operation in 2002 were undertaken according to the Scope and Purpose of the Center which have been adopted since the year 2000. The objectives, core competencies, and scale of operation were outlined as follows:

Scope and Purpose of the Center since the year 2000

Objective: To develop and diffuse foresight capability across APEC through multi-economy studies, training, consultancy and related activities.

Core Competencies of the Center:

- 1) Capability to coordinate and facilitate multi-economy foresight studies (with embedded training);
- 2) Expertise in training and consultancy services;
- 3) Expertise in foresight methodologies and practice;

Underpinned by:

- 4) Ability to work effectively across a range of cultures and types of organisation;
- 5) Ability to understand and communicate basic science and technology and its implications for socio-economic development.

Scale of Operation: The APEC Center for Technology Foresight is both a national and an international Center. From a solid base in its host economy – Thailand - the Center aims to serve and involve all the members of APEC.

The CTF is also open to cooperation with non-APEC members where appropriate.

B. ACTIVITIES IN 2002

1. COMMITTEE AND ISTWG ACTIVITIES:

1.1 International Advisory Board: In 2002 the International Advisory Board met only once on November 20, 2002 as a joint meeting with the Steering Committee. The venue was at the Tunkha Room, Merlin Beach Resort, Phuket. In addition to the adoption of the Minutes of the last IAB meeting of 13 December 2001 and of the SC meeting dated 14 May 2001, the meeting discussed the Center's plan of activities for 2003 and provided suggestions to the future plan of the Center.

1.2 Steering Committee: The committee met twice in 2002. The first meeting was on 14 May 2002 and was briefed on the overall plans of the Center in 2002 and 2003. Specific suggestions by committee members were given to the Center concerning the planning to hold the foresight conference during the APEC CEO Summit during 18-21 October 2003, the resource to secure the funding to support the Center's visiting and internship programs, and other issues. The Committee also agreed to conduct a strategic planning session to brainstorm the members and other invited key stakeholders to map out the 5 year strategy and a one-year action plan for the Center. This planning session was to support the first planning done by the IAB in 2002. This second workshop by the SC was organized due to the rapid changes of the world situations which the Center itself must strategically readjust to accommodate them. The strategic planning session was held on the 6th of September 2002 at the Amari Atrium Hotel, Bangkok. (*Appendix I: Composition of the IAB and SC*)

1.3 Industrial Science and Technology Working Group (ISTWG): In 2002, the Center participated in the 23rd APEC ISTWG during 23-25 September 2002 in Chinese Taipei and organized a side meeting on 24 September to cover the following topics:

- The Center's activities during October 2001 to September 2002
- Multi-Economy Foresight Projects on Nanotechnology: the Technology for the 21 Century" and "DNA-Analysis for Human Health in the Post-Genomic Era"
- Preparation of the 4th APEC R&D Leaders Forum: the Challenges of Research and Technology Organizations in the Knowledge-based Economies
- International foresight Conference in 2003
- Future APEC-wide foresight topics

The suggestions made in the side meeting were useful for the Center to process new initiatives on the APEC-wide scale to be discussed in the 24th ISTWG meeting. (*See Appendix II*)

2. PROJECT ACTIVITIES:

2.1 Multi-Economy Project

2.1.1 Post Foresight Project:

The APEC CTF has successfully completed 5 APEC-Wide projects since its establishment in 1998. In 2002 the Center conducted two post foresight activities.

The first post foresight activity was *the Center's participation in international conferences* on various occasions. Lists of the activities were:

- 27-28 February Asia-Pacific Nanotechnology Inaugural Conference, Tsukuba, Japan
- 1 March US/Japan Workshop on Nanotechnology in Tokyo, Japan
- 14 March Institute for Perspective Technological Studies in Seville, Spain
- 12-15 August the 6th International Conference on Technology Policy and Innovation in Kyoto, Japan
- 26 August Symposium on Synergies of Engineering Branches at Czech Academy of Engineering, Prague
- 30 August Centro de Investigacion en Microsistemas, University of Navarra, San Sebastian, Spain
- 10-12 September UNIDO International Foresight Conference for Ukraine, Kiev, Ukraine

The second activity was the organization of *the Nanotechnology for the ASEAN Region workshop* which was held in Bangkok on 19-20 September 2002. This event was a cooperation between the Center and four other organizations: the Asia-Pacific Nanotechnology Forum (APNF); National Science and Technology Development Agency (NSTDA); the Thai Academy of Science and Technology; and the ASEAN Subcommittee on Science and Technology Infrastructure and Resources Development (SCIRD). It was a successful event to create an awareness in nanotechnology among the countries of both developed and developing settings. Representatives of countries participating in the workshop were informed of the importance of this new emerging area and of the need to set up an appropriate action to suitably accommodate the fast development of nanotechnology. The workshop received positive comments and wide publicity from the participants and the public. The information about the workshop, for example, was invited by APNF to be published in its journal as follows:

REPORT for APNF newsletter, from the APEC Center for Technology Foresight

The APEC Center for Technology Foresight was delighted to cooperate with the Asia-Pacific Nanotechnology Forum to co-organise a two-day workshop on "Nanotechnology for the ASEAN region". It was held in Bangkok, Thailand in September 2002. The workshop developed a clearer picture of nanotechnology research in the south-east Asian region and provided valuable opportunities for information sharing and building collaboration.

The APEC Center for Technology Foresight reported on its newly-completed foresight study of nanotechnology which involved 11 Asia-Pacific economies. Having developed scenarios of the future impacts of nanotechnology, the foresight project elaborated 11 key issues which were seen as critical to the successful development of nanotechnology for the benefit of society (for more information see <http://www.nstda.or.th/apectf>). The issue of education and training was of particular interest to the participants.

The Asia-Pacific Nanotechnology Forum arranged presentations from leading researchers from Chinese Taipei Japan, Korea and Singapore on the latest developments in fields such as nano-photonics, tissue engineering and nanomaterials. APNF speakers also provided an overview of Asia-Pacific nanotechnology initiatives and reviewed the potential for regional cooperation and commercialisation of nanotechnology research. Everyone appreciated the suggestion of regional nanotechnology facilities for both research and training.

ASEAN is comprised of 10 countries in south-east Asia, only one of which (Singapore) is usually recognized as having advanced S&T capabilities. So the organizers were delighted to receive an enthusiastic response from ASEAN scientists, with nearly one hundred

researchers participating in the event to share their experiences and plans for nanotechnology.

Representatives of 4 ASEAN countries initiated a lively discussion of the prospects for nanotechnology in ASEAN, dream or reality? Speakers from Malaysia, the Philippines, Thailand and Vietnam proved that while nanotechnology research is a reality in ASEAN, the scale of the work is very modest and there have not yet been any commercial applications. With very limited government funds for S&T, and priority given to areas with direct impacts on socio-economic development of these relatively less advanced economies, ASEAN countries may choose to use nanotechnology to build on existing resources and capabilities. In Thailand for example, “nano-innovations” in food packaging might be an especially valuable product to develop, since the food industry is already one of the country’s strengths. The possibility of identifying niche opportunity areas was highlighted; the Malaysian researchers gave the example of their work on aero-gels (patent pending!).

This meeting was co-sponsored by the National Science and Technology Development Agency of Thailand (host of the APEC Center for Technology Foresight), the Thai Academy of Science and Technology and the ASEAN Subcommittee on Science and Technology Infrastructure and Resources Development (SCIRD) and their support is gratefully acknowledged. Also see <http://www.nstda.or.th/apectf>.

(A list of participants in the ASEAN Workshop on Nanotechnology was provided in Appendix III)

2.1.2 New APEC-Wide project:

In 2002 the Center received a funding support for the new project on “**DNA-Analysis for Human Health in the Post-Genomic Era**” A full proposal of USD\$ 82,630 was submitted to the 22nd ISTWG meeting in Singapore on 11 March 2002 and was, then, approved by the APEC Fund Management Committee. An official notification of the final budget approval of USD\$ 78,132 was made to the Center in November 2002. The DNA project will be carried out fully in 2003. A full proposal was appended in the Appendix IV.

2.2 Thai Foresight Projects

One of the Center’s roles was to encourage the follow up activities in APEC member economies. In Thailand, the Center played a key role in terms of study design and implementation of these foresight studies. Depending on the design of each study, either scenario workshop or Delphi was used. These projects were all initiated in 2000 and completed in 2002. The cooperating agencies and projects were:

- **IT for Education** – Dr. Pichet Durongkaveroj, advisor to the President of King Mongkut's University of Technology Thonburi (KMUTT) (Scenario Workshop);
- **IT for SMEs** – Dr. Pasu Loharnchun, Director of Bureau of Supporting Industries Development, Department of Industrial Promotion, Ministry of Industry (Delphi); and
- **Training of the Trainers for strengthening Local Government Capacity on Foresight project (TOT)**, Associate Professor Dr. Somchai Durongdej, Head, Department of Nutrition, Faculty of Public Health, Mahidol University (Scenario Workshp).

At the end of the projects, the Center organized a public seminar on the Thai sectoral foresight as part of the NSTDA Annual Conference 2002 on 21st August 2002. The venue was at the International Convention Center of Impact Muang Thong Thani, Bangkok. The purpose of the conference was to report and disseminate the outcomes of the three studies to public and private participants. A total of 169 participants signed up

to join the meeting. The discussion among audiences and the leaders was useful in the array of how foresight can be applicable to institutional level. This activity contributed to creating the network of future collaborations in foresight activities at various levels in Thailand. (*Appendix V*)

3. CONSULTING ACTIVITY

The Center in cooperation with Science, Technology and Innovation Policy Research Unit, National Science and Technology Development Agency (NSTDA) was approached by Technology Promotion Association (Thailand-Japan) (TPA) to conduct a study review of Association's vision, mission, and existing strategies. The final objectives were to assist TPA in developing a 5-year strategic plan and a one-year action plan, and to draw their future directions. TPA is a non-profit organization, which is partially funded by the Japanese government. The duration of the activity was from July-November 2002. The final result was submitted to TPA for their implementation within the organization. TPA also reported the outcomes of the consultancy during its annual international conference in January 2003.

4. INTERNATIONAL CONFERENCE

4th APEC R&D Leaders Forum: the Challenges for Research and Technology Organizations (RTOs) in the Knowledge-based Economy

The Center jointly organized forum with the National Science and Technology Development Agency of Thailand, the Industrial Technology Research Institute of Chinese Taipei (ITRI) and the National Research Council of Canada (NRC). It was well attended by 161 people from 11 APEC economies and 1 participant from Norway. The purposes of the forum were to allow RTO leaders to reflect on the changed environment, to share experience on new projects and new ways of working that can be productive in the changed environment and to look to the future for the changes that they will need to make.

In addition to co-planning and international coordinating for speakers and participants, the Center had introduced the foresight session into the conference, in cooperation with Professor Ron Johnston, the Executive Director of the Australian Center for Innovation at the University of Sydney and the lead facilitator of the foresight process in the forum. The session, using scenario planning tool, was aimed to assist the participants to stretch their thinking to the realm of uncertainties in the future i.e. environmental challenges and public support on R&D. The outcome was to complement the dialogue of current issues and draw policy implications on the management of RTOs. (*See appendix VI for program and summary report, and list of participants of this forum.*)

5. APEC TECHNOLOGY FORESIGHT NETWORK (<http://www.apectf.net>)

Background

The foresight network was commenced in late 2001 through the support of Mr. Jacques Lyrette, Vice-President of the National Research Council of Canada (NRC) and member of the International Advisory Board of the Center. The network aimed at connecting foresight practitioners globally, and to enable them to share ideas and experiences. At the same time, by recruiting foresight experts to the Network, a very valuable database would be developed of foresight practitioners, contact details, their areas of expertise and interest, and their projects and publications.

In 2002, there were quite a few organizations and individuals applying for memberships. With a successful foundation of APEC TFN laid in the year 2001 and additional network development in 2002, the Center determined to continue its effort to campaign for new members and add interactive discussion sessions in 2003. A summary of the membership status as of 2002 was briefed in the following: (*appendix VII list for all profiles*)

83 Profiles have been created as of December 2002:

- **Experts:** 36 from 14 Canada; 6 Thailand; 3 Australia; 2 Peru; 2 UK; and 1 each for Chile, Denmark, Hong Kong, China, Iran, Malta, South Africa, Venezuela, Turkey, U.S.A
- **Organizations: 19** -- divided into six categories:
Government 10; Industry Association 2; International Organization 1; Private Sector / NGO 3; Professional Association 1; University 2
- **Events: 7** -- 3 events from the Center, 2 from U.S.A., 1 Canada, and 1 Ireland. This profile category is available for network publication and advertising
- **21 APEC economies: 6** key member profiles -- Australia, Canada, Japan, Philippines, Thailand, and Vietnam. This profile is established for 21 APEC member economies with network contact person in each economy.

6. INTERNATIONAL TRAINING WORKSHOP

The Center was invited to provide training workshops both at the national and organizational levels in the APEC economies. In the year 2002, there were three major training workshops (under individual economy and APEC-wide categories) as follows:

6.1 Individual Economy Workshop

- **Malaysia**

The Ministry of Science, Technology and the Environment, Malaysia invited the Center to give lectures on Technology Foresight for their Pre-national Technology Foresight Seminar on 16-17 September 2002 in Malaysia. Lectures were part of a series which were led by Professor Greg Tegart, Executive Advisor of the Center; Dr. Chatri Sripaipan, Vice-President of NSTDA; and Dr. Witaya Jeradechakul, Executive Director of the Center. The sessions were as follows:

Professor Greg Tegart (Executive Advisor of the Center)

- What is Technology Foresight and how it fits in with Traditional Tools for Forecasting, challenges for Science and Technology/Research and Development in the future, New Tools for Managing Knowledge about the Future?
- Approaches to Technology Foresight – matching methods to purpose, critical success factors.
- Technology Foresight as Planning Tool – managing expectations, what can planning deliver and how is foresight special, realities of policy development process and political decision making.
- Experiences learned and Pitfalls to avoid

Dr. Chatri Sripaipan (Vice-President of NSTDA)

- Case Studies of Successful companies and countries using Technology Foresight – Shell, Japan, etc.
- Foresight's Impact on Policy Planning – what has happened/can happen as a result of Technology Foresight – case study of UK plus examples from other Technology Foresights to illustrate lessons on how to increase policy impact.
- Portfolio of Technology Foresight Tools: Strengths and weaknesses, etc.

Dr. Witaya Jeradechakul (Executive Director of the Center)

- Challenges to Knowing the Future / Predicting the Future & Drivers of Change
- Role of The Center in the region, reports on other Technology Foresight activities in the region, etc.

- **Vietnam**

The National Institute for Science & Technology Policy & Strategy Studies (NISTPASS), Ministry of Science, Technology, and Environment, Vietnam invited the APEC Center for Technology Foresight to conduct the second workshop on food processing. This time the focus was on tea industry and was held in Do Son, north of Hanoi.

There were about 90 participants on the first day, 25th November 2002, with over 60 people from the tea industry; state-run Tea corporations and its subsidiaries of tea companies as well as Tea Association. Most were senior executives. The rest of about 30 people were from various ministries: Ministry of Trade, Ministry of Agriculture and Rural Development, Ministry of Health, Ministry of Science, Technology, and Environment, and universities. On second and third days, many participants returned to work, but 50 remained at the workshop, including the General Director of Vietnam National Tea Corporation.

The workshop was conducted by the APEC CTF team, comprising Professor Greg Tegart, Executive Advisor, Dr Witaya Jeradechakul, Executive Director and Ms. Kasina Limsamarnphan, Assistant Policy Researcher. For effective communication during the workshop, Dr Bach Tan Sinh from NISTPASS was invited to serve as the interpreter. Methodology used in this workshop included scenario planning and a series of lectures on Technology Foresight.

The positive comment for the workshop was received from the teacompany's director that the workshop was useful to get them to agree upon important issues they would need to tackle. There were so many issues of concern before they came to the meeting, and the workshop made them see their priority. Important areas, which had been covered, were development of seeds, safety of the products, sufficient plantation areas and a framework of government roles that the tea industry wants, clear land policy for tea plantation, opening the business to the private sector and set tea standard and standard for processing equipment.

6.2 APEC-Wide Workshop

- “Tools for Managing the futures: A Portfolio Approach”

The first workshop of its kind for the Center was held on 18-22 February 2002 at the Pathumwan Princess Hotel Bangkok. It took place after more than a year of planning, marketing and organizing and the efforts were richly rewarded with a productive training workshop. Professor Ron Johnston, the Executive Director of the Australian Center for Innovation at the University of Sydney is the major partner of this venture from the planning of the course structure and content to the leading of the workshop. The international character and high caliber of the participants was especially noteworthy. Through the target was 20, the course eventually ran with 29 people from 11 countries (including 7 APEC member economies). They ranged from young postgraduate students to government officials at the highest levels. The group included many foresight beginners but also a small but significant number with considerable expertise based on leadership roles in their national or organizational foresight efforts, whose main concern seemed to be to increase their repertoire of methods and learn from the experiences and ideas of the facilitators and other participants. Many were interested in S&T issues, others in national and organizational development, for human resource development, and for education and social planning. The positive response from this workshop led the Center to consider opening the course again in 2003. (*Details of the workshop were summarized in Appendix VIII.*)

7. INTERNATIONAL COOPERATION

During 2002, the Center enhanced its international cooperation with three major organizations, namely

- **the Association of Southeast Asian Nations (ASEAN);**
- **Commonwealth Science Council (CSC); and**
- **United Nations Industrial Development Organization (UNIDO).**

ASEAN: The first organization was a cooperation to launch a regional workshop on Nanotechnology for the ASEAN Region during September 19-20, 2002. Currently, ASEAN and the Center are working on a new foresight related project on ASEAN Technology Scan. The project starts in July 2003 and covers two years.

CSC: The linkage with CSC started in 2002 when CSC sponsored 5 participants to attend the Center's first International Conference "Tools for Managing the Future: A Portfolio Approach" held during 18-22 February 2002. The success of the first workshop led CSC by Mr. Ken Lum to visit the Center to exploring the possibility that the Center's workshop be conducted specifically for CSC participants. The Center and CSC are still pursuing a discussion to jointly hold the workshop in 2003.

UNIDO: The UNIDO cooperation was mainly done in the form of discussion with no specific plans to be realized. The Center was approached by UNIDO for a cooperation in the program on "Technology Foresight Initiative for East Asia" Discussions were carried out between the Center and UNIDO representatives, Dr. R.Seidel da Fonseca, Dr. Toshiyiki Miyake, and Dr. Ketmanee Ausadamongkol. The Center was later informed by UNIDO that the project had undergone some internal reshaping to suit the nature of each participating country. During December 2002, the Center was visited by Dr. Toshiyiki Miyake to discuss a cooperative project that UNIDO would hope to propose at a later date.

8. WEBSITE

The website of the APEC CTF has been providing information about the center, its activities, foresight research projects, and foresights in APEC since October 1997. It was an information resource on technology foresight and a place where visitors exchange their information and ideas. The website has been updated and modified on its contents regularly during the past five years of the Center's operation. Most of the updates and modifications emphasized APEC-wide research projects. As a virtual center, the site has gradually become a powerful communication tool on foresight research projects and other activities such as international conferences and training workshops. The site offers reciprocal links to relevant sites around the world and prominent link of the APEC Industrial Science and Technology Working Group site at <http://www.apecst.org>. The content structures of the website are combined in the major sections as follows:

<ul style="list-style-type: none"> • About our center • Our organization • Our activities • About Thailand's NSTDA • Calendar of events • Technology Foresight Network 	<ul style="list-style-type: none"> • Foresight research • Useful links • Foresight in APEC • Foresight training • Free publications • Site search
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Moving NSTDA Servers to Science Park, North of Bangkok

In April 2002, NSTDA had moved its location to Science Park. The Management Information System (MIS) office and all equipment were relocated to the new location. As the Center's website is installed on a NSTDA server, all web pages had to move to Science Park as well. The website redesigns and reconfiguration were prepared at the end of 2001 prior to the move with kind supports from the MIS unit. When the transfer was finished, an estimate of 100 web pages out of 200 technical pages were completely relocated and published smoothly at its new server location.

Website's visibility

The Center outsourced online advertising to a company to increase website's visibility in late 2001. The web promotion installation took 6 months (from 23 August 2001 to February 2002). It was hoped that after this installation the visits for the web site would improve satisfactorily, but the new server relocation from the old location to the new Science Park disrupted the continuity of the visit records since every page on the website was modified to accommodate to new server. Thus the visits as shown in the curves in the appendix IX slightly fluctuated and showed no sharp improvement visit records. The leverage of the visit counts was recorded to differentiate previous numbers of visit counts for continual improvement. It was also remarkable that the elevated visit counts associated with the Center's activities. For example, prior to the 4th APEC R&D Leaders' Forum in November 2002, the visit counts rose distinguishably. (A summary of visit counts in graphs was presented in Appendix IX.)

C. FORESIGHT PUBLICATION

In the year 2002, the Center produced three new publications.

The first one was the Volume II of “Nanotechnology: the Technology for the 21st Century” which was prepared by Professor Greg Tegart, the Center’s Executive Advisor with extensive support of the National Research Council of Canada and the participating economies. The report was launched at a good timing as Nanotechnology was the issue of interest by most global institutions. The Center distributed this report widely in the APEC economies as soon as the printing work was completed. Copies were also sent to a number of institutions and agencies on their request.

The second publication was prepared as a publicity tool titled “Introducing Foresight and the APEC Center for Technology Foresight”. The main purpose of producing a technology foresight booklet was simply to diffuse the knowledge of technology foresight to the range of planners to decision-makers of the public and private institutions, or any interested groups to be able to conveniently obtain such information as basic technology foresight guidelines. Importantly, readers of this booklet will have a clearer understanding of the key elements of foresight.

The third publication was the Annual Report 2001, which was completed in late April 2002. The book included the key activities done in 2001 and was aimed to serve as another resource book for the interested public. The Center’s publications are currently available in electronic versions which could be accessed through <http://www.nstda.or.th/apectf> (See Appendix X for list of the Center’s publications)

D. TEAM DEVELOPMENT

Appointment of new staff

The Center entered into further stages of development. The Center's team was fully engaged to manage the activities in 2002. The latest member was Dr. Chatwarun Ongkasing who was recruited as a new policy researcher, thus, putting the Center to a full team of six members, as originally planned for by the IAB.

Dr. Chatwarun Ongkasing graduated with a bachelor degree in Business Administration from Chiang mai University. After graduation, she worked for a training division at the Provincial Electricity Authority (PEA). Her work involved with management training and lecturing in areas such as team building and organizational behaviors. In 1997, she completed a master degree in Public Administration (Human Resource Development-HRD) at National Institute of Development Administration (NIDA). In May 2002, she completed a doctoral degree in Development Education, at Srinakarinwirot University. Her current areas of interest are learning process, education, and management as applied to foresight.

Thursday Forum

As part of team development, the Center organized an informal forum, which is called "Thursday Forum" to provide opportunities for staff members to learn and discuss the topics relating to foresight disciplines as well as its practical applications to work responsibility. Other related topic such as futures studies was also included.

E. BUDGET REPORT

The Center was operated on the funding support from the Thai government through NSTDA annual allocation. This main source of funding supported the day-to-day function of all activities. As an APEC center, the Center also received in-kind contribution from the APEC member economies sending the participants and resources to assist in the Center's activities. In addition, during the year, the Center organized a training workshop that could generate a small sum of revenue for its services. However, this latter source constituted a small portion of revenue for the Center.

Budget from the Thai Government, through NSTDA:

The APEC financial year ran from January – December but the Thai fiscal year was from October - September. By the end of the Thai financial year 2002, the Center had spent 7,426,719.56 out of allocated budget (7,989,576.73 Million Baht). The 2002 budget was slightly reduced while the core expenditures increased. However, the level of activities funded from the core budget in 2002 was similar to and compatible with those in the previous year.

Table E1: Budget Report (from October 1, 2000 to September 20, 2001)

No	Items	Budget* Allocated (Thai Baht)	Spending	Committed	Balance
	Total Budget (year 2001, Oct. 00-Sept.02)	7,989,576.73			
1	เงินเดือนและค่าจ้าง / Salaries including new staff *	2,521,954.84	2,521,954.84		
2	ค่าตอบแทน ใช้สอย วัสดุ / Expenditures: per diem, publication, office equipment, etc	496,998.97	249,153.17		247,845.80
3	ค่าใช้จ่ายสาธารณูปโภค / Utilities **	50,000.00			50,000.00
4	เงินอุดหนุน / Support Research Fund	495,522.61	344,536.51		150,986.10
5	รายจ่ายอื่น / OTHER Expenses				
	- ค่าใช้จ่ายในการจัดประชุม / Meetings, Public Seminars, and Workshops	3,781,830.31	3,933,437.14	101,801.00	-253,407.83
6	Office equipment	643,270.00	377,637.90		265,632.10
		7,989,576.73	7,426,719.56	101,801.00	461,056.17

* Transferred to other departments

In-kind contribution

In-kind contributions were also important to the Center. During 2001 – 2002, there were no APEC funds provided, as the “Nanotechnology” in 2001 was self-funded through the Thai budget. The approval of the APEC-wide project on the DNA-Analysis for Human Health in the Post-Genomic Era was endorsed late of this year. In 2002, an estimated in-kind contribution was more than USD \$100,000.

Appendix I

–Composition of International Advisory Board and Steering Committee

In principle, the roles of Steering Committee (SC) and International Advisory Board (IAB) are closely interrelated. SC oversees the Center's operation and management, approves work plans, monitors the progress outputs of the studies far off to implementation, and assists in identifying opportunities to obtain additional resources. Whilst, IAB provides guidance by establishing board strategies and directions, identifying opportunities and ensure relevancy of the projects. Their advice includes monitoring the progress of the Center against the work plan and provides insight into technology foresight activities in the member economies. Finally and importantly encourage participation of the APEC members in the activities of the Center. Both committees were appointed for 2 year terms on the basis of their expertise in foresight, or in science and technology policy and planning and their organization positions.

Members of International Advisory Board and Steering Committee 2002-2003

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Permanent Secretary, Ministry of Science,
Technology and Environment

Pairash Thajchayapong (Chairman)
President, National Science and Technology
Development Agency (NSTDA)

Chatri Sripaipan (Vice-Chairman)
Vice-President, National Science and
Technology Development Agency (NSTDA)

Ajva Taulananda
Chairman, Telecomasia Corporation Public Co.
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Director General, Department of Technical and
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Minister

Montri Chulavatanatol
President, Kenan Institute of Asia

Pradap Pibulsonggram
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Sompop Amatayakul
Executive Chairman, B. B. Business
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Tawee Butsunton
Former Chairman, The Federation of Thai
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Witaya Jeradechakul (Secretary)
Executive Director of APEC CTF

International Advisory Board Members

Arthur Carty (Chairman)
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APPENDIX II: 23rd APEC ISTWG Side Meeting Report

APEC Center for Technology Foresight (www.apectf.nstda.or.th)
September 24th, 2002, 10.30-11.30 hrs.
Room 102, Grand Hotel, Taipei

Number of participants: 15 from 11 economies (Australia; Canada; China; Hong Kong, China; Korea; Mexico; New Zealand; Philippines; Chinese Taipei; Thailand and USA)

Objectives:

- To ensure that the Center's activities respond to the needs of APEC members
- To seek ISTWG delegates' ideas on the projects/and participation of economies
- To promote understanding of the value of technology foresight

Outcomes:

Dr Chatri Sripaipan, Vice President of the National Science and Technology Development Agency, Thailand and former Co-director of APEC Center for Technology Foresight welcome participants to the meeting. He then introduced Dr Witaya Jeeradechakul, the new Executive Director to the Center.

1. Activities Report (October 2001-September 2002)

Dr Witaya reported on 1-year activities covering the main tasks of the Center as the followings. **APEC-wide foresight studies:** "Nanotechnology: The Technology for the 21st Century has already been completed and 2 post foresight activities on the topic have been carried out; and the new project on "DNA Analysis for Human Health in the Post-Genomic Era" will be carried out during 2003-2004.

Training and consulting activities: "Tools for Managing the Future: A Portfolio Approach" training workshop was successfully completed in February 2002 with 29 participants from 7 APEC member economies and the workshop will be offered again on 18-22 February 2003. The second event on "Technology Roadmapping" facilitated by Prof. Ron Johnston was carried out on December 13, 2002 and a new workshop is being planned for September 2003 to be facilitated by Mr Geoff Nimmo of Industry Canada.

The third activity on "Technology Foresight Workshop" concerning futures of research and development for Universiti Sains Malaysia in the next 10 years was carried out in Penang during 6-8 March 2002. Then on 16-17 September, the Center conducted the Pre National Foresight Seminar for the Ministry of Science, Technology and Environment in Putrajaya, Malaysia to about 300 stakeholders comprising IRPA Panel members, academicians and major government agencies. In addition, the Center is planning the second workshop on food processing of Vietnam in Ho Chi Minh City in November 2002.

Conferences and Seminars: The Center participated in 3 important conferences: The Role of foresight in the Selection of Research Policy Priorities in Seville, Spain on 13-14 May 2002 organized by the European Commission; the International Conference on Technology Foresight for Ukraine in Kiev, 10-11 September 2002, organized by UNIDO (a paper titled Technology Foresight in the APEC Region was presented); and 6th International Conference on Technology Policy and Innovation, Kansai 2002 on 12-15 August 2002 in Kyoto (a paper on Multi-Economy Foresight as a Contribution to Addressing Globalisation was submitted). Thai Sectoral Foresight seminar reporting 3 project activities (IT for Education study, IT for SMEs study and Training of the Trainers for Municipal Officials) was organized on 21 August 2002 with 115 participants.

APEC Technology Foresight Network: The Center has actively operated the network (<http://www.apectf.net>) which currently has identified an expert as the focal point in the following economies; Australia, Canada, Japan, Philippines, Thailand and Vietnam. The Center requests the remaining economies to identify a focal point, who is knowledgeable of the foresight activities in his/her respective economy.

2. "Nanotechnology: The Technology for the 21st Century" APEC-wide Foresight

Kasina Limsamarnphun, Assistant Policy Researcher, presented some outcomes of the study, which was completed in early 2002. The process of the study included papers' preparation (4 position papers, 1 paper on issues related to developing economies, 1 issues paper and 9 economy papers which reviewed status of nanotechnology development in participating economies). The information was used as background for discussion in the core experts' meeting, which was hosted by the National Research Council of Canada on 5-7 November 2002 in Ottawa with 26 experts from 9 member economies; Australia, Canada, Chinese Taipei, Japan, New Zealand, the Philippines, Singapore, Thailand, and the United States. Major outcomes were key issues for the nanotechnology development in the APEC region ranging from definition of nanotechnology, potential areas of opportunity, multidisciplinary education and training promotion, increasing R&D budget in developed economies as compared with limited budget resources in developing economies, regional collaboration, commercialization and nanomeasurement and standards. The study were published in 2 volumes: a summary report as Volume I and the main report as Volume II. Follow-up activities included a presentation to the Asia Pacific Nanotechnology Forum in February 2002 in Japan and

an organization of a Nanotechnology Workshop in ASEAN Region, 19-20 September 2002, in Bangkok with 75 participants from Australia, Malaysia, Philippines, Vietnam, Japan, Korea, Singapore, Chinese Taipei and Thailand.

3. New Multi-Economy Foresight on DNA Analysis for Human Health in the Post-Genomic Era

Dr Chatri reported on its progress. The project was proposed by Thailand and co-sponsored by Canada; Japan; Philippines; Chinese Taipei; USA. It has also received support from CONACYT, Mexico; CONCYTEC, Peru. The project idea was first discussed in the 20th ISTWG, Hanoi April 2001, the concept paper proposed in the 21st ISTWG, Malaysia October 2001, and approved in the 22nd ISTWG, Singapore, April 2002. APEC funding was endorsed by the Budget Management Committee in July 2002 (USD78,130) and awaits a formal notification around November 2002.

Project plans: October-December 2002 - preparation of short overview of the topic (past studies, APEC relevance etc); March 2003 in Bangkok - core group meeting of the Center and selected experts to review the outcome of stage 1 and identify priority areas for APEC members, in order to focus the study; April-July 2003 - preparation of an Issues Paper; August 2003 in Bangkok - APEC-wide meeting of experts, policy-makers and business, to review the Issues Paper, and then use scenario-planning techniques to assess future issues and impacts of DNA diagnostics; September-November 2003 - final report prepared and published for wide dissemination; and January 2004 onwards - post-foresight activities to promote project outcomes through meetings in economies, conference presentations and journal articles.

Specific inputs from ISTWG focal points were requested: suggesting important areas of focus for the study, informing the Center of any relevant studies in their economies, and providing at least one contact point per economy for the project, by end of December 2002.

USA suggested that there is a similar project discussion in SOM 3 concerning life sciences and it could be beneficial to have a dialogue with the group for project ideas. Canada suggested that the project could focus on social implications from the new knowledge of the genetic composition to predict human health and behavior. New Zealand suggested the study could focus on the application of knowledge and its social implications, also on an issue of the gap of usage between developed and developing economies.

5. Preparation of 4th APEC R&D Leaders Forum: The Challenges of Research and Technology Organizations in the Knowledge-based Economies

Dr Chatri reported on the progress of the preparation of the forum, to be taken place between 20 -22 November 2002 in Phuket, Thailand. The event is jointly organized by National Science Technology Development Agency of Thailand, the Industrial Technology Research Institute of Chinese Taipei and the National Research Council of Canada. A foresight session will be introduced in the afternoon of the first day to explore the future of research and technology organizations (RTOs) in the knowledge-based economy in the next 5 years. Prof Ron Johnston from the Australian Centre for Innovation and Mr Jack Smith from the National Research Council of Canada will be the main facilitators. The scenarios would then be a backdrop for discussion on the following day in parallel sessions on 3 core areas: internal management techniques for knowledge effectiveness, creating value from knowledge through entrepreneurship and strategic directions for RTOs. For more details, please visit http://www.apectf.nsttda.or.th/html/leaders_forum.html

The Center invited all interested RTOs and individuals to register soon and informed that participants could also submit a short paper, which might be possible to present during the parallel sessions.

New Zealand expressed strong support for the Forum and would send delegates to participate. Productive outcomes from the event could be proposed as issues for discussion in the 4th Ministerial Meeting in May 2004.

6. International Foresight Conference in 2003

The 1-day event is planned in Bangkok to be coincided with Thailand's hosting of the APEC 2003 and timed at a few days before the Leaders' Meeting, reported Dr Witaya. A proposed theme is "Enhancing the APEC Process in Development Cooperation: The Value of Foresight". It has an objective to promote dialogue between government and private sectors on foresight studies, research and practices and the development cooperation process in the APEC region. The dialogue would be in 4 sessions: the role of APEC development cooperation in science and technology for a common future; foresight as a tool for policy formulation and interdisciplinary management in business, science and technology; knowledge production and human resource development in APEC region and developing global science, technology and business network.

7. Future Foresight Topics

The meeting suggested consideration of future foresight topics like water, future fuels, and climate change.

Meeting closed at 11.30.

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APPENDIX IV: New APEC-Wide Foresight Project Proposal 2002

A CONCEPT PAPER towards a new APEC-wide foresight project on:

DNA-Analysis for Human Health in the Post-Genomic Era: An APEC-wide technology foresight study

- * **Proposing Economy:** Thailand
- * **Co-sponsors:** Canada; Japan; Philippines; Chinese Taipei and USA
- * **Concept Paper discussed at:** 21st ISTWG, Malaysia, October 9-12, 2001
- * **Project Proposal submitted:** 22nd ISTWG, 16-17 April 2002
- * **Funding:** APEC Budget and Management Committee approved funding of USD78,130 (November 2002)

Background

The APEC Center for Technology Foresight, a Center established and supported through ISTWG and hosted by Thailand, has successfully completed 4 APEC-wide foresight projects, and is currently running a fifth. Developments in gene technology and their applications were noted as a very high priority for ISTWG members in a 1997-survey of opinions of important topics for foresight studies. Since that time, ISTWG has supported a number of biotechnology projects, and at its last meeting in Hanoi, expressed the view that a foresight project of gene technology would be timely and valuable.

Technology Foresight

Foresight involves systematic attempts to look into the future of science, technology, society and the economy, and their interactions, in order to promote social, economic and environmental benefit. It has been noted by OECD that:

Reaping the rewards and reducing the dangers of technological advances demands careful consideration of 2 dimensions. First, how various socio-economic environments lead to differences in the pace and direction of technological innovation and diffusion, and second, what the implications are of the uses and spread of new technologies for economy and society

(OECD 1998 21st Century Technologies)

Project Focus

Draft maps of the human genome were published earlier this year, thanks to thousands of scientists from across the globe who laboured for some 15 years to achieve this impressive feat. The head of one of the sequencing teams described the thrill of looking at all this data for the first time: "It's the same feeling you must get when you are on a satellite and look down at the Earth". Although the Human Genome Project (HGP) is almost finished, this is really just a beginning. Now scientists have to chart the genomic landscape, make sense of its contours and features and use this understanding for new tools and applications. The possible future directions of this research and some of its implications are starting to emerge.

This foresight project will focus on the implications for human health, specifically in the field of gene analysis and DNA-diagnostics. As bio-medical research moves into a new paradigm (see box 1), it draws on new linkages to other disciplines, throws up new challenges and creates new opportunities and risks.

Box 1: Paradigm shifts in biomedical research

Structural genomics-----> Functional genomics

Genomics----->Proteomics

Map-based gene discovery-----> Sequence-based gene discovery

Monogenic disorders-----> Multifactorial disorders

Specific DNA diagnosis-----> Monitoring of susceptibility

Analysis of one gene-----> Analysis of multiple genes; pathways; systems

Gene action-----> Gene regulation

Etiology (mutation)-----> Pathogenesis (mechanism)

Peltonen & McKusick Science vol291 p1226

Multidisciplinary and International Networking: links with physicians, biochemists and computer scientists will be essential to developments in gene technology. The large scale data processing required for dealing with the 3-billion bases of the the human genome has already given rise to a new field of 'bioinformatics'. The HGP was truly an international effort with the largest contributor – USA – still only sequencing about one third of the

genome. Centers of expertise and innovation in gene technology are likely to exist in many different parts of APEC, and international networking could be very valuable.

Technological Developments: the HGP was completed several years ahead of schedule as new groups joined the effort, and as new technology was developed to speed up the processes. It provides a fascinating study of the way technology development interacts with social / scientific demand. There is still enormous scope and value in developing new technologies to increase the speed and efficiency of DNA-sequencing. New technologies are also needed for gene identification, and for understanding gene function and expression, while Field comments that “for a field so laden with razzmatazz methods, it is striking that the number one need in proteomics may be new technology” (*Science* vol291 p1224)

DNA-Diagnostics: Powerful new tools for diagnosing disease and tailoring treatments to suit individuals are envisaged through the application of DNA-diagnostic technologies. The techniques will tackle hereditary diseases, including those where the genetic basis is not determinate but merely leads to a predisposition to the disorder such as many forms of heart disease and cancers. It can also help to optimise treatments by tailoring them to what would be most effective for each individual. DNA-analysis of pathogens will help to identify them more accurately, and thus permit more effective treatment. Here are some examples to demonstrate the potential of this field:

- * Nucleic acid testing allowed the ‘HIV virus’ to be detected in blood samples which current methods classified as safe; the new method reduces the time taken to determine if donated blood is safe from 6 months to about 4 weeks;
- * Subtypes of TB can be identified allowing doctors to prescribe an antibiotic to which that subtype is not resistant;
- * The use of aspirin is particularly effective for some heart disease sufferers but much less so for others; DNA-diagnostics can help to identify who will benefit most from this treatment.
- * Identifying those people at risk of cancers with a strong hereditary component such as some breast cancers, retinoblastoma and colon cancers, would allow them to take preventive action, and encourage early diagnosis of any problem.

DNA diagnostics relies mainly on three fields of research: gene research produces data on gene sequences, bioinformatics is required to store and analyse that data, and finally special technologies are applied in the design and manufacture of the basic investigative tools, such as “DNA-chips” and micorarray systems.

Handling Genetic Data: The power of gene analysis and DNA-diagnostics throws up new social, ethical and economic concerns. For example, there will be issues about:

- * intellectual property (should genes be patentable? etc.)
- * privacy (who has the right to know about my genes? is it fair that I know I have a ‘cancer gene’ while my insurance company doesn’t? etc)
- * human rights (can I be discriminated against for having ‘bad’ genes? etc)
- * societal fairness (how should such treatments be prioritised in our increasingly hard-pressed health care systems? etc)

Business Opportunities: DNA-diagnostics is expected to become the basis of many research and business opportunities. The early winners will be tool-makers, those that sell the machines and chemicals, computers and their software that make it possible to sequence raw DNA, characterise genes and search for meaningful patterns in the data. At the other end of the spectrum are the drug-discoverers that may make profits in the long-term but must first invest enormous effort into basic research. Somewhere in between are those companies that act as a kind of service-sector, selling the latest information about genes and related products to companies searching for new tools, diagnostic tests and drugs. As the technological possibilities grow, and the applications become more widespread, the business opportunities are likely to mushroom.

Process and Expected Outcome of this foresight project

The project would consist of an Issues Paper, a scenario-planning workshop of APEC experts, and further analysis and research to produce a final report. This has been the process of the past projects by the APEC Center for Technology Foresight.

Foresight is a process of strategic planning which is designed to tackle complex problems, and integrate the different perspectives of people with diverse interests and agendas. This study would bring together stakeholders from many different APEC member economies, and provide an opportunity to assess the opportunities and risks of developments in the field of gene technology over the next 20 years, specifically in the health sector. It would assess research and development priorities, promote inter-economy cooperation, review policy options, highlight areas of social and ethical concern requiring further consideration, and identify business opportunities.

(Update information at <http://www.nstda.or.th/apectf> → Click on ‘Foresight Research’)

APPENDIX V: A Summary of Thai Foresight Projects during 2001-2002

	IT for Education	IT for SMEs	TOT
Project year	2001-2002	2001-2002	-
Objectives	To examine the applications of IT for learning in the dimensions of equity, quality, and efficiency	To promote the role of IT among SMEs focusing on three areas of the industry: automobiles, electronics, and food	To improve the quality and effectiveness of training in urban planning, promote scenario-planning techniques and provide the participants basic knowledge for healthy city planning.
Main Players	King Mongkut's University of Technology	Department of Industrial Promotion	local government officers across the country
Time Frame	10 years	5 year	-
Key Questions	In 10 years from now, how can the community develop methods of learning under the influence for IT?	What the views of SMEs on <ul style="list-style-type: none"> • Government IT policy • Application of IT in SMEs • Future of own business • Future of SMEs 	-
Participants & Methods	<ul style="list-style-type: none"> • 22 participants in scenario workshop • 31 participants in a consultation workshop to re-examine strategies from the first <u>workshop</u> • Case study of IT in a village • Discussion of a youth research network 	<ul style="list-style-type: none"> • Policy Delphi questionnaire to 2,000 SMEs with 9.9% success rate • 5 seminars organized in four regions and Bangkok 	<ul style="list-style-type: none"> • Participation combination of 24 core local government officers across the country <u>workshop</u> • Scenario planning • Strategic planning • Visioning formulation
Outputs	<u>Important aspects from the studies:</u> <ul style="list-style-type: none"> • Communities will access information and knowledge easily and enhance capabilities in life-long learning. • Communities will learn how to integrate and balance the global knowledge with local wisdom. • Good governance and management mechanisms were key factors in shaping their future. 	<u>Needs of SMEs</u> <ul style="list-style-type: none"> • Special courses of IT training from existing institutions • Low cost software package for SME's business • Fast cost analysis • Laws for E-commerce • Model of supply chain management • Speed of introducing new products into the market • Financing of IT from government banks 	<ul style="list-style-type: none"> • understanding of foresight technique, scenario planning • holistic urban planning across public and private sectors • Set of facilitator manual • Collaboration of the future projects and network of exchange foresight knowledge.

Appendix VI: 4th APEC R&D Leaders Forum (Program, Summary Report, and list of Participants)

Program

WEDNESDAY, 20 NOVEMBER 2002

16:00-18:00 Registration: Welcome Reception (cocktail)

THURSDAY, 21 NOVEMBER 2002

08:30-09:00 Registration

09:00-11:40 Opening Plenary Session

Chairman: Mr. Jacques Lyrette, Vice President, NRC, Canada
 09:00-09:10 Welcome remarks by Mr. Phinij Jarusombat, Thai Minister of Science and Technology
 09:10-09:30 Opening speech by Mr. Suwit Khunkitti, Thai Deputy Prime Minister
 09:30-10:00 Managing for Knowledge Effectiveness by Dr. Jih-Chang Yang, Executive Vice President of ITRI, Chinese Taipei

10:00-10:30 Strategic Positioning of RTOs in the Knowledge-Based Economy by Professor Pairash Thajchayapong, President of NSTDA, Thailand

10:30-11:00 Coffee / tea

11:00-11:10 Reflections and Actions of the Chinese Academy of Sciences by Professor Yan Yixun Former Vice President, Chinese Academy of Sciences

11:10-11:20 New Environment of Research & Technology Organizations in Japan

Mr. Kaname Ikeda, Executive Director of National Space Development Agency Japan

11:20-11:30 The co-evolution of innovation intermediary organizations and national innovation systems in Asia by Professor Mark Dodgson, Director of Technology and Innovation Management Center, University of Queensland

11:30-11:40 Government Research and Development Mechanism and Its Evaluation: Current Status in Chinese Taipei by Dr. Chia-Cheng Lin, Research, Development and Evaluation Commission, Executive Yuan, Chinese Taipei

11:40-12:15 Questions and Answers Session

12:15-14:00 Lunch

14:00-14:30 Plenary Session

Creating Value from Knowledge through Entrepreneurship by Dr. Arthur J. Carty, NRC, Canada

President of
 14:30-14:40 *Moving to Break-out Sessions*

14:40-16:30 Parallel Break-out Session - 3 themes:

Theme 1: Management Techniques for Knowledge Effectiveness

Theme 2: Creating Value from Knowledge through Entrepreneurship

Theme 3: Strategic Directions for RTOs

16:30-17:30 Plenary Session: Chair - Professor Greg Tegart

Recap of day 1

Short presentations by Facilitators

18:30-21:00 Dinner and Loy Krathong Festival

FRIDAY, 22 NOVEMBER 2002

09:00-09:40 **Plenary Session: Introduction to Foresight, and the foresight exercise** by Prof. Ron Johnston Director of Australian Centre for Innovation, University of Sydney

- Drivers and Uncertainties
- Introduction to Scenario Logics
- Clusters and Scenario Development Groups

09:45

Moving to Parallel break-out Clusters A, B, C

09:55-11:00 Scenario Development in small Groups with each Cluster

11:00-11:30 Report back by Scenario Groups within Cluster

11:30-12:15 Each group develops 3-5 Policy Initiatives

12:15-12:30 Report back within each Cluster

12:30-14:00 Lunch

14:00 Final Plenary Session

14:00-15:15 Plenary Report by Each Cluster Facilitator and list of Policy Actions

- Theme B: Managing Knowledge (MK) (Facilitator: Jack Smith)
- Theme C: Strategic Partnerships (Facilitator: Tamsin Jewell)
- Theme A: Knowledge Entrepreneurship (KE) (Facilitator: Greg Tegart)

15:15-15:20 Summing up by Prof Ron Johnston

15:20-15:35 Coffee / tea

15:35-15:50 **Summary & Conclusion** by Professor Ron Johnston, Director of Australian Center for Innovation, University of Sydney

15:50-16:00 Closing remarks:

- Dr. Jih-Chang Yang, ITRI, Chinese Taipei
- Dr. Arthur J. Carty, NRC, Canada
- Professor Pairash Thajchayapong, NSTDA, Thailand

Summary Report

(by Science Technology Innovation and Policy Research Unit, NSTDA)

The 4th APEC R&D Leaders Forum was held at Merlin Beach Resort Hotel in Phuket, Thailand from 20 to 22 November 2002. This Forum was jointly organized by National Science and Technology Development Agency of Thailand (NSTDA), the Industrial Technology Research Institute of Chinese Taipei (ITRI) and the National Research Council of Canada (NRC). The theme of this Forum was "The Challenges for Research and Technology Organizations in the Knowledge-based Economy".

The purposes of the Forum were to allow RTOs leaders to reflect on the changed environment, to share their experiences on new projects and new ways of working that can be most productive in these circumstances, and to look to the future for the changes that they will all need to make. The Forum attracted 161 participants from 11 APEC member economies and 1 participant from Norway.

The Forum was divided into 3 main sessions which were:

- 1) plenary session for keynote addresses and invited speeches by prominent APEC R&D leaders,
- 2) parallel break-out session to discuss on 3 main themes which would challenge RTOs in the knowledge-based economy, and
- 3) foresight session to explore the future for RTOs in the knowledge-based economy.

In the plenary session, Dr. Yang emphasized the fact that ICT, not knowledge itself, makes the knowledge-based economy differ from other traditional economy. ICT enables us to exploit knowledge in unprecedented ways and drives the growth of the service sector. ITRI recognized the power of ICT and made a transition to focus on a high value-added service sector. Dr. Pairash stressed an urgent need for RTOs to revise their strategic positioning toward a KBE. He gave a real example on how NSTDA, one of the RTOs in developing countries, has repositioned itself for the arrival of a KBE. Lastly, Dr. Carty highlighted a new model of innovation, using the analogy of a soccer game rather than a relay race as in the traditional model. He also illustrated this change from NRC strategic evolution.

In the parallel session, participants were divided into 3 groups. Each group focused on different themes which were:

- ***The 1st theme*** "Management Techniques for Knowledge Effectiveness" was led by ITRI, Chinese Taipei. It was agreed that organizations should be more matrix in nature in order to liberate the entrepreneurial and innovation potentials of their researchers. This matrix should extend beyond organizational boundaries to network outside resources. The effectiveness of managing knowledge depends on each RTOs leaders to anticipate change and well plan to move in the right direction and meet the demand of customers.
- ***The 2nd theme*** "Creating Value from Knowledge through Entrepreneurship" was led by NRC, Canada. Participants pointed out that RTOs can create value through entrepreneurship in the following aspects:
 - 1) Human Resource – Introducing early understanding of S&T and training the people to become entrepreneurs,
 - 2) Organization Culture – Breaking down bureaucracy,
 - 3) Funding and Financing – Finding out ventures who can accept high risk from technology investment,
 - 4) Process-related – Time and service are critical issues,
 - 5) Communication – Information and good business plans are essential for supporting the innovative process, and
 - 6) Linkages, Networking and Capacity Building – Linkages to other R&D organizations to exchange the knowledge.
- ***The 3rd theme*** "Strategic Directions for RTOs" was led by NSTDA, Thailand. Each economy faces different situation in setting up RTO strategic direction. However, there was a consensus that the role of each RTO should correspond to its evolving national innovation system. Four key elements in shaping strategic directions of RTOs in the future were outlined as 1) internal capabilities of RTOs, 2) collaborations and partnerships, 3) human resources and, 4) political support.

The foresight session was held on the second day. This session started with an introduction to foresight by Prof. Ron Johnston, and a recap of the 3 main themes of the conference. He then presented 10 key

drivers which had been partly identified by participants through an email poll, and he discussed some of their implications. The drivers were: the Knowledge Economy, the Evolution of the Internet; Knowledge Management Capabilities; Global and Regional Competition; Demands for Direct Economic Contributions; Active Entrepreneurial Roles; International Collaboration; Skilled Talent Challenges; Access to Infrastructure; and New Organizations Processes and Practices. Two major challenges were then selected on the basis that they are expected to be highly significant and uncertain over the coming five years and that they potentially impact most or all of the APEC RTOs. These critical uncertainties were: the degree of challenges presented by the environment (environmental challenge - high or low), and the degree of public support for science and technology (support - high or low). Combining these 2 uncertainties created possible 4 scenario conditions: 1) high environmental challenges / high support , 2) low environmental challenge / high support 3) high environmental challenges / low support , and 4) low environmental challenges / low support.

Participants were then divided into 3 clusters corresponding to 3 main themes (entrepreneurship / knowledge management / collaborations and partnerships) and each cluster consisted of 4 groups of about 10 people. Within each cluster, each small group addressed one scenario condition. The task of the small groups was to elaborate the scenario conditions, attempting to describe what the future would be like in this scenario, focussing especially on how the RTOs might fare in such conditions. Once the scenarios had been characterised and debated by the clusters, the small groups then developed a set of policy and research management implications, pertinent to the prospective future of APEC RTOs. These policy implications were then reported back to the conference with an emphasis on potential policy initiatives that could be robust under all scenarios. Some examples included:

- Recognition of the need for an increase in collaborations and partnerships;
- Greater attention to building public support for science and technology, since the negative consequences of low public support for S&T could be so severe;
- While the RTOs may be broadening in scope and scale, a reduction in technology breadth may be necessary.

In sum, RTOs in the future have to change their roles. Some RTOs could be intermediaries in the innovation process, while some RTOs could be innovative infrastructure and learning networks, or facilitators of the business environment. These new roles require new ways of thinking and working.

Besides a fruitful and interactive conference, this forum was also an excellent opportunity to get to know each other and build up connections among key players responsible for science, technology and innovation in APEC economies. Participants had chances to communicate with others facing similar issues and the Forum therefore offered opportunities for learning, cooperation and information exchange.

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Appendix VII Lists of all profiles of the APEC Technology Foresight Network

36 Experts profiles sorted by economy		7 Events sorted by economy	
AUSTRALIA		CANADA	
1.	Ron Johnston Australian Centre for Innovation	1.	Foresight Workshop on Nanotechnology
2.	Jordi Robert-Ribes Optus	IRELAND	
3.	Greg Tegart APEC Center for Technology Foresight	2.	Creating and Applying Vision in the Regions: Towards Agile and Networked Regions through Foresight
CANADA		THAILAND	
1.	Carl Caron National Research Council of Canada	3.	Tools for Managing the Future
2.	Kevin Cliffe Natural Resources Canada	4.	4th APEC R&D Leaders Forum
3.	Denys COOPER National Research Council of Canada	5.	Tools for Managing the Future: A foresight training workshop
4.	Colin Davidson Universit de Montral	UNITED STATES OF AMERICA	
5.	Yves Deslandes National Research Council of Canada	6.	Ninth Foresight Conference on Molecular Nanotechnology
6.	Carol Fairbrother Natural Resources Canada	7.	Technological Forecasting for Science & Technology Intelligence
7.	Kevin Fitzgibbons National Research Council of Canada		
8.	Sadiq Hasnain National Research Council of Canada		
9.	Louis-Daniel Levac National Research Council of Canada		
10.	Jacques Lyrette National Research Council of Canada		
11.	Sean A. MacDonald MD Biotech		
12.	Hamid Mostaghaci Department of Foreign Affairs and International Trade		
13.	Geoff Nimmo Industry Canada		
14.	Jack Smith National Research Council of Canada		
CHILE			
1.	David McCormick niversidad del Valle (Colombia)		
DENMARK			
1.	Aksel Moller-Jorgensen Copenhagen Business School		
HONG KONG, CHINA			
1.	Jurgen Schulte nABACUS Ltd, Nanotechnology Consulting and Investment		
IRAN			
1.	Nasser Bagheri Sharif Technology University		
MALTA			
1.	Wilfred Kenely Malta Council for Science and Technology		
PERU			
1.	Benjamin De la Torre Lastarria TF CONSULTANT		
2.	Fernando Ortega National Council of Science and Technology		
SOUTH AFRICA			
1.	Butana Mboniswa Council for Scientific and Industrial Research		
THAILAND			
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2.	Chatri Sripaipan National Science and Technology Development Agency		
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4.	Tamsin Jewell APEC Center for Technology Foresight		
5.	Frank Kelly Chiang Mai University		
6.	Kasina Olarnriksupuck APEC Center for Technology Foresight		
TURKEY			
1.	Fatih Mehmet SAHIN TUBITAK- The Scientific and Technical Research, Council of Turkey		
UNITED KINGDOM			
1.	Sylvan Katz University of Sussex		
2.	Wendy Schultz World Futures Studies Federation		
UNITED STATES OF AMERICA			
1.	Richard Mignogna Technology/Engineering Management, Inc.		
VENEZUELA			
1.	Manuel Toledo CONICIT		
19 Organizations profiles sorted by organization type			
GOVERNMENT			
1.	APEC Center for Technology Foresight	Thailand	
2.	Environment Canada	Canada	
3.	Industry Canada	Canada	
4.	National Council of Science and Technology	Peru	
5.	National Institute for Science and Technology Policy	Japan	
6.	National Research Council of Canada	Canada	
7.	National Science and Technology Development Agency	Thailand	
8.	Ppinre d'entreprises innovantes de chaudlire Appalaches	Canada	
9.	Strategic Market Intelligence Group, Forest Research	New Zealand	
10.	Technological Research Corporation	Chile	
INDUSTRY ASSOCIATION			
1.	Centre qu'bcois de recherche et de dveloppement de l'aluminium	Canada	
2.	Malaysian Industry Government Group for High Technology	Malaysia	
INTERNATIONAL ORGANIZATION			
1.	Asia Pacific Nanotechnology Forum	Hong Kong, China	
PRIVATE SECTOR / NGO			
1.	Intellectual Aims Sdn Bhd	Malaysia	
2.	Kenan Institute Asia	Thailand	
3.	Perkhidmatan Rundingan Industri Malaysia Sdn. Bhd.	Malaysia	
PROFESSIONAL ASSOCIATION			
1.	Center for NanoSpace Technologies, Inc.	United States of America	
UNIVERSITY			
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2.	IF Research Group	Canada	

APPENDIX VIII:**A Summary Report and List of Participants of Tools for Managing the Futures: A Portfolio Approach**

Part 1 focussed on explaining and assessing 5 key foresight methods and describing how to select and combine these into a real foresight study. It included sessions on: The Challenge of the Future / Introduction to the Portfolio of Tools / Environmental Scanning / Modelling and Trend Analysis / Delphi Polling / Technology Roadmapping / Scenario Planning / Logistics of Future Management Exercises / Implementing the Findings of Future Management Exercises / and / Summation and Evaluation of Future Management. The course was designed by Prof Johnston who also undertook almost all of the teaching.

Part 2 provided the opportunity for engaging in a detailed application of appropriate tools to an issue chosen by the participant. In the space of two intensive days, the following stages were completed: clarification and refinement of the issue / review and selection of tools appropriate to the issue / development of a plan to conduct the future management exercise, including logistics, stakeholder identification, interface with strategy and policy, and budget / design of a detailed management plan to apply the future management tools / development of a strategy and plan for implementation. In practice, participants worked on their own or in small self-selected groups and consulted the facilitators when they felt the need. There was also some (optional) sharing of ideas, plans and perspectives.

The workshop took place at the luxurious Pathuwam Princess Hotel in central Bangkok. Most participants also stayed there, though 4 participants chose more modest accommodation on the nearby campus of Chulalongkorn University, and some of the participants were local. The schedule ran from 8.30am-5.30pm each day and overnight 'homework' was also set. Each session of part 1 included small group work such as a simulation exercise of the technique being addressed, with some time for feedback and full-group discussion at the end. It was clear that the course was hard work for all concerned, but there were 2 social occasions in the evenings for more relaxed interaction, and in part 2, participants worked at their own pace. Course certificates were presented on completion.

Further details of the event are provided below in the following sub-sections:

- A. Evaluation table
- B. A Selection of Comments from the Evaluation Forms
- C. Some examples of the projects planned by Participants in Part 2.
- D. List of Participants (*see appendix V*)

A) Evaluation Table

At the end of the workshop, participants were asked to complete a simple evaluation form and the results are summarised below. However during the workshop, feedback on the learning experience was obtained in many different ways. For example, there was discussion at the end of each session and at the beginning of each day. Participants were also asked to complete forms each evening about: 'what have I learnt? what questions do I need answers to? what issues or areas would be worth learning more about?'. At the end of Part 1, they were also asked to evaluate their own learning and to create a personal future foresight program. All of this information contributed to the CTF's internal assessment of the workshop and will be used to inform planning and design of the next one.

Where very good=4 / good=3 / fair=2 / poor=1

<u>Program</u>	average response
1. Content	3.8
2. Time schedule	3.2
3. Materials provided	3.7

4. Opportunity to participate	3.6
5. Information and knowledge obtained	3.4
6. Expected future utilization of information and knowledge obtained	3.6
<u>Communication</u>	-
7. Communication between you and the facilitators during the workshop	3.5
8. Communication between you and the organizers before the workshop	3.2
9. Communication between you and the organizers during the workshop	3.6
<u>Other</u>	-
10. Environment	3.4
11. Meals and other refreshments	3.3
12. Other facilities	2.8

B) A Selection of Comments from the Evaluation Forms

1. Bravo to the whole team who organised this workshop – perfectly done.
2. THANK YOU!! This is a very intellectually stimulating experience. Thank you Ron and all facilitators and staff for making these three days fun, informative and useful event. Please let me know of other related workshops in the future. I'll certainly attend your events again.
3. It will be desirable that we can have more case study and examples such as at the national level, industry-specific, firm-specific etc. Thank you so much.
4. A very big 'well done' and 'thanks' to Ron and all the team. This was just mind-blowing.
5. The workshop is very good for understand how the available tools work and apply. What I want to know more is how to make use of the technology foresight result for S&T Policy and Strategy development. It should be a workshop after this one to deal with policy / strategy making.
6. I would like to keep long-term relationship with all the participants, facilitators and organizers. It seems that everyone have their own plan in implementing foresight at their national / company level. So it will be beneficial to all of us to keep exchanging our experience including problems and challenges.
7. Gain a very valuable experience and knowledge on foresighting. A very fruitful training indeed.
8. The workshop come timely for me as I will be leading the process of developing a new R&D program for my institution.

Some examples of the projects planned by Participants in Part 2.

- foresight for national development planning, especially aiming to diversify the economic base and identify 'niche' opportunities for a 'late-comer'.
- foresight for environmental technologies aimed at enabling SMEs from the participant's country to increase their penetration of global markets (especially Asia) over next 5 years.

- preliminary planning for the next round of a National Technology Foresight program, aiming to address the limitations of ‘Delphi’ and incorporate some additional tools.
- foresight to develop the R&D strategy of an industrial research and technology development center for the next 5-10 years, beginning with the agro-processing area.
- refinement of the terms of reference for a national foresight study
- foresight for a small island state, to identify ICT niches in order to become a ‘cyber-island’.
- revamping a national foresight program which had stalled; redesigning an effective national foresight structure and associated training and awareness program; planning a first foresight study
- foresight by a national planning organisation, to identify R&D priorities and competitive ‘niches’ in the tourism and mining sectors, taking into account environmental concerns.
- a foresight study of the long-term implications of gene technology in the post-genomic era.

Conclusion

CTF views this workshop as a great success. It was an excellent learning experience that fulfilled the core mandate of the CTF to promote and develop foresight expertise around the region. It attracted a very good number of participants from 11 different countries (7 APEC economies) and was revenue positive. Valuable follow-up activities for both the CTF and the participants were generated.

Thus the CTF, with Prof Johnston, decided to repeat the training workshop next year. There will be some minor modifications to the program and content of sessions, based on the feedback provided by participants. The first announcement of the workshop “Tools to Manage the Future – 2003” will be released in May 2002.

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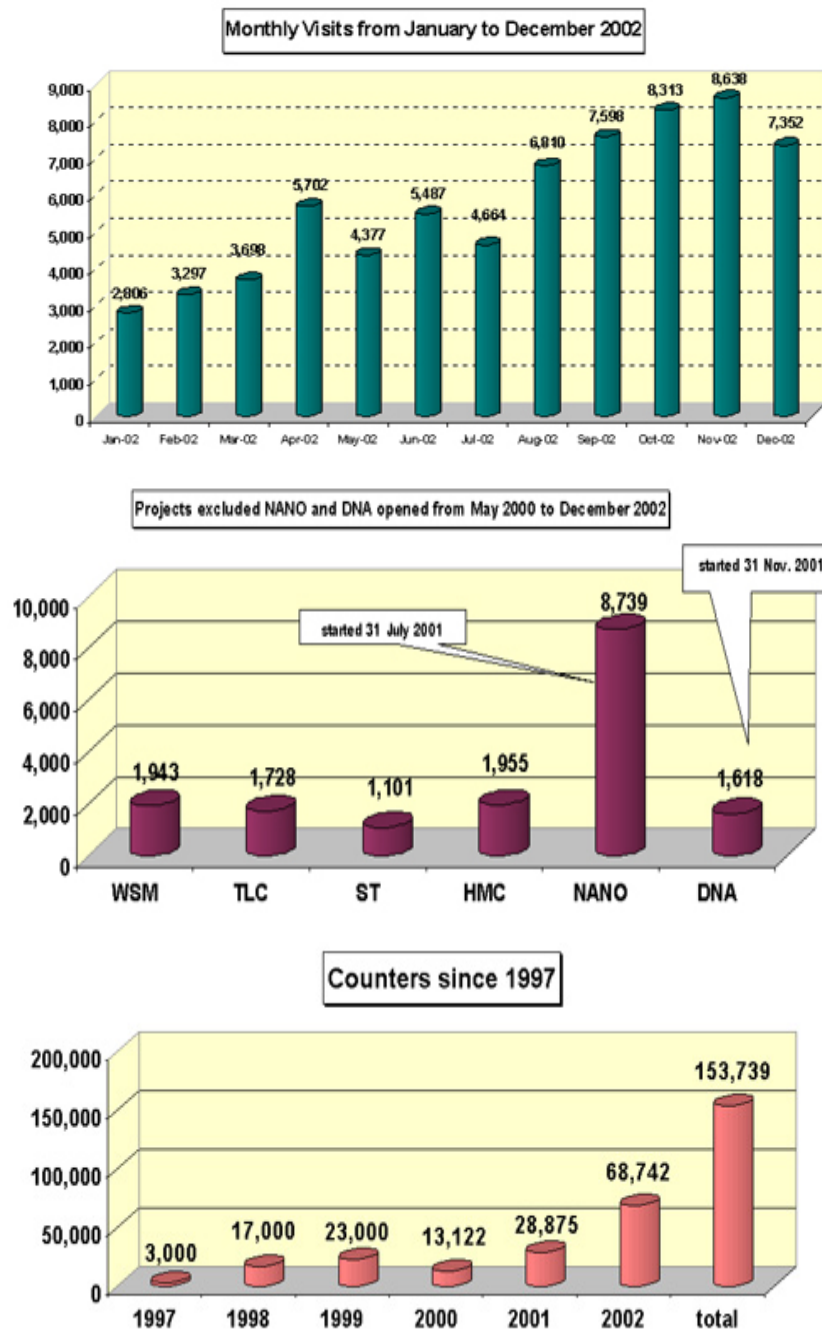
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APPENDIX IX: Website Visit Counts



Future Development

Beside current regular html pages on the website, the center will initiate database..... projects. When the ColdFusion developer will be added next year, projects such as download publication database can be installed and managed. Obtaining such download information will be useful for the center to evaluate success of the center's core objectives, i.e., to develop and diffuse foresight capability across APEC through multi-economy studies, training, consultancy and related activities. Other database projects will be possible with data structures and designs to fit the purposes of the future projects. Comments and suggestions from IAB and SC would be appreciated for the future of database development.

Remarks:

- Cybnauts visits up to December 2002 = 153,739
- Web promotion started on August 23, 2001

- **WSM:** Water Supply and Management in APEC region
- **TLC:** Technology for Learning and Culture in the APEC Region to 2010
- **ST:** Sustainable Transport
- **HMC:** Healthy Futures for APEC Megacities
- **Nano:** Nanotechnology the technology for 21st Century
- **DNA:** DNA-analysis for Human Health, in the Post-Genomic Era

Appendix X: List of Publications

General Books on Foresight

1. *Introducing Foresight and the APEC Center for Technology Foresight*, October 2002. (ISBN 974-229-370-8)
2. *Proceedings of the APEC Symposium on Technology Foresight*, held in Chiang Mai, Thailand in July 1997. (ISBN 974-7576-44-9)
3. *Applications of Technology Foresight: Proceedings of the First Public Seminar*, held in Bangkok, Thailand in February 1998. (ISBN 974-7577-87-9)

Journal of Futures Studies, Strategic Thinking and Policy Emerald Publications

4. *Sustainable Transport for Asia-Pacific Megacities* by Professor Greg Tegart and Mr. Ainsley Jolley Vol.03, no.05, oct.01
5. *Healthy Futures for Asia-Pacific Megacities* by Professor Greg Tegart and Ms. Tamsin Jewell Vol.03, no.06, dec.01

Foresight Project Outputs

6. **Water Supply and Management in the APEC Region:** Vol 1: Summary Report (1999) Vol 2: The Supporting Material (1999)
1. **Technology for Learning and Culture in the APEC Region to 2010:** Vol 1: Summary Report (2000) Vol 2: The Supporting Material (2000)
2. **Sustainable Transport for APEC Megacities: Issues and Solutions** Vol 1: Summary Report (2000) Vol 2: Full Report (2000)
3. **Healthy Futures for APEC Megacities:** Vol 1: Summary Report (2000) Vol 2: Summary Record of a Foresight Project (2000)
4. **The Future of APEC Megacities: A Foresight Approach:** Review of Studies by the APEC Center for Technology Foresight 1998-2000 (December 2000)
5. **APEC CTF and Foresight for Asia Pacific Region (in Thai 2001):** ศูนย์คาดการณ์เทคโนโลยีเอเปกกับการมองอนาคตเพื่อภูมิภาคเอเชียแปซิฟิก (ISBN 974-229-041-5)

Conference Papers

1. *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.
2. *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.
3. *Sustainable Cities – can Foresight help us?* by Prof Greg Tegart, presented to POLMET 2000 – the 6th International Conference on Pollution in Metropolitan Cities, in Kuala Lumpur, Malaysia, March 20, 2000.
4. *Technology Foresight for Urban Sustainability – Regional Collaboration* by Prof Greg Tegart, presented to the 17th World Congress of the Eastern Regional Organisation for Planning and Housing, in Asan City, Korea, October 11-13, 2000
5. *Sustainable Transport for Megacities: Issues and Solutions*, by Prof Greg Tegart, presented to the 17th World Congress of the Eastern Regional Organisation for Planning and Housing, in Asan City, Korea, October 11-13, 2000
6. *Foresight for Healthy Megacities, remarks presented* by Dr Chatri Sripaipan to the PECC General Meeting on Sustainable Cities, in Bangkok, Thailand, October 17-18, 2000
7. *The Approach to and Potential for New Technology Foresight: Proceedings of the International Technology Foresight Conference, March 2000.* Published by the National Institute for Science and Technology Policy, Japan, 2001.
8. *Sustainable Transport for APEC Megacities:* by Prof Greg Tegart (Executive Advisor to the CTF) and Mr Ainsley Jolley (Consultant to the Sustainable Transport study) in *Foresight: the Journal of Future Studies, Strategic Thinking and Policy* Vol 3 No 5.
9. *Regional Foresight – the experience of the APEC Center for Technology Foresight* by Tamsin Jewell (Policy Researcher) for the panel organizer (Dr Guenter Clar, European Commission Research DG, Science &

