

# TDRI

Quarterly  
Review

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The Thailand Development Research Institute Foundation was established in 1984 to conduct policy research and disseminate results to the public and private sectors. TDRI was conceived, created and registered as a non-profit, non-governmental foundation, and is recognized as such by the Royal Thai Government. The Institute does technical and policy analysis to support the formulation of policies with long-term implications for sustaining social and economic development. There are seven research programs: Agriculture and Rural Development; Industry, Trade and International Economic Relations; Macroeconomic Policy; Natural Resources and Environment; Human Resources and Social Development; Energy, Infrastructure and Urban Development; and Science and Technology Development.

**Photo on front cover:** Pollution and overcrowding are by-products of Bangkok's rapid industrial growth. Photograph by Somkwuan Asokepornchai

**Editor:** Nancy Conklin

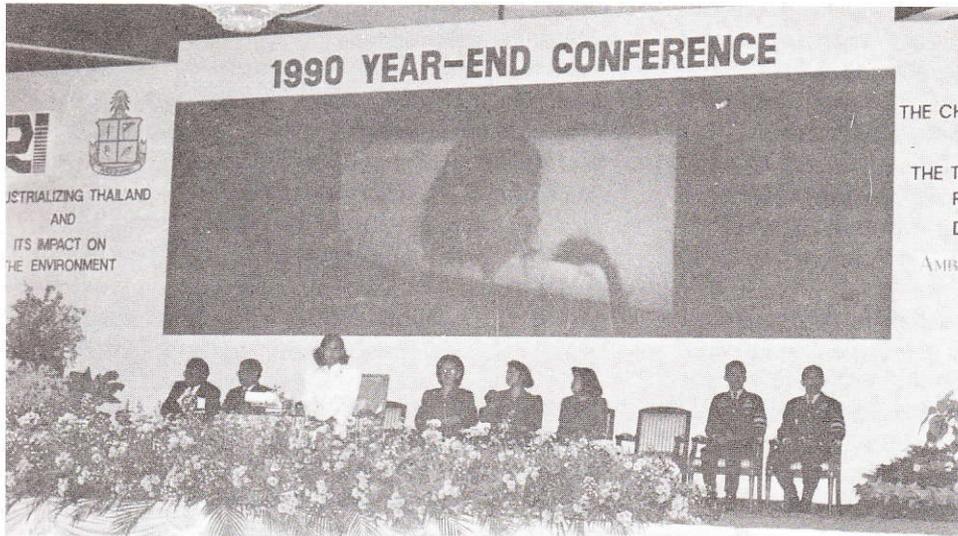
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SUMMARY OF PROCEEDINGS  
THE 1990 YEAR-END CONFERENCE

## “Industrializing Thailand and Its Impact on the Environment”



*Her Royal Highness Princess Maha Chakri Sirindhorn presided over the proceedings of this year's Conference.*

In less than 30 years, Thailand has been transformed from a subsistence agrarian economy into a rapidly industrializing country—a rare accomplishment among developing countries. The country's rural natural resources—land, water, and forests—have made indisputable contributions to the country's industrialization and economic growth. Yet, it is widely recognized that Thailand's future economic growth may be threatened by a dwindling resource base unless more efforts are made to protect and conserve its environment.

While rapid urban growth has been making a major contribution to Thailand's economy, that same growth is placing a major burden on the physical, environmental, and social infrastructure. Air and water pollution are growing rapidly, and the traffic congestion in the Bangkok Metropolitan Region is among the worst in the world. The demand for water in the rapidly growing suburban areas far exceeds the available municipal supply, and the resultant groundwater pumping has led to serious ground subsidence.

Thus, Thailand's accelerating industrialization and its consequent impact on the country's natural resources and environment is one of the most important policy issues facing the country today. Recognizing the need to thoroughly examine all the issues involved in addressing this dilemma, the Chai Pattana Foundation and the Thailand Development Research Institute co-organized this year's conference as a major forum for discussing the conflict between industrialization and the environment.

The conference's 733 participants included representatives from private industry, government and state enterprises, academic institutions, NGOs, international agencies, and the media. This year, participants were gratified and indeed honored by the presence of HRH Princess Maha Chakri Sirindhorn, who presided over the conference's proceedings. In her opening address before the conference on Saturday, December 8, Her Royal Highness said:

*Development is not only measured by economic growth. Development also means good public health, appropriate education, wise use of natural resources, conservation of the environment and culture, equitable income distribution, job opportunities, and the freedom to choose one's own way of living. Even though Thailand has enjoyed rapid economic growth, our natural resources have been used unwisely. Deforestation, conflicts in land use, and water scarcity are major problems. Pollution is plaguing our cities. These problems must be solved, and development in the future must be carefully planned. Because of the large scope of environmental problems, every citizen must cooperate and participate in both preventing and solving these problems before they become even more severe.*

Prior to the conference, a team of Thai and international researchers undertook a large-scale research

effort resulting in the publication of eleven conference papers that detailed their findings and policy recommendations. These papers were distributed to all participants prior to the beginning of the conference. The conference itself was structured around the main themes of this research. The following article summarizes the proceedings of this important conference and some of the recommendations and policy implications that were drawn from it.

### **SESSION 1 Global Environmental Issues and Their Impact on Thailand**

Chairperson: *Mr. Anand Panyarachun*  
Chairman  
The Federation of Thai Industries

Presenters: *Sir Ninian Stephen*  
Ambassador for the Environment and  
former Governor-General, Australia

*Mr. Benjamin Bassin*  
Director-General  
Finnish International Development  
Agency

*Mr. Jim MacNeill*  
Director, Institute for Research on  
Public Policy, Canada

*Mr. H. J. Shields*  
Managing Director  
Shell Company (Thailand)

The panelists introduced several global environmental issues that are being widely discussed, such as global warming and depletion of the ozone layer. The emphasis was on cooperation among sectors, both nationally and internationally.

It was agreed that any preventive measures for arresting these global problems must take into consideration the economic development of individual countries—particularly developing countries, who are less able to mobilize financial and technical resources.

However, some measures such as energy conservation have been viewed as a viable means to mitigate environmental problems and yet sustain economic development. Many international organizations have supported negotiations to reduce global greenhouse gas emissions, which will be one of the most important issues to be discussed at the United Nations Conference on Environment and Development (UNCED) in Brazil in 1992.

The panelists also shared the experiences of some countries such as Finland, Australia, and Canada and the role of multinational corporations in dealing with environmental problems.

### **SESSION 2 Natural Resources for the Future**

Chairperson: *Dr. Sumet Tantivejkul*  
Secretary-General  
Chai Pattana Foundation

Presenters: *Dr. Dhira Phantumvanit*  
Director, Natural Resources and  
Environment Program, TDRI

*Dr. Vute Wongwacharakul*  
Research Fellow, TDRI

Discussants: *Dr. Prawase Wasi*  
Chairman  
Local Development Institute

*Dr. Ajva Taulananda*  
Group Vice President  
Charoen Pokphand Group

Dr. Sumet's introductory statement indicated the significance of taking environmental quality into consideration when natural resources are utilized.

The presenters stressed the need for Thailand to preserve and protect its forest cover areas and to accelerate reforestation without depriving some 8-9 million farmers living in forest reserves of their means of livelihood, thereby further exacerbating social conflict.

*Dr. Sippanondha Ketudat,  
Dr. Theodore Panayoutou  
and Dr. Quanchai  
Leepawpanth discuss the  
issues of the mining industry  
and land use during the  
Conference's Third Session.*



The provision of clearly understood and secure property rights over the land and of income-generating alternatives were considered crucial. It was noted that large private plantations in forest reserves bring only limited benefits to local people and can lead to conflicts between investors and local farmers. At the same time, small plantations have not proved to be privately and socially profitable. If the government wants to encourage community forestry, it has to ensure the participation of local people as well as support from non-governmental organizations (NGOs).

Regarding water resources, it was pointed out that Thailand is faced with the problem of water allocation as a result of urbanization and the expansion of tourism and of industry in general. The presenters recommended that water should not be provided free-of-charge or be subsidized for use in any sector. Water should be priced at the full cost of long-term supply, including the cost of necessary infrastructure and the opportunity cost of rain water. Water rates should be progressive, with lower rates charged for small users.

It was proposed that social sustainability should be considered an important element of sustainable development. A lack of public awareness of the need for environmental conservation could obstruct proper resource management.

The private sector's role in raising the quality of life of farmers via agricultural market mechanisms was stressed as well.

### SESSION 3 Mineral Resources Development and Its Environmental Implications

- Chairman: *Dr. Sippanondha Ketudat*  
President  
National Petrochemical Corp, Ltd.
- Presenters: *Dr. Theodore Panayotou*  
Fellow, Harvard Institute for  
International Development  
*Dr. Quanchai Leepowpanth*  
Research Fellow, TDRI
- Discussants: *Mr. Chadab Padmasuta*  
Department of Mining  
Chulalongkorn University  
*Mr. Darnp Tewthong*  
Chairman  
Mining Industry Council

Dr. Sippanondha opened the discussion by raising the challenging question of what should be the optimum level of mining and environmental quality.

The presentation's main emphasis was on identifying the problems that the mining industry is facing and the idea of establishing an environmental fund contributed to by miners. The problems of the mining industry include the declining price of minerals as well as conflicts over land use (trade-offs between mining areas and forest conservation). The proposed solutions included the reform of the concession policy to increase

incentives for exploration, the restructuring of the royalty structure to reflect the true profitability and environmental impacts of each mineral, and the establishment of an environmental fund and bond mechanism to ensure land reclamation after mining.

The discussants proposed that the merits of the mining industry should not be overlooked since it has made an important contribution to economic growth. Development of the mining industry and the environment should not be a none-or-all trade-off. While the idea of an environmental fund was impressive, it could face operational problems when implemented. Past experience in coping with mining and environmental problems indicates that the government has not paid adequate attention to solving the root cause of the problem.

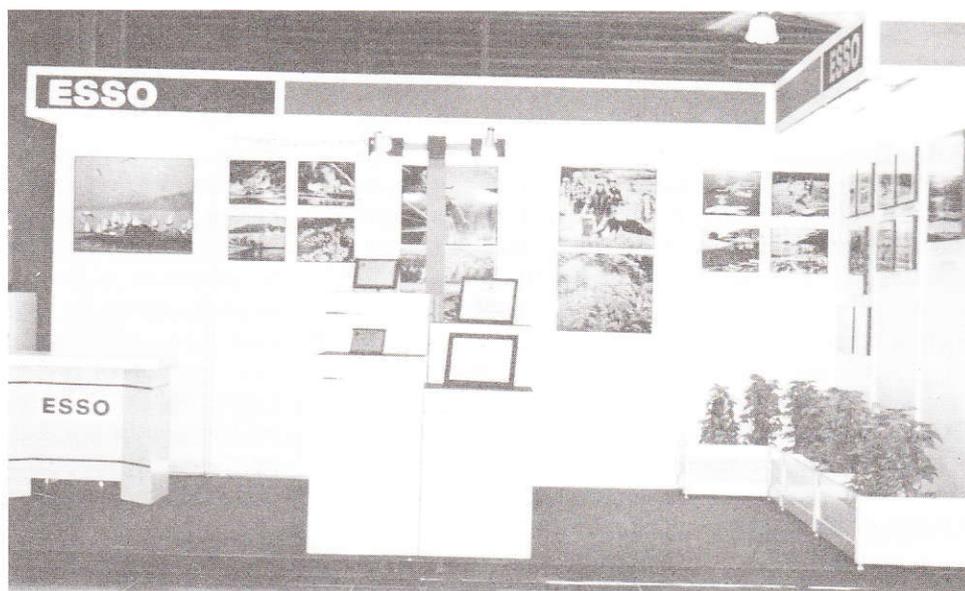
### GOVERNMENT AND PUBLIC RESPONSES:

TDRI's conference has drawn many policy recommendations from research conducted during the previous twelve months. Many of these recommendations have been well received and supported by the public and have been adopted by government agencies. This is due to the Institute's practice to consider policy research as a process during which users — either in government or the private sector — will be invited to review the practical aspects of each study and policy analysis before it can be finalized.

The government has considered lowering the lead content in fuel in order to mitigate air pollution problems. One of the most recent changes in the government's energy policy is the rescheduling of phasing out leaded gasoline. Reduction of the lead content in gasoline to 0.15 mg/liter will be effective in 1992, and mandatory retail sales of unleaded gasoline will be started on September 1, 1993. The government also took further action on CO (carbon monoxide), NO<sub>x</sub> (Nitrogen Oxides), and hydrocarbon control by scheduling the enforcement of the utilization of catalytic converters on new cars beginning on September 1, 1992.

In the conference, TDRI advocated the idea of establishing an environment fund for cleaning up industrial pollution. In concert with the idea, the Industrial Finance Corporation of Thailand (IFCT) has agreed to provide low-interest loans for industrial pollution treatment projects. Each project's loan limit is set at 20 million baht. IFCT has committed a 300 million baht fund for this purpose. The objective of this low-interest loan is to control and prevent industrial pollution from exceeding the safe limit.

*Private corporations and NGOs provided displays featuring technological solutions to environmental pollution at the Conference.*



#### **SESSION 4 Industrializing Thailand and the Impact on Its Environment**

- Chairman:** *Dr. Phisit Pakkasem*  
Secretary-General  
National Economic and Social  
Development Board
- Presenters:** *Dr. Dhira Phantumvanit*  
Director, Natural Resources and  
Environment Program, TDRI  
*Dr. Tienchai Chongpeerapien*  
Research Fellow, Energy, Infrastructure  
and Urban Development Program  
TDRI
- Discussants:** *Dr. Chaianan Samudavanija*  
Professor, Political Science  
Chulalongkorn University  
*Dr. Prida Wibulswasdi*  
Vice-Rector  
King Mongkut's Institute of Technology,  
Thonburi Campus

Dr. Phisit characterized the structural change of the country in three ways: the country's transformation of traditional practices to the adoption of new technology; increasing migration to the city, particularly expansion of the Eastern Seaboard vicinity; and Thailand's increasing involvement in the world economy.

Presenters summarized TDRI's research in the area of environmental quality management. The conclusion was that deterioration of the environment as a result of the rapid expansion of industry, growth of the urban population, and the increase in the demand for energy has reached a critical stage, especially in the Bangkok Metropolitan Area. The evidence was the pollution load, which is steadily growing. This trend will continue as the economy expands.

It was recommended that pollution controls should be incorporated into the national development plans. The "Polluter Pays Principle" and appropriate market

mechanisms should be applied. Immediate action should be taken to alleviate Bangkok's air pollution problem. For example, controls over fuel oil and gasoline quality should be imposed. The study recommended that the government should promote lead-free gasoline utilization as soon as possible. This will expedite the installation of catalytic converters. The study also called for a reduction of SO<sub>2</sub> and NO<sub>x</sub> emissions from power plants.

It was pointed out that for solutions to environmental problems to be effective, a strong political will and an improvement of political systems were needed. It was also suggested that development of renewable and unconventional energy sources should be emphasized.

#### **SESSION 5 General Discussion**

- Chairman:** *Dr. Ammar Siamwalla*  
President, TDRI

The format of this session was that of open discussion for all participants. While there were many opinions voiced, three major points that were emphasized are as follows:

- **Villagers and Forest Reserves:** It was noted that the problem of forest encroachment is partly due to past government policies, which promoted export-oriented agricultural expansion. It is important to recognize that many of these villagers had lived in these forest areas long before the government announced its forest reserves policy. Thus, it is not appropriate to classify these villagers as encroachers. The government's encroachment policy should therefore focus on raising agricultural productivity, increasing farmers' incomes, and raising education levels rather than on relocating encroachers out of the forest reserves.
- **"Polluter Pays Principle":** It was noted that while this principle has been discussed for a long time, it

has never been realized. In order to successfully implement this principle, a clear plan of action must be drafted, the right incentives (such as tax incentives) must be offered, and responsible organizations must be designated to carry out the policy.

- Further Studies: The following issues were suggested for further study
  - A detailed study of the economic costs of environmental damage.
  - A study on the economic impact of the environment and sustainable development.
  - An environmental assessment of the government's economic policies.

### CLOSING REMARKS

Dr. Snoh Unakul, Chairman of TDRI, summarized the conference's results as follows:

*From the conference, it is clear that the issues of natural resources and the environment are every citizen's concern. Development cannot be sustainable without considering the environmental aspects. The "Polluter Pays Principle" must be used for solving environmental problems. The conference's proposals to set up an environment fund for general industry and an environment fund for the mining industry are based on this principle.*

*Because natural resources are limited, owners or users of these resources must pay in proportion to their possession or usage. The government can then use this income to further develop the country.*

*It is not sufficient to expect the government be solely responsible for preventing and solving environmental problems. Citizens, political institutions, the private sector, and non-governmental organizations must also cooperate and participate.*

Dr. Snoh also noted that the benefits obtained at this conference can be summarized by the following three points:

- (1) The Institute's research activities reported at this conference represented a cooperative effort among researchers from different disciplines such as environmental engineering and economics. Environmental conservation and economic development were given equal importance.



*HRH Princess Maha Chakri Sirindhorn leaving the Conference after presenting her closing address.*

- (2) The research works were beneficial in terms of integrating data from different sources. Policy issues and recommendations were also clearly stated. Thus, with additional input from conference participants, these policy recommendations could be immediately used by policy makers.
- (3) The actual benefits of the research will occur only when the recommendations are adopted and implemented. This conference's purpose was to present guidelines for formulating policy. The next step must be a cooperative effort to implement the ideas and suggestions that resulted from this conference.

In officially closing the conference, HRH Princess Maha Chakri Sirindhorn said:

*The research works reported at this conference indicate that environmental problems will become more acute in the future. Immediate solutions to these problems must be implemented. The measures should include drafting appropriate environmental policies, creating public awareness, and developing clear and efficient action plans. By adopting the principle of sustainable development, growth can be sustained, and the environment can be saved.*

**TDRI 1990 Year-End Conference Papers are available through the Publications Office at the cost of 3,000 baht per set.**

# AIDS in Thailand: Some Preliminary Findings

Charles N. Myers  
Teera Ashakul

**T**hailand has an AIDS epidemic. How serious is it? How serious might it become? What consequences could it have for the economy and Thai society in the decade ahead?

The nature of AIDS and the AIDS epidemic make these questions important and, at the same time, difficult to answer. This article presents some preliminary results from a TDRI study of AIDS.<sup>1</sup>

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**“AIDS” is not a single, distinct disease but rather a complex of illnesses that results from immune deficiency. The causal agent is the Human Immunodeficiency Virus – “HIV.” HIV is transmitted by sexual intercourse, by blood contact, and by infected mothers to children during pregnancy or at birth.**

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## Characteristics of AIDS and the AIDS Epidemic

Three general characteristics of AIDS and the AIDS epidemic can be summarized at the outset:

First, “AIDS” is not a single, distinct disease but rather a complex of illnesses that results from immune deficiency. The causal agent is the Human Immunodeficiency Virus – “HIV.” HIV is transmitted by sexual intercourse, by blood contact, and by infected mothers to children during pregnancy or at birth. AIDS is eventually fatal, but the causes of death among AIDS patients vary. Unusual types of pneumonia and cancer are among the leading causes in the United States and Europe. The causes are more diverse among low-income countries. In Africa they include meningitis, tuberculosis, and the syndrome of wasting, recurrent fever and diarrhea called “Slim Disease.”<sup>2</sup> It is too early to know what the leading causes of death of infected people in Thailand will be. But the pattern will have important consequences for health care and health care costs.

Second, there is a long period of latency between the initial HIV infection and the onset of serious illness. In the United States and among middle- and upper-income Africans, the average interval between infection and illness for adults is about ten years.<sup>3</sup> During this

latent period infected individuals appear healthy, but they can and do infect others. The epidemic thus spreads unobserved and undetected. Some infected individuals are identified through routine blood screenings and through special surveys in which blood tests for the presence of antibodies to HIV are conducted. AIDS cases are confirmed through blood tests once individuals develop illnesses that are associated with previously confirmed AIDS cases. But these people who tested positive for HIV or who were identified AIDS carriers represent only a small proportion of the total number of infected people.

By January 1991, 25,342 Thais had tested positive for HIV through routine blood testing and special surveys. At the same time there were 311 confirmed cases of AIDS, 88 of whom had already died.<sup>4</sup> But there is no way of knowing with any certainty how many people not tested or diagnosed were also infected.

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**AIDS epidemics typically advance in waves of infection starting with the highest risk groups, then spreading to the general population.**

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Third, AIDS epidemics typically advance in waves of infection starting with the highest risk groups, then spreading to the general population. The first wave infects male homosexuals and intravenous drug users (IVDUs). The second wave – via IVDUs – infects female prostitutes. The third wave infects men who visit prostitutes. The fourth wave infects the wives and other sexual partners of these men, and the fifth wave infects the babies of these women.<sup>5</sup> In the United States and Europe the epidemic is primarily confined to male IVDUs and male homosexuals and their partners. In Thailand, however, all five waves of the epidemic are now visible.

## The Current Situation

Every six months, the Ministry of Public Health (MOPH) conducts a “sentinel surveillance survey” in which samples of both high-risk groups and the general population are tested for HIV infection. Table 1 sum-

marizes the results from the first three surveys and partial results from the fourth survey conducted in December 1990. The figures given are unweighted national averages for the groups surveyed.<sup>6</sup> The numbers of provinces represented are given in parentheses.

### In actuality, the epidemic is progressing at an impressive rate.

The population groups shown in the table correspond to the waves of the epidemic in Thailand. Intravenous drug users (IVDUs) are the first wave. Female prostitutes are the second wave. Men seeking treatment in sexually transmitted disease (STD) clinics (many of whom are clients of prostitutes) and blood donors (mostly men, some of whom are clients of prostitutes) represent the third wave. Pregnant women attending ante-natal (ANC) clinics represent both the fourth wave—the partners of infected men—and the fifth wave—the infants of infected mothers. A third or more of their babies will be HIV-positive.

Note however that fewer provinces were sampled in the 1989 surveys. The sampling in 1989 was done in Bangkok and in provinces where HIV infection was expected to be highest. The June 1990 survey sampled all provinces. The December 1990 survey also sampled all provinces, but the results shown in the table are incomplete. Thus, comparisons across surveys are somewhat misleading because of the upward bias of the first survey compared with the second and of the first two compared with the third. Thus, IVDU, blood-donor and ANC rates appear to “drop”; however, this is due to the higher number of provinces sampled in the later surveys.

**Table 1 Percentages HIV-Positive: Sentinel Surveillance Surveys (Number of Provinces Represented)**

Population Group	June 89	Dec 89	June 90	Dec 90
IVDUs	33.43 (14)	32.25 (26)	35.56 (49)	32.04 (31)
Brothel Prostitutes	6.37 (12)	9.82 (29)	13.78 (70)	17.00 (41)
Males in STD Clinics	1.29 (14)	3.69 (29)	4.39 (70)	5.80 (42)
Blood Donors	0.56 (13)	0.96 (30)	0.60 (72)	1.03 (46)
Women in ANC Clinics	0.15 (13)	0.41 (28)	0.21 (73)	0.70 (49)

Source: Ministry of Public Health

In actuality, the epidemic is progressing at an impressive rate. Increases in prevalence among high-risk groups—brothel prostitutes and males seeking treatment in STD clinics—are high from survey to survey, even with the upward bias of the earlier surveys. Particularly noteworthy are the increases in blood-donor and ANC prevalence between June and December 1990. And regional variations may signal higher average prevalences in the future. For example, in the June 1990 survey prevalence rates among brothel prostitutes in Chiang Mai, Chiang Rai and Phayao were over 40 percent. In the December 1990 survey the ANC rates in Chiang Rai and Phayao were 3.5 percent to 4.0 percent, and the blood-donor rates in Phayao and Chiang Mai were 7.3 percent and 8.0 percent, respectively.<sup>7</sup>

### The fact that the epidemic has not peaked and that it may not peak for some time has important implications as to how serious it may become in the future.

Even allowing for the special characteristics of these northern provinces, the indication is that the epidemic has not peaked—not reached the point beyond which the number of new cases of infection begins to decrease, as high-risk groups become as infected (as “saturated”) as they will become and as other people’s behavior changes to patterns of lower risk. Only the IVDU population may be close to saturation, and because the epidemic has broken out into the general population so quickly, the behavior of large numbers of people needs to change. The fact that the epidemic has not peaked and that it may not peak for some time has important implications as to how serious it may become in the future.

### Scenarios for the Future

HIV infection is not observable and is thus not known; projecting future infection from an unknown base is therefore a difficult task. We have chosen to approach this task in a manner that is deliberately very conservative—to make choices of assumptions and data that will tend to understate what the future situation may be. The actual situation may be worse than our scenarios suggest. But barring a sudden and quickly available medical breakthrough, it is unlikely to be better.

We have used a model developed by Chin and Lwanga to construct our scenarios.<sup>8</sup> The model requires an estimate of the year in which rapid HIV spread began and an estimate of HIV prevalence in a recent reference year.

The year we use for the beginning of the rapid spread of HIV is 1987. The estimated number of HIV-positive individuals we use for the reference year 1990

is 100,000. This number is conservative. It is the number the MOPH estimated by multiplying the June 1990 ANC rate by an estimated number of sexually active women and multiplying an adjusted blood donor rate by an estimated number of sexually active men.<sup>9</sup> The same methodology using the preliminary December 1990 ANC and blood donor rates would yield an estimate of more than 200,000 HIV-positive.<sup>10</sup> Thus, the 100,000 estimate cannot be viewed as an overstatement of the number of people infected in 1990.

With these inputs, the model calculates HIV infection, AIDS cases, and AIDS deaths backward from the reference year to the start of the epidemic and forward ten years beyond the reference year, based on the assumption that the average time from infection to AIDS is ten years and from AIDS to death a year and a half. It is possible to modify these assumptions: for example,

to assume that people will live less time once infected; and to make the curve of the epidemic fitted by the model steeper. We made no changes in the model's parameters and assumptions. Two scenarios were constructed, using 1993 and 1995 as the peak epidemic years. These scenarios are shown in Table 2.

Given the limitations of the Chin/Lwanga Model for projecting future HIV infection, the important implications of the two scenarios shown in the table are not in the absolute numbers but in the difference between a relatively early peak of the epidemic in 1993 and a peak two years later, in 1995. The differences in the year 2000 between the two scenarios are in the 80 percent range for HIV infection and the 40 percent range for AIDS cases and AIDS deaths. The scenarios suggest that if the peak is in 1993 rather than in 1995, there would by the year 2000 be roughly:

**Table 2 Scenarios for the Future<sup>a</sup>**  
Projections of HIV Infection, AIDS Cases and AIDS Deaths

Year	HIV			AIDS			DEATH	
	Incidence	Cumulative Incidence	Prevalence	Incidence	Cumulative Incidence	Prevalence	Incidence	Cumulative Incidence
PEAK YEAR: 1993								
1987	945	945	945	0	0	0	0	0
1988	5,986	6,931	6,926	5	5	2	2	2
1989	30,010	36,941	36,883	54	58	27	29	32
1990	63,474	100,415	100,000	356	415	178	205	236
1991	94,292	194,707	192,809	1,483	1,898	742	920	1,156
1992	115,415	310,122	303,940	4,284	6,182	2,142	2,884	4,040
1993	124,987	435,109	419,898	9,029	15,211	4,514	6,656	10,697
1994	124,384	559,493	528,720	15,562	30,773	7,781	12,295	22,992
1995	116,358	675,851	621,720	23,358	54,131	11,679	19,460	42,452
1996	103,828	779,679	693,803	31,745	85,876	15,873	27,552	70,004
1997	89,258	868,937	742,990	40,071	125,947	20,035	35,908	105,911
1998	74,453	943,390	769,707	47,736	173,683	23,868	43,903	149,815
1999	60,577	1,003,967	776,413	53,871	227,554	26,936	50,804	200,619
2000	48,267	1,052,234	766,633	58,046	285,601	29,023	55,959	256,577
PEAK YEAR: 1995								
1987	753	753	753	0	0	0	0	0
1988	5,036	5,789	5,785	4	4	2	2	2
1989	28,156	33,945	33,897	44	48	22	24	26
1990	66,414	100,359	99,999	312	360	156	178	204
1991	110,024	210,383	208,640	1,383	1,743	692	848	1,051
1992	150,186	360,569	354,571	4,255	5,998	2,127	2,819	3,870
1993	181,379	541,948	526,369	9,581	15,579	4,790	6,918	10,788
1994	201,297	743,245	710,042	17,624	33,203	8,812	13,602	24,391
1995	210,003	953,248	891,867	28,179	61,381	14,089	22,901	47,292
1996	208,975	1,162,223	1,060,139	40,703	102,084	20,352	34,441	81,733
1997	200,345	1,362,568	1,206,011	54,473	156,557	27,236	47,588	129,321
1998	186,367	1,548,935	1,323,711	68,667	225,224	34,333	61,570	190,891
1999	169,101	1,718,036	1,410,724	82,088	307,312	41,044	75,377	266,268
2000	150,260	1,868,296	1,467,204	93,780	401,092	46,890	87,934	354,202

<sup>a</sup> Projections based on the Chin/Lwanga Model.

Projection assumptions:

Starting year of rapid spread = 1987  
Reference Year = 1990  
Number HIV-positive in 1990 = 100,000

**Note:** Incidence is the number of new cases per year.  
Prevalence is the total number of current cases.

- 800,000 fewer people infected
- 115,000 fewer AIDS cases
- 97,000 fewer AIDS deaths

The importance of vigorous prevention efforts to bring about an early peak of the AIDS epidemic in Thailand is obvious from the comparison between these two scenarios.

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### **Even with a peak in 1993, the effect of the AIDS epidemic will be to increase and redistribute mortality.**

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#### **Prospective Demographic and Economic Consequences**

Even with a peak in 1993, the effect of the AIDS epidemic will be to increase and redistribute mortality. Deaths from AIDS can be expected to increase among women in their twenties and thirties; men in their thirties, forties and fifties; and eventually, among infants and young children of HIV-positive mothers.

Most AIDS deaths in the next decade, will be of adults in their prime working years. If we assume that the average loss per AIDS death is 20 prime working years (again, a conservative assumption), then the loss by the year 2000 in the 1993 scenario is 5 million prime working years; and in the 1995 scenario, 7 million.

The prospective economic costs of the illness and death of adults of prime working age include the costs of medical care and the product lost to the economy and society that these individuals otherwise would have contributed.

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### **The AIDS epidemic will alter the Thai economy's performance from what it would have been had the epidemic not occurred.**

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Thus, the AIDS epidemic will alter the Thai economy's performance from what it would have been had the epidemic not occurred. AIDS mortality will decrease the quantity of labor supply. Quality of labor inputs will decline as the increase in AIDS morbidity reduces the stamina and persistence of workers and their motivation to work. It is also likely that household savings will decline as spending on medical care rises relative to disposable income. The country's aggregate investment may be further eroded as the government is required to spend more resources on social and health services to alleviate the socioeconomic impact of the epidemic rather than on productive capital formation. And there may be AIDS-related decreases in foreign tourism and foreign investment. TDR will estimate some of these costs in detail as the projections of AIDS and AIDS deaths are refined.

#### **Endnotes and References**

- 1 TDR's research on the prospective economic costs of AIDS is supported by USAID and the British Council. We are grateful for their support.
- 2 Charles N. Myers and Albert E. Henn, "Potential Impact of AIDS in Africa," in Robert I. Rotberg (ed.), *Africa in the 1990s*, Reference Publications, Inc., 1988.
- 3 Ibid.
- 4 Division of Epidemiology, Ministry of Public Health.
- 5 In some literature, six waves of the epidemic are distinguished, the first among male homosexuals, the second among IVDUs, and so on. While there were early AIDS cases and continue to be AIDS cases and new cases of HIV infection among homosexuals in Thailand, the numbers are small and appear controlled by behavior change. The first major wave of the epidemic in Thailand has been among IVDUs.
- 6 It would be better to calculate weighted averages. However, there are no reliable estimates by province or even nationally of total numbers in the various risk groups sampled.
- 7 MOPH, June 1990 Sentinel Surveillance Survey and preliminary data from the December 1990 Sentinel Surveillance Survey—results for individual provinces.
- 8 Chin and Lwanga recommend that the model not be used to project HIV infection. This is because the model is based on a logistic function which, in the absence of any understanding of underlying behavior, may or may not fit the path of an AIDS epidemic in a particular country. See: J. Chin and S.K. Lwanga, "Estimation and Projection of Adult AIDS Cases: A Simple, Non-Mathematical, Epidemiologically-Based Model." Global Program on AIDS, WHO, Geneva, 1990. Subsequent TDR projections of the epidemic will be based on a behavioral model. The preliminary results presented in this article are based on the Chin/Lwanga model at its most conservative slope and assumptions about conversion from HIV to AIDS and from AIDS to death.
- 9 "HIV/AIDS Situation and Surveillance in Thailand." Division of Epidemiology, MOPH, September 15, 1990, p. 18 (mimeo).
- 10 Mechai Viravaidya and Stasia Obremsky of the Population and Community Development Association make a strong case for an estimate of 300,000 HIV-positive in 1990. Personal communications, and see also: Mechai Viravaidya, "Some Preliminary Findings Indicating a Need for Radical Action in AIDS Prevention in Thailand." Paper presented at the Chulabhorn Research Institute International Conference on AIDS, 17-21 December 1990, Bangkok, Thailand.

# A Value-Added Tax (VAT) in Thailand: Who Wins and Who Loses?<sup>1</sup>

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## I INTRODUCTION

During the last few years, the Thai government has been planning the introduction of a value-added tax (VAT) in the country. If and when this tax is implemented, Thailand will be among the more than 40 countries in the world that have adopted a VAT (Gillis et al., 1990). The primary reason for introducing a VAT is that existing indirect taxes—such as Thailand's business tax—have a “cascading” effect. As an ad valorem tax levied on every transaction, the business tax accumulates along the chain of production. Thus, an initial tax rate of 10 percent can lead to an effective rate of over 25 percent. Furthermore, the effective rate will vary across goods depending on the number of intermediate stages in their production. This leads to at least two problems. First, the business tax distorts production decisions by causing the tax rate to vary across goods. Second, it creates an incentive for vertical integration. Finally, the business tax discriminates against exports. Even if exporters are exempt from paying the tax, they pay tax-ridden prices for their inputs, which undermines their competitiveness in world markets.

By replacing the business tax with a VAT, Thailand can in principle achieve a more uniform tax rate throughout the economy. Several other aspects of the government's proposal, however, will lead the effective tax rate to vary across commodities. The proposed VAT will use the “credit method,” whereby enterprises pay the tax on their gross output but receive a rebate (or “credit”) for the taxes paid on their inputs. For example, suppose the VAT rate is 10 percent. An enterprise buys 60 baht worth of inputs, processes them and sells the processed good for 100 baht. The enterprise pays 10 baht worth of taxes on its output (10 percent of 100 baht) but receives a rebate of 6 baht for the taxes paid on the inputs (10 percent of 60 baht). The net tax paid by the enterprise is 4 baht, which is 10 percent of the value added by the processing (100 minus 60).

The credit-method VAT will result in a uniform rate only if all the enterprises in the country are part of the VAT system. If an enterprise is exempt, it not only pays no VAT on its output, but it also does not receive the

rebate on the VAT paid on its inputs. In this case, the net tax paid will no longer be 10 percent of value added. The government's proposal calls for several exemptions: enterprises with an annual turnover of less than 240,000 baht; traditional agriculture; producers of major agricultural inputs (fertilizers, insecticides); transport; education; health; and some professional services. In addition, three major groups will be “zero-rated:” not only will they pay no VAT on their output, but they will also receive a rebate for the taxes paid on their inputs. These groups are exporters, producers of investment goods, and utilities selling to residential customers. They will truly be paying a VAT rate of zero.

What, then, will be the impact of the VAT on the Thai economy? Who will gain and who will lose? What will be the effect on output, prices and incomes? To investigate these questions, we present some simulations with a computable general equilibrium (CGE) model of the Thai economy.<sup>2</sup>

We choose a multisector, general equilibrium model for this analysis because it captures the very effects we wish to study. As a result of the incomplete coverage of Thailand's VAT, the total tax burden will not be equal across-the-board, but depend on the input-output structure of production. Hence, a multisector model, incorporating the economy's intermediate demand pattern is called for. For the same reason, we model the credit system explicitly, rather than assume the VAT is a tax on value added. This is also why we choose a general, rather than partial equilibrium model for this exercise. Furthermore, as a tax instrument, a VAT affects the economy through its influence on prices and incentives. Our model solves for the set of market-clearing prices and wages in the presence of a VAT.

We describe the model, data and experiments in the next section of this article. Section III reports on and interprets the results of simulations with the model. Section IV contains some concluding remarks.

## II THE MODEL, DATA AND EXPERIMENTS

As with all CGE models, ours solves for the set of market-clearing goods and factor prices, given the sup-

ply and demand behavior of the various agents in the economy. There are seven labor markets and two capital markets, all of which are assumed to clear. Our results therefore describe a medium-term equilibrium for the economy, when factors have moved to eliminate differentials in their rewards across sectors. Total factor supplies are assumed fixed and inelastic. Production of each sector's output is determined by a constant returns to scale CES production function in factors and fixed coefficient technology in material inputs. All producers maximize profits and perfect competition rules throughout.

On the demand side, consumer demand is determined by a linear expenditure system (LES), with one variation: each household type's savings rate is a non-linear function of its disposable income. There are nineteen different types of household, so that the distributional implications of the VAT can be captured. Government consumption and investment demand are exogenous. Export demand is a constant elasticity function of Thai export prices relative to world prices. Finally, imports are assumed to be imperfect substitutes for Thai goods in the same sector. Given the last two assumptions, domestic prices in Thailand will not equal world prices but will nevertheless be influenced by them.

Most of the parameters of the model are calibrated from a benchmark data set, which is a social accounting matrix (SAM) of Thailand for 1987. In order to calibrate the model, certain elasticities have been estimated or assumed.<sup>3</sup>

Turning to the experiments, we aim to simulate the replacement of the business tax with a VAT. The government's proposal calls for a VAT rate of 10 percent. It also claims that the tax change will be "revenue-neutral"—that is, the VAT will generate as much revenue as did the business tax (35 billion baht, or 16 percent of government revenue in 1987). We find these two propositions inconsistent. Given reasonable assumptions about the share of each sector's output, which will be in the VAT net (see Table 1 below), we find that a VAT of 5.8 percent will generate enough revenue to replace the business tax. This will therefore be our base experiment, or **Case 1**.

Introduction of a VAT raises the tax rate on some commodities (such as tobacco, alcohol and fuel) that are already subjected to an excise tax. **Case 2** involves lowering the excise tax rates on these commodities so that the total tax burden (per unit of output) is the same as before the VAT was introduced.

**Case 3** has all the ingredients of Case 2, except that the VAT rate is 10 percent; we solve for the participation rates in each sector, which are consistent with this rate and revenue neutrality (see Table 1).

Finally, **Case 4** represents an extreme scenario, where the VAT replaces both the business tax and the excise tax. Here the revenue-neutral VAT rate is much higher—almost 15 percent.

**Table 1 Assumptions on Five Different Experiments**

Case Study No.	1	2	3	4
Tax Replaced	Bus	Bus	Bus	Bus + Excise
Adjustment Of Excise Tax	No	Yes	Yes	No Tax
Coverage of Value-Added Tax by Sector:				
1 Paddy	0.00	0.00	0.00	0.00
2 Other Major Crops	0.00	0.00	0.00	0.00
3 Vegetables & Fruits	0.00	0.00	0.00	0.00
4 Other Agriculture	0.00	0.00	0.00	0.00
5 Fishing	0.00	0.00	0.00	0.00
6 Slaughtering	0.30	0.30	0.19	0.30
7 Canned & Processed Foods	0.30	0.30	0.19	0.30
8 Rice Milling	0.30	0.30	0.19	0.30
9 Beverage	0.50	0.50	0.25	0.50
10 Tobacco Processing	1.00	1.00	1.00	1.00
11 Other Foods	0.50	0.50	0.25	0.50
12 Clothing	0.50	0.50	0.25	0.50
13 Wood, Plastic and Rubber Products	0.50	0.50	0.25	0.50
14 Basic Industries	0.50	0.50	0.25	0.50
15 Appliances	0.50	0.50	0.25	0.50
16 Other H-H Items	0.50	0.50	0.25	0.50
17 Other Industries	0.50	0.50	0.25	0.50
18 Fuel	1.00	1.00	1.00	1.00
19 Utilities	1.00	1.00	1.00	1.00
20 Construction	0.50	0.50	0.25	0.50
21 Hotel & Restaurant	0.50	0.50	0.25	0.50
22 Transport	0.00	0.00	0.00	0.00
23 Real Estate	0.50	0.50	0.25	0.50
24 Public Administration	0.00	0.00	0.00	0.00
25 Education	0.00	0.00	0.00	0.00
26 Health	0.00	0.00	0.00	0.00
27 Other Services	0.30	0.30	0.19	0.30

### III RESULTS

The economywide effects of introducing the VAT in Thailand according to the four cases are presented in Table 2. As a proxy for the change in efficiency, we look at the percentage change in GDP. Note that in Case 1, GDP actually falls; it rises slightly in the other three cases. This is because there are other taxes in the system. While it eliminates the cascading nature of the business tax, introducing a VAT may not necessarily

**Table 2 Summary of Simulation Results**

Case Study No.	1	2	3	4
Revenue Neutral Vat Rate (%)	5.79	6.37	9.99	14.97
Efficiency Gain (% GDP Change)	-0.04	0.01	0.02	0.60
Price Change (%)	1.00	1.00	1.07	1.36
Income Distribution (% GINI CHA)	-0.11	-0.12	-0.10	-0.24

make the tax burden more uniform. In particular, the presence of excise taxes acts as a distorting element, which the VAT fails to counterbalance.

Table 2 also shows the effects of a VAT on the average price level and the distribution of income in the economy. The one percent increase in the price level should be interpreted with care. There is occasionally a presumption that the introduction of a VAT will fuel inflation. Both theory and empirical evidence suggest that this is not true (Tait, 1988). A one-shot tax change may increase the price level that year, but there is no reason to suspect that, by itself, this policy will lead to a persistent increase in prices year after year. Therefore, this one percent increase should be interpreted as the amount by which we would expect the domestic price level to be higher in the year the tax was adopted. In other words, from the inflation rate of that year, we can attribute about one percentage point to the VAT.

Finally, the improvement in income distribution (reduction in the Gini coefficient) can be interpreted only in light of the changes at the household and sectoral level, to which we now turn.

Table 3 shows the effective tax rate (as a percentage of value added) across the 27 sectors for the four cases as well as for the Thai economy without a VAT. Note that agriculture and the export-oriented sectors (canned foods, clothing, wood-plastic-tires and appliances) enjoy a reduction in their tax burden, while

others (basic industries and slaughtering) undergo an increase. This is due to the exemptions and zero-rating under the VAT, as shown in Table 1. Note further that the variation in effective tax rates (represented by the coefficient of variation) under Case 1 is actually higher than without the VAT. This is because of the continued existence of excise taxes, whose effect is exacerbated by the introduction of the VAT. When excise taxes are lowered (Cases 2 to 4), so is the coefficient of variation. Indeed, the pattern of the coefficient of variation in effective tax rates mirrors the changes in GDP or efficiency across the four cases (see Table 2). Whenever the tax change lowers the coefficient, it reduces the production distortions and increases efficiency.

The effects of introducing the VAT on sectoral output reflects the changes in effective tax rates. Those sectors whose effective tax burden fell increase their output; conversely, those whose effective tax rate rose decrease their output. The winners appear to be agriculture and the export-oriented manufacturing sectors. Recall that these are the sectors either exempt or zero-rated in the VAT proposal. The losers are some of the nontradable service sectors. Finally, note that the dramatic increase in the beverages and tobacco sectors under Case 4 is due to the elimination of excise taxes that are targeted at those sectors.

The income distributional implications of the VAT can be discerned from changes in the sectoral pattern

**Table 3 Dispersion of Total Business and Excise Tax Burden Before and After Vat (% of Sectoral Value Added)**

	Before VAT	VAT Case 1	VAT Case 2	VAT Case 3	VAT Case 4
1 Paddy	0.95	0.00	0.00	0.00	0.00
2 Other Major Crops	0.83	0.00	0.00	0.00	0.00
3 Vegetable & Fruits	0.47	0.00	0.00	0.00	0.00
4 Other Agriculture	1.78	0.00	0.00	0.00	0.00
5 Fishing	0.31	0.00	0.00	0.00	0.00
6 Slaughtering	2.36	6.33	6.97	6.98	16.47
7 Canned & Processed Foods	2.17	0.33	0.36	0.64	0.69
8 Rice Milling	3.24	5.51	6.06	6.19	14.25
9 Beverage	89.32	89.07	89.60	89.43	14.92
10 Tobacco Processing	237.19	249.51	233.48	230.64	34.07
11 Other Foods	3.99	5.52	6.07	5.30	13.98
12 Clothing	7.87	4.91	5.41	4.85	12.46
13 Wood, Plastic And Rubber Products	6.72	2.58	2.82	2.55	6.18
14 Basic Industries	11.86	18.49	19.57	18.42	28.28
15 Appliances	6.81	3.36	3.69	3.76	8.35
16 Other H-H Items	6.62	7.98	8.80	9.04	20.96
17 Other Industries	7.57	10.07	11.09	10.00	26.63
18 Fuel	399.37	470.44	387.22	380.63	167.74
19 Utilities	0.00	8.31	9.17	15.65	22.79
20 Construction	4.64	7.33	8.05	6.84	19.17
21 Hotel & Restaurant	6.86	5.01	5.52	4.69	13.09
22 Transport	4.72	0.00	0.00	0.00	0.00
23 Real Estate	5.50	3.20	3.52	2.86	8.34
24 Public Administration	0.00	0.00	0.00	0.00	0.00
25 Education	0.00	0.00	0.00	0.00	0.00
26 Health	0.92	0.00	0.00	0.00	0.00
27 Other Services	9.06	9.20	9.43	9.53	6.01
Coefficient Of Variation	2.83	2.93	2.76	2.75	1.95

of output. Overall, there is a slight improvement in the distribution of income. This result stems from the fact that the "winning sectors" (agriculture and exported manufactures) employ a higher proportion of the poor than do the "losing sectors." In particular, agricultural incomes decline by less (in real terms) than do non-agricultural incomes. Furthermore, within the non-agricultural sector, there is a shift in favor of poorer households because these households are more heavily involved in export-oriented activities.

#### IV CONCLUSION

This simulation analysis of a value-added tax in Thailand has yielded several conclusions. First, the government's proposal of replacing the business tax with a 10 percent VAT rate will probably not be revenue neutral; it will result in an increase in revenues. Second, the efficiency gains of the proposed VAT will be negative unless excise taxes are reduced as well. In any event, the VAT will not lead to a uniform tax rate across the economy, given the myriad of exemptions and zero-rated sectors. Third, the winners from the VAT will be those sectors that are either exempted or zero-rated, especially to the extent that these were not excluded from the business tax. Specifically, these tend to be agriculture and the export-oriented manufacturing sec-

**Table 4 Impact on Sectoral Outputs  
(Real GDP Changes %)**

	Case 1	Case 2	Case 3	Case 4
1 Paddy	0.32	0.24	0.26	0.00
2 Other Major Crops	0.36	0.23	0.18	-0.20
3 Vegetable & Fruits	-0.39	-0.38	-0.34	-0.64
4 Other Agriculture	0.02	0.01	0.01	0.31
5 Fishing	-0.71	-0.34	-0.42	-0.04
6 Slaughtering	-0.27	-0.29	-0.26	-1.15
7 Canned & Processed Foods	0.37	0.84	0.31	1.88
8 Rice Milling	0.33	0.24	0.26	-0.00
9 Beverage	-0.84	-0.89	-0.81	15.36
10 Tobacco Processing	-1.09	0.38	0.98	29.09
11 Other Foods	0.20	0.17	-0.03	-0.05
12 Clothing	0.75	0.63	0.60	0.23
13 Wood, Plastic and Rubber Products	1.46	1.41	1.27	0.82
14 Basic Industries	-0.80	-0.59	-0.51	-0.10
15 Appliances	1.38	1.39	0.97	1.45
16 Other H-H Items	0.04	0.03	-0.31	-0.05
17 Other Industries	0.18	0.18	-0.04	-0.31
18 Fuel	-1.07	0.42	1.13	7.23
19 Utilities	-0.46	-0.31	-0.44	0.15
20 Construction	-1.06	-1.21	0.90	-4.13
21 Hotel & Restaurant	-0.31	-0.36	-0.20	-1.54
22 Transport	0.05	0.24	0.30	0.21
23 Real Estate	0.06	0.06	0.10	-0.21
24 Public Administration	-0.05	-0.01	-0.00	0.19
25 Education	-0.01	-0.01	-0.00	-0.01
26 Health	-0.44	-0.41	-0.44	-1.31
27 Other Services	0.07	0.05	0.01	0.48
All Sectors	-0.04	0.01	0.02	0.60

**Table 5 Impact on Sectoral Prices**

	Case 1	Case 2	Case 3	Case 4
1 Paddy	0.24	0.33	0.24	0.84
2 Other Major Crops	0.30	0.40	0.32	0.48
3 Vegetable & Fruits	0.38	0.48	0.44	0.72
4 Other Agriculture	-0.25	-0.10	-0.16	0.68
5 Fishing	1.64	0.92	0.88	-0.00
6 Slaughtering	0.98	1.26	1.26	4.36
7 Canned & Processed Foods	1.61	1.62	1.80	3.95
8 Rice Milling	1.22	1.47	1.45	4.47
9 Beverage	0.44	0.62	0.69	-22.56
10 Tobacco Processing	3.22	-0.01	-0.27	-37.20
11 Other Foods	2.12	2.45	2.11	6.91
12 Clothing	0.11	0.48	0.21	3.06
13 Wood, Plastic and Rubber Products	0.69	0.98	0.61	4.99
14 Basic Industries	2.45	2.59	2.54	4.67
15 Appliances	1.32	1.59	1.33	5.71
16 Other H-H Items	2.24	2.51	2.45	6.31
17 Other Industries	1.65	1.91	1.75	5.92
18 Fuel	5.11	1.41	1.52	-6.63
19 Utilities	6.02	6.09	9.99	11.74
20 Construction	1.26	1.47	1.09	5.40
21 Hotel & Restaurant	-0.21	0.05	-0.18	2.15
22 Transport	-1.64	-2.14	-2.10	-3.24
23 Real Estate	-1.74	-1.43	-1.97	3.04
24 Public Administration	0.00	0.00	0.00	0.00
25 Education	0.01	0.06	0.08	0.32
26 Health	0.03	0.07	0.19	0.90
27 Other Services	0.35	0.56	0.70	-1.51
All Sectors	1.00	1.00	1.07	1.36
CPI	0.60	0.60	0.47	0.39

**Table 6 Change in Real Income by Household  
Groups (%)**

	Case 1	Case 2	Case 3	Case 4
Farm Household 1	-0.39	-0.33	-0.26	0.08
Farm Household 2	-0.34	-0.29	-0.23	0.07
Farm Household 3	-0.31	-0.26	-0.22	0.06
Farm Household 4	-0.31	-0.25	-0.22	-0.01
Farm Household 5	-0.34	-0.29	-0.26	-0.24
Non-farm Household 1	-0.48	-0.42	-0.29	-0.00
Non-farm Household 2	-0.62	-0.56	-0.43	0.06
Non-farm Household 3	-0.71	-0.68	-0.56	-0.46
Non-farm Household 4	-0.69	-0.65	-0.54	-0.75
Non-farm Household 5	-0.73	-0.71	-0.61	-1.01
Government Household 1	-0.59	-0.53	-0.40	-0.39
Government Household 2	-0.70	-0.61	-0.49	-0.08
Government Household 3	-0.67	-0.64	-0.52	-0.30
Government Household 4	-0.36	-0.34	-0.26	-0.55
Government Household 5	-0.25	-0.16	-0.10	-0.20
State Ent. Household 1	-0.45	-0.37	-0.23	0.17
State Ent. Household 2	-0.51	-0.46	-0.33	-0.09
State Ent. Household 3	-0.84	-0.78	-0.64	-0.26
State Ent. Household 5	-1.04	-1.01	-0.95	-1.20
All Households	-0.48	-0.42	-0.31	-0.06
Shorrocks' Index	-0.09	-0.08	-0.02	0.06
Gini Index	-0.03	-0.03	-0.00	0.03

**Table 7** Impact on Export by Sector  
Changes in Export Value (%)

	Case 1	Case 2	Case 3	Case 4
Agricultural Products	0.55	0.66	0.47	1.25
Manufactured Products	1.03	1.27	1.32	3.49
Services	-0.98	-1.11	-1.04	-3.16
Total Exports	0.58	0.72	0.69	1.76

**Table 8** Changes in External Balance

	Case 1	Case 2	Case 3	Case 4
Change (value)				
- Export	2210	2747	2618	6659
- Import	1112	1336	1289	2829
Trade Balance	1098	1411	1329	3830
Service Surplus	-499	-571	-577	-981
Current Account Balance	600	840	752	2849
Change (%)				
- Export	0.74	0.92	0.88	2.23
- Import	0.33	0.39	0.38	0.83
Trade Balance	2.51	3.22	3.03	8.74
Service Surplus	-1.74	-1.99	-2.01	-3.41
Current Account Balance	6.43	9.01	8.07	30.58

tors. Fourth, the VAT will have a slightly favorable effect on the distribution of income in Thailand because the winning sectors employ a greater share of the poor than do the losing sectors.

To be sure, the conclusions from our modelling exercise should be interpreted carefully. The results are not a forecast of the future. The Thai economy is also affected by changes in the external environment, which we have held constant in our analysis. Our purpose has been to isolate those effects that can be attributed to the VAT alone and to express them in the context of a consistent view of how the Thai economy functions. Moreover, we have left out several aspects of the VAT. Implementing a credit-method VAT requires new administrative methods, which can in turn alter the coverage and efficiency of the tax. We have ignored the administrative dimension entirely. In addition, utilization of the VAT in other countries has shown that because the credit method creates an incentive to declare one's earnings honestly, income tax evasion also declines when a VAT is introduced. We have not included this effect in our simulations.

Nevertheless, our general equilibrium analysis has shown that the consequences of a VAT in Thailand may not be exactly those intended by the policy makers who proposed the tax, particularly if the VAT is to replace only the business tax. Furthermore, this conclusion was reached with a model that is nothing more than a quantitative representation of the implicit model used by policy makers in making a case for the VAT.

## Endnotes

- 1 This is a summary of an earlier paper published in Thai in Sumpakorn Sarn, 75th Year Anniversary Issue of the Revenue Department, Vol. 37, No. 9, September 1990. For other attempts at modelling value-added taxes using CGE models, see Dervis et al. (1982), Bovenberg (1985) and Dahl and Mitra (1989). Devarajan (1989) surveys the use of CGE models for tax analysis in developing countries. The computable general equilibrium model of the Thai economy used for this exercise is a descendant of Johansen's (1960) work on the Norwegian economy. It is more closely related to CGE models of developing countries which are surveyed in, among other places, Dervis, de Melo and Robinson (1982). The particular model of Thailand is part of a family of models started by Amaranand and Grais (1984) and used extensively for policy analysis over the past five years by the Thailand Development Research Institute and National Economic and Social Development Board; Sussangkarn, Tinakorn, and Chongpeerapien (1988), Devarajan and Sussangkarn (1988).
- 2 This model is currently in use at TDRI and the NESDB for macroeconomic analysis and for the preparation of macroeconomic targets for the Seventh National Economic and Social Development Plan.
- 3 This model has been able to track the Thai economic performance from 1987 to 1990 fairly well.

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# Rural Natural Resources Management: Lessons From Thailand\*

Theodore Panayotou  
Dhira Phantumvanit

Thailand's rural natural resources – forests, land and water – have made indisputable contributions to the country's industrialization and economic growth not only by providing food and materials but also by generating investable surpluses and foreign exchange at a critical stage of the country's development. The fact that the rural resource sectors' share in the Gross Domestic Product (GDP) and exports has been steadily falling while their absolute contribution is concurrently rising indicates the success of these sectors in fuelling the diversification and sustained growth of the economy. The inherent risk is to infer from this inevitable structural change that rural natural resources no longer warrant special attention because the share of the resource-based sectors is relatively small (under 20% at present) and is steadily declining.

## The Growing Importance of the Rural Resource Sectors

Despite this apparent contradiction, the importance of the rural resource sectors, particularly agriculture, might have increased along with the decline of its share in GDP because of the country's unbalanced structural change and its implications for income distribution and socioeconomic stability. The majority of the Thai population continue to depend on agriculture for employment and income, while the agricultural sector's share in the national income has dropped to 15 percent and continues to fall. This implies wide and growing inequality in the distribution of income. If current trends continue, it is projected that by the end of the decade, agriculture will account for only 8 percent of GDP while it will still employ 40 percent of the labor force – which implies an increase in inequality. At the same time, the national economy will be at least twice its current size. Income disparity will thus worsen as the share of the rural sectors is reduced and the rural interests will become more vocal and articulate.

Therefore, improved rural natural resource management is critical if the rural sector's productivity is to be increased and inequality contained. In the past, mismanagement of the rural resource base may have meant less investable surplus and less foreign exchange

for industrialization and therefore somewhat lower growth. Today and in the foreseeable future, failure to conserve and manage the rural resources may undermine the sustainability of the entire growth process.

Of course, there are further reasons why rural resource management and agricultural growth are still essential to industrial and overall growth. Over 44 percent of the value of manufacturing is still resource based, and about 50 percent of trade and services depends on a healthy agricultural sector through backward and forward linkages. Even as the share of natural resources as a source of growth has declined, the share of domestic demand in economic growth has increased from 74 percent in the early 1980s to 78 percent in the late 1980s. With the majority of the population engaged in agricultural activities, faster rural growth means larger markets for nonagricultural products.

## The Growing Demand for Natural Resources by the Nonagricultural Sectors

The non-resource-based sectors, industry and services, are themselves placing increasing demands on land, water and forests. Land previously under agriculture or forestry is now demanded for location of industry, development of tourism, expansion of urban areas, and infrastructure. While the land converted to non-agricultural uses is still relatively small in comparison to the total agricultural area, its rate of growth is high, and the time allowed for adjustment is minimal. Moreover, such land is usually of very good quality (higher-than-average agricultural productivity) and of close proximity to irrigation systems, infrastructure, and markets. Thus, even though the agricultural value of converted land is only a fraction of its value in other uses, the foregone agricultural production and rural income are disproportionately high.

During times of rapid economic growth, industrial expansion, and massive construction activity, the land lost to agriculture in the proximity of urban, industrial, and tourist centers is a multiple of the land actually converted to other uses because of land speculation. Land bought for speculation often lies idle because the buyers, usually urban investors, neither farm nor wish

\* Extracts of the paper presented at the 33rd Colombo Plan Consultative Committee, Bangkok, November 1990

to rent out the land to farmers from fear of losing full control of the land when they want to sell it.

The current inadequate infrastructure and the uncertainty regarding the location and scale of contemplated infrastructural projects further fuel land speculation and pull land out of crop production.

Rapid industrialization, tourist development, urbanization, and income growth also raise the demand for water and energy. Water resources are increasingly diverted from crop irrigation to supply urban centers and industrial users and to produce hydropower. The latter necessitates further water resource development and construction of hydroelectric dams and reservoirs that inundate large areas of land and forests, creating additional pressures on and conflicts over increasingly scarce rural natural resources.

Yet the most latent and perhaps the most potent demand for rural natural resources over the long run is the demand for environmental amenities, open spaces, parks, and recreation areas arising from income growth and urbanization. This environmental and recreational demand for land, water, and forests is now manifested in growing visits to national parks and coastal resorts, the rapid growth of golf courses, and growing support for the environmental movement. As incomes continue to grow and the environment of the cities deteriorates from pollution and congestion, growing numbers of people will increasingly demand the amenities of the countryside, open spaces, rural landscape, natural forest, and unpolluted waters. Soon enough, the second home outside the city will become as much a reality for the urban middle and upper classes of Thailand as it is for those of the developed countries.

For all these reasons, the demand for rural natural resources will not decline, and it may, in fact, increase with Thailand's successful industrialization and rapid economic growth. Not only are the resources expected to provide employment for the majority of the Thai population, but they are also expected to play a critical role in containing inequality and in improving the quality of life of an increasingly affluent urban population.

### **Past Natural Resources Management**

The past and current approaches to rural natural resource management have been less than successful, which is evident from a simple comparison of objectives and accomplishments.

The first three National Development Plans set a target of maintaining 50 percent of the country's area under forest at a time (the early 1960s) when over 50 percent of the area was under forest. Failing to arrest deforestation that had reduced the forest area below 50 percent by the late 1970s, the Fourth National Development Plan (1976-81) set a target forest area of 37 percent. Having failed to hold the set target and with the natural forest down to only 29 percent, at the end of the Fifth Plan (December 1985) the government established a National Forest Plan to increase the forest area

to 40 percent, of which 15 percent would be protection forest for conservation and 25 percent economic forest for timber production. Achieving this target would require reforestation of 6 million hectares. However, because the rate of deforestation is ten times the rate of reforestation, the "economic forest" target rate has been an unsurmountable goal thus far. Even assuming an effective halt to deforestation and a tripling of the rate of reforestation, it would take at least 35 years to reach the 40 percent target (TDRI, 1987).

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### **Unfortunately, the experience of the two years since private deforestation promotion began and logging was banned has been less than encouraging.**

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Recognizing these difficulties, the government has sought to involve the private sector in reforestation by making denuded public forestland available for private tree plantations at a nominal rent (63 baht/ha) and by providing investors with generous incentives such as tax holidays and exemptions for import duties on machinery and equipment. Several large companies expressed interest in participating, each with plans for large-scale plantations covering thousands of hectares of denuded forestland, and for a moment, it appeared that the 40 percent target would become a reality. This belief was reinforced by the fact that in January 1989 the government imposed a nation-wide ban on logging. If deforestation had been stopped and reforestation was indeed accelerating with the infusion of private capital, it was a matter of simple arithmetic to conclude that the country's forest cover would grow to meet the target in only a few years.

Unfortunately, the experience of the two years since private deforestation promotion began and logging was banned has been less than encouraging. The private sector's involvement in reforestation met with serious obstacles from the beginning. In the first place, the denuded forestlands are not vacant but are occupied by farmers who have encroached on the forest reserves in search of land for cultivation. Evicting farmers is out of the question, and where it has been attempted, it has created serious social problems.

Offers by plantation companies to buy off squatters' claims to the encroached land partially solved this dilemma. However, this solution has in turn created two other problems that are equally serious. First, since the land transferred from farmers to companies was untitled and without a legal status for the encroacher who is thus subject to the threat of eviction, some farmers complained that they were forced to sell "their" land, even though they may have been paid a higher price than the market price of untitled land. Second, there is concern (but little evidence yet) that farmers who sold their land have moved into the forest and have cleared new plots of land for farming. If this

turns out to be true on a large scale, the government's promotion of reforestation by the private sector may degenerate into replacement of natural forest with plantations.

Further problems with private reforestation arose from the fact that eucalyptus, a fast-growing hardwood, is the preferred species of private plantation companies. While the scientific evidence may not be entirely conclusive, many rural people are convinced that large-scale eucalyptus plantations damage their crops and deplete their water sources. Opposition to the government's reforestation policy is also being raised by rural communities, social groups and NGOs who prefer a community forestry approach to reforestation, and environmentalists, who do not consider eucalyptus plantations as forest.

Under these circumstances, the reforestation effort is at a stalemate, as companies and communities are awaiting a more clearly defined forest policy.

The problems of forest policy easily spill into other rural natural resources such as land and water. First, there is an unreconciled conflict between people's demand for agricultural land and the State's target for a 40 percent forest cover. There is at least a 30 percent overlap between the agricultural land and the forest area. An area of 7-8 million ha is claimed by both the farmers as agricultural land and by the government as forestland. Legally, the area is a public forest; in reality, it is private farmland. The conflict is becoming more serious over time as farmers continue to clear new forest areas to compensate for falling crop yields on deteriorating encroached land while the government tries to do exactly the opposite: stop forest encroachment and bring more of the encroached land under forest.

The government's modest effort to reconcile this conflict by issuing STK (right to farm) certificates to squatters in forest reserve areas had only limited effect because it covered only a limited area (8 million rai) and did not improve the security of ownership or the incentives for reforestation. STKs cannot be used as collateral for loans, while investments in land improvement cannot be liquidated through sale. Similarly, the issue of Sor Por Kors (land use permits) over degazetted public forestland by the Agricultural Land Reform Office (ALRO) has had limited effect on resolving agriculture-forest conflicts because such certificates are neither acceptable as collateral for loans by commercial banks nor transferable via sale. While the restriction of transferability is well intended, aiming to prevent the sale of land and the continuation of forest encroachment, it may turn out to be self-defeating if it constrains investment and productivity growth.

The lack of secure ownership over much of the agricultural land outside the forests is an obstacle to investment needed to: (a) reduce land degradation from soil erosion, nutrient leaching and salinization, and (b) make profitable the use of modern inputs for increasing yields. Higher productivity on existing land is a prerequisite for containing encroachment of mar-

ginal, steep, and fragile lands. Security of ownership and access to capital are also critical incentives for the planting of perennials and tree crops, including forest trees.

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**Obviously, the traditional approach to rural natural resource management formulated during times of relative resource abundance and modified in response to localized scarcity cannot meet the challenge of generalized natural resource scarcity facing Thailand today.**

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Finally, forest management, land ownership, land use and land management are all critical to water resource availability and management. Continued deforestation of watersheds and cultivation of fragile lands and steep slopes result in flash floods, soil erosion and sedimentation of rivers and reservoirs. Insecure ownership limits investment in on-farm water development, and in soil erosion control. Without such investment, sedimentation of water bodies and reservoirs is inevitable. Similarly, some land uses may help retain moisture and regulate water flows, while others may do the reverse. Some land uses such as rice and sugarcane are water-intensive while others are not. Water resource scarcity and the associated conflicts between competing uses dictate more efficient water resource management. Yet the failure to price irrigation water and the underpricing of municipal/urban and industrial/commercial water supply result in wasteful use and inadequate funding for further water resource development. Moreover, the failure to fully account for the environmental costs of past and currently planned water resource development projects has given rise to strong opposition by local interests and environmental groups to new projects.

### **A New Approach to Rural Natural Resource Management**

Obviously, the traditional approach to rural natural resource management formulated during times of relative resource abundance and modified in response to localized scarcity cannot meet the challenge of generalized natural resource scarcity facing Thailand today. A fresh approach that aims to balance demands and supplies at a level of resource use that is sustainable and makes the best use of increasingly scarce resources is needed. A new approach to resource management would recognize and reconcile the conflicts between different resource users, the discrepancies between private and social benefits and costs, and the tradeoffs between present resource use and future availability. At times of generalized scarcity, decisions to use any natural resource by anyone—whether private individ-

ual, community, or government agency—impose costs on others, on the society at large, and on future generations that must be duly accounted for. Three major costs must be considered: (a) opportunity costs in terms of foregone benefits from alternative uses; (b) environmental costs in terms of negative impacts on other activities; and (c) user costs in terms of foregone future uses of the resource. Unless these three costs are fully paid for by the users of the resource, demands and supplies cannot be balanced, and shortages and conflicts would be compounded as the gap between demand and supply grows. This precisely describes the situation with forests, land and water in Thailand and in many other countries today.

Indisputably, a limited resource base—especially one that suffers from past abuse—cannot accommodate forever-increasing numbers of people with rising aspirations for a higher standard of living. For example, the forest, land and water resources of Northeast Thailand, already under internal pressure, cannot be reasonably expected to provide the means for raising the living standards of over a third of the Thai population to the level enjoyed by other regions, much less to that of Bangkok. Non-resource-related off-farm employment and seasonal and permanent migration to other regions help relieve some of the pressure on the resource base. But much more needs to be done to encourage more inflow of industry and outflow of people to restore a sustainable equilibrium between demand and supply for rural natural resources.

### Raising Agricultural and Resource Productivity

Rural poverty and resource degradation are only partly due to the scarcity of resources relative to the number of people that depend on them. Another important factor is the very low productivity of both land and labor. To reduce the pressure on marginal lands and the remaining forests and to bring incomes more in line with other parts of the country, it is necessary to raise productivity per unit of land and labor. Migration and non-farm activities would help raise labor productivity, since good-quality land holdings per household would increase. However, for fewer people to work more land, increased mechanization and other capital investments would be necessary. This requires capital and access to credit.

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### Worldwide, the protection of tropical forests has been a formidable task because it is intertwined with rural poverty.

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Average land productivity may also rise somewhat as a result of migration and nonagricultural employment since presumably, marginal land of low productivity would be taken out of production. However, this is not certain since those who migrate or take up other

occupations tend to be better off and more educated. This is another reason why educational reforms are critical to provide alternatives for those most likely to encroach on the forests and clear marginal lands for cultivation.

The needed increase in land productivity to raise rural incomes to forestall forest encroachment will have to come from an increase in investment in land development, farm assets, and use of modern inputs, especially fertilizer and improved seed. Again, access to credit markets for the necessary capital is critical to any efforts to raise agricultural productivity. Securely titled land is potentially the only asset available to low-income farmers that is acceptable for collateral and for long-term loans from formal financial institutions. Most farm investments are unprofitable at non-institutional interest rates of 30-40 percent.

### Restructuring Forest Policy and Management

Forestry faces two fundamental resource conflicts or imbalances between supply and demand. The gap between desired and actual forest cover grows daily, without any effective measures in sight to stop deforestation and accelerate reforestation. Second, there is a fundamental conflict between a forest policy that aims to achieve a 40 percent forest cover and farmers who aim to clear more forest land for cultivation. It is imperative that a new approach to forest management aimed at resolving these conflicts be developed.

There simply is no forest solution unless the land use issue is also addressed. Land and forest must be considered as one. For developing countries, the issue of conserving a forest must be taken in the light of alleviating the poverty of the farmers who are residing in the forest. The success in alleviating the plight of the farmers in the forest will be the key to the success in protecting the forest from further encroachment and plundering.

To protect a house, first and foremost, we have to rely on the home owner. Similarly, to protect a forest, we have to rely on the farmers, whose livelihood is at stake. Past records establish the fact that government alone cannot succeed in protecting or bringing back the forest. A concerted national mobilization is required, involving the government, the private sector, and the farmers. Community forestry, whereby individual farmers are given incentives to protect and/or replant nearby forestlands, is a promising option that warrants serious consideration.

Worldwide, the protection of tropical forests has been a formidable task because it is intertwined with rural poverty. Without employment alternatives, we can hardly expect farmers not to rely on forest products to supplement their meager incomes. In the absence of better alternatives, resources in the public domain and forests are encroached on at the expense of the society at large, and of the future.

Lack of reliable information on the precise location, boundaries, composition and condition of

Thailand's forests has been a major obstacle in the formulation of an appropriate and effective forest policy. Modern technologies such as remote sensing, geographic information systems, airborne surveys, and global positioning systems, enable reliable recording of forest boundaries so that basic information on the size and precise location of natural forest can be accurately mapped and protective measures applied. The knowledge on the protected areas in terms of their fauna and flora and their physical limitations is basic to any successful forest protection program. The remaining natural forests, estimated to cover 28 percent of the country's land area, must be clearly demarcated. Thailand cannot afford to lose any more of its natural forest. The emphasis on economic forests in recent years has diverted attention from the need to save the remaining natural forest, which is essentially a nonrenewable resource and national heritage. At least 25 percent of the total land area of the country should be set aside as protected or conservation forest.

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**There can be no successful forest policy unless the issue of land ownership over encroached forestlands is clarified and settled.**

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However, there can be no successful forest policy unless the issue of land ownership over encroached forest lands is clarified and settled. The land and forest policies are opposite sides of the same coin and must be addressed integrally and concurrently. Similarly, the alleviation of poverty of farmers in the forest and hence rural development is the key to the success of forest protection from further encroachment and plundering. Therefore, land reform programs that improve the security of land ownership as well as provide infrastructure and development assistance are of critical importance to halting deforestation and protecting the remaining natural forests. It is therefore recommended that the issuing of land titles to farmers over land they occupy be accelerated and such titles be as secure and unconstrained (unattenuated) as possible.

The reforestation policy is urgently in need of revision. The policy of granting public forestland for commercial plantations should be discontinued because it leads to conflicts with the farmers already occupying this land. Once the remaining natural forest is adequately protected and the issue of land rights is settled, commercial forestry should be set on an equal footing with other land uses that involve tree cover.

To be realistic, forest policy must be closely allied with the development policy of a country. If it is considered vital to the national interest to protect the forests, then sufficient funds must be allocated accordingly. The current global interest on reforestation as a means to absorb carbon dioxide, a major greenhouse gas, should provide an added impetus and possibly a source of additional financing. However, is-

sues of insecure resource ownership, perverse incentive structure and rural poverty must be addressed simultaneously if not preemptively.

### Conclusion

Thailand is no longer a natural-resource-based, predominantly agrarian society but a rapidly industrializing and service-based economy. Primary resource sectors such as forestry, mining and fishery have lost their status as leading growth sectors and major foreign exchange earners. Even agriculture, which made Thailand one of the few major food-exporting countries in the developing world, has lost its predominance and glamour as a source of income growth and export earnings. As increasingly more value is generated from human resources and man-made capital, rural natural resources are gradually losing their quantitative significance. Yet their qualitative significance increases for reasons that range from structural rigidities and policy distortions to changing preferences with urbanization and rising incomes.

A major structural rigidity is found in the imbalance between the rapid structural change of national income and the slow structural change of employment. The increasing income inequality between the 50 percent of the population who depend on agriculture and the 50 percent who don't, heightens the importance of rural natural resources during the transitional stage (over the next ten years). Educational reforms, land titling, access to capital markets, improved agricultural productivity, and increased nonagricultural employment are the key policy reforms necessary for restoring the balance between a still-growing resource-dependent population, rising income expectations, and a limited and partially-degraded natural resource base.

A second force that heightens the significance of rural natural resources is the change of preferences that comes with industrialization, tourism development, urbanization, and income growth. The amenity value of rural landscape, natural forests, open and green spaces, and a clean environment is growing as more people are crowded in congested cities and work in polluted industrial environments. Given the current and projected rapid income growth and the high income elasticity for environmental amenities (of both the local population and foreign tourists), the rapid growth of demand for environmental amenities and related services is assured. The supply is not. The reasons range from continued forest encroachment to unplanned tourist development, and from urban congestion to industrial pollution – themselves the result of market failures and policy distortions.

A new forest policy, land titling with appropriate land taxation, full cost pricing of utilities and amenities, environmental charges, and removal of distortional promotional privileges and market-based incentives are the policy changes needed to bring about a balance between growing demands and dwindling supplies of natural resources and environmental amenities.

# Evaluation of the 1990 Year-End Conference: A Summary

Orapin Sopchokchai

## INTRODUCTION

### Conference Participants

A primary objective of the 1990 Year-End Conference was to provide a forum for disseminating the conference's research findings and to share some practical solutions for solving Thailand's environmental problems. Thus, in May 1990 the conference's organizers began compiling a list of participants that included key personnel from the public and private sectors. Invitation letters detailing the conference, its theme, and its goals were sent to government policy makers, policy planners, researchers, academicians, business executives, and media representatives. The response this year was impressive—conference organizers found it necessary to increase the number of reserved spaces from 550 to over 700, as the number of participants climbed past earlier expectations. In fact, due to space limitations at the hotel, many late applications had to be turned down.

An indication of the conference's success in achieving its objectives can be gauged through an assessment of the participants and the various sectors they represented. Table 1 shows the participants classified by type of organization and nationality and the percentages of the total number of participants that each sector repre-

sents. The total number of participants was 733. Of this total, there were 600 Thai participants and 133 non-Thai participants. We found that the largest representative group at the conference was from the private sector (173) and that the next largest group (169) was from the public sector—government officials and state enterprise employees. Participants from international organizations totaled 90, while there were 77 representatives from research and academic institutions. Media representatives totaled 62, and the number of participants from non-governmental organizations was 17. This year 145 TDRI staff, including both the research staff and the conference organizing team, also attended.

### The Evaluation Questionnaire

Year-End Conference organizers consider the evaluation process to be an essential activity for assessing the conference's performance. Each year an evaluation questionnaire form is designed to obtain participants' reactions to the conference's substance, the research results presented, the policy recommendations proposed, the conference's organization, and the hotel's services and facilities. The evaluation questionnaire distributed at the 1990 conference was designed to meet these objectives. We believe that the conference's effectiveness can be measured by how the participants rate the conference overall; by their opinions of the individual sessions; and by whether the conference was viewed to be beneficial to them and to their work. The conference's organization and management can be measured by how the participants rated its registration process, conference facilities, and hotel facilities and services. In addition, participants' opinions, comments, and suggestions will provide the organizers with useful guidelines for improving the effectiveness of future conferences.

Approximately 700 evaluation forms were distributed during the conference's opening session on Saturday morning so that participants would have sufficient time to fill them out and make their comments. Participants were asked to return the questionnaires at the end of the conference. A total of 166 questionnaires—134 from Thai participants and 32 from non-Thai participants—were returned and later analyzed. These 166 returned questionnaires represented 28.2 percent of the total non-TDRI participants at the conference. In the

**Table 1** Year-End Conference Participants

Participants (by types of organizations and nationality)	Number	Percent
<b>Types of Organizations</b>		
The Private Sector	173	23.6
Government and State Enterprises	169	23.0
Academic Institutions	77	10.5
Non-governmental Organizations	17	2.3
International Agencies	90	12.3
The Media	62	8.5
TDRI and Organizing Staff	145	19.8
<b>Total Participants</b>	<b>733</b>	<b>100.0</b>
<b>Nationality</b>		
Thai Participants	600	81.9
Non-Thai Participants	133	18.1
<b>Total Participants</b>	<b>733</b>	<b>100.0</b>

following analysis, these 166 respondents will be referred to as “participants.” The participants were classified by type of organization and nationality in order to separate differing opinions and reactions into each participating group.

## RESULTS OF THE ANALYSIS

### Overall Ratings

We asked the participants to assess the conference’s content, materials, and facilities and to rate the overall conference on a scale ranging from 0, which means “very poor,” to 10, which means “excellent,” with a score of 5 interpreted as “satisfactory.” A total of 158 participants answered this question; 29 non-Thai participants and 129 Thai participants. Their average rating was 7.45, which indicates that most participants believed the conference to be above the satisfactory level, while some participants believed the conference could have been better. There were 128 participants (77.1 percent) who rated the conference from 7 to 10 (excellent); this accounted for a maximum of 10 and a mode of 8. One participant gave a rating score of 2.5, which is noted as a minimum score, and two persons gave a rating of 3. Figure 1 shows the rating distribution of the overall ratings.

When compared among various groups, the Thai participants’ average rating score (7.45) was higher than the non-Thai participants’ average rating score (6.51). The highest average rating score was given by Thai government officials and state enterprise employees (8.19), and the lowest average score was given by the non-Thai media representative (4.00). The majority of the participants rated the overall conference at an above-satisfactory level.

Another important part of the evaluation process is to appraise the comments and suggestions made by

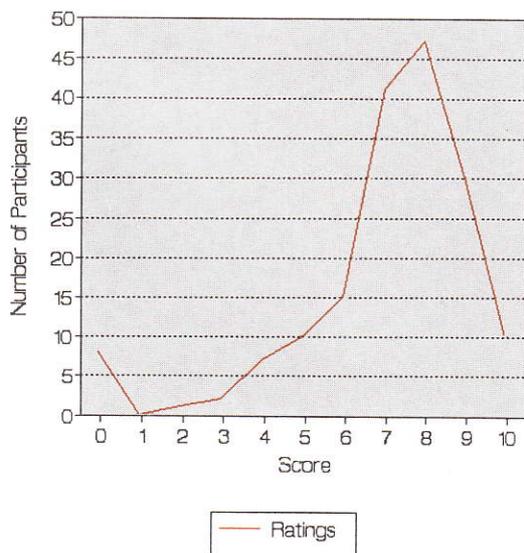


Figure 1 Overall Conference Rating Distribution

some participants, since these comments will be useful feedback for planning future conferences. We found that 29.5 percent of the participants wrote comments and suggestions in addition to their rating of the conference’s overall performance. In analyzing all statements, we found that participants’ opinions covered several issues. This section assesses and summarizes the comments and suggestions on the overall conference, with a special focus on the conference’s substance, papers, panelists, and presentation.

### The Conference’s Substance

Participants mentioned that the conference’s topic was quite important to the country and that TDRI’s research was a valuable contribution. In addition to this conference’s research work, participants recommended that the Institute conduct further in-depth studies, particularly on environmental problems and their policy implications. During the conference, participants said that there were many subtopics related to environmental issues that should have been discussed in detail. With time limitations during the conference, most participants believed that they lost an opportunity to listen to or discuss some important issues. As the conference time could not be extended, it was suggested that small group presentations and discussions should be arranged for participants who may be interested in discussing individual issues.

### Conference Papers

Eleven people mentioned the conference papers, and many of them said that the papers were very good and represented valuable research. A participant mentioned that the papers were too long, especially concerning some issues, and it was suggested that the papers would be more useful if they were translated into Thai. The papers’ abstracts were also thought to be too long and it was noted that they should not be longer than five pages.

### Panelists

Participants said that in general, the selected panelists were satisfactory. However, a few people thought that better speakers or discussants should have been selected. Participants said that they believed most discussants had not read the conference papers, as they failed to address the issues related to the session’s presentation. There were a few complaints that there were no female panelists or presenters participating in any sessions.

### The Conference’s Presentation

Several participants liked the presentation substance and the presentation method, which they said was quite innovative. Although audio-visuals were used

during the presentation, there were many technical problems such as lighting, the sound system, and blurred pictures or diagrams on the screen. Some participants thought that the presentations were too long and, sometimes, boring; several participants wanted to hear more on some issues and said it was inappropriate to summarize all research findings and recommendations within 20 minutes.

### The Conference's Feedback Process

There were three participants who made interesting suggestions on the conference's feedback process. The first one was on rating the conference's recommendations. It was suggested that the participants' overall opinions on each recommendation presented at the conference would be interesting information for both policy makers and the public. The second suggestion was that the participants' comments during the conference sessions were limited to a few people due to time limitations; with this large audience, the organizers should ask some participants who wanted to express their opinions to write them on a piece of paper and summarize them for all participants. The last comment was about the evaluation process and suggested that it might be useful to conduct a pre-conference assessment.

### Benefits Derived from the Conference

A total of 164 persons answered the question about whether they believed that they had benefited from the

conference. Table 2 details the results of this analysis, which can be summarized as follows: The majority of the conference's participants, or 53 percent, believed that they had directly benefited from attending the conference, while 42.7 percent said that they had benefited from part of the conference.

It was found that 3 percent of the participants said they did not benefit from the conference; the majority were non-Thai participants, representing 12.5 percent of the total non-Thai participants. However, most participants in this group said that they benefited from the conference.

The majority of the Thai participants (98.5 percent) indicated that they either benefited directly or benefited from some of the conference, while less than one percent said that they did not benefit from the conference. This indicates that the conference has contributed useful information to most participants, especially those who work for the Thai government, state enterprises, universities, and non-governmental organizations.

Many interesting comments and suggestions were derived from different groups of participants. Participants said that the conference was quite informative, was well-organized, and presented good ideas for future discussion and consideration. Seven Thai government officials said that they found the conference's substance pertinent to their work and that the information will be applicable to the formulation of future plans and policy measures. Comments from a representative of Parliament and from those who work with an international organization confirmed the above statement. The media representatives said that they have a better un-

**Table 2** Participants Benefiting from the Conference

Group	Percent of Participants' Ratings			
	No Answer	Yes, Directly	Some of it	Did Not Benefit
<b>Non-Thai Participants</b>				
- The Private Sector	0.00	28.57	42.86	28.57
- GO & State Enterprises	0.00	50.00	30.00	20.00
- NGOs	0.00	0.00	100.00	0.00
- Academic Institutions	0.00	100.00	0.00	0.00
- Inter'l Organizations	12.50	37.50	50.00	0.00
- The Media	0.00	50.00	50.00	0.00
<b>Total Non-Thai Participants' Ratings</b>	<b>3.13</b>	<b>43.75</b>	<b>40.63</b>	<b>12.50</b>
<b>Thai Participants</b>				
- The Private Sector	2.08	25.00	72.92	0.00
- GO & State Enterprises	0.00	85.37	14.63	0.00
- NGOs	0.00	85.71	14.29	0.00
- Academic Institutions	0.00	63.64	36.36	0.00
- Inter'l Organizations	0.00	33.33	66.67	0.00
- The Media	0.00	57.14	28.57	14.29
<b>Total Thai Participants' Ratings</b>	<b>0.75</b>	<b>55.22</b>	<b>43.28</b>	<b>0.75</b>
<b>Overall Ratings</b>	<b>1.20</b>	<b>53.01</b>	<b>42.77</b>	<b>3.01</b>

derstanding of environmental issues and that they had gained a great deal of useful information to be disseminated to the general public. Most participants agreed that one of the benefits was an opportunity to meet many eminent scholars and policy makers. One suggested that more politicians be invited to the conference. Although participants agreed that it was beneficial to be given concrete solutions to environmental problems, some said that the conference would have been more effective if it had focused more on practical solutions for each issue rather than presenting a policy framework.

Those who were disappointed with the conference complained about several issues: that the sound system for translation services and the effectiveness of one translator were poor; that the selections of discussants for some sections were not appropriate; and that limited time was allowed for floor discussion. Those who had problems with our translation service believed that they did not fully benefit from the conference since one translator's performance was quite dissatisfactory and because the sound system was inefficient.

**Ratings and Comments of Each Conference Session**

Participants were also asked to assess each session's performance in terms of its content, substance, presentation clarity, and discussants. Figure 2 shows the average ratings of Thai and non-Thai participants for each of the Conference's sessions. The following paragraphs discuss each session's ratings as well as comments and suggestions about each session.

**Opening Session**

Participants liked the opening session. More than three-quarters of the participants (78.3 percent) rated this session either "good" or "excellent" (51.8 and 26.5 percent, respectively). Most of the comments were positive (such as that the opening ceremony was a great honor to the Institute, and that the session was short and effective).

**SESSION 1 Global Environmental Issues and Their Impact on Thailand**

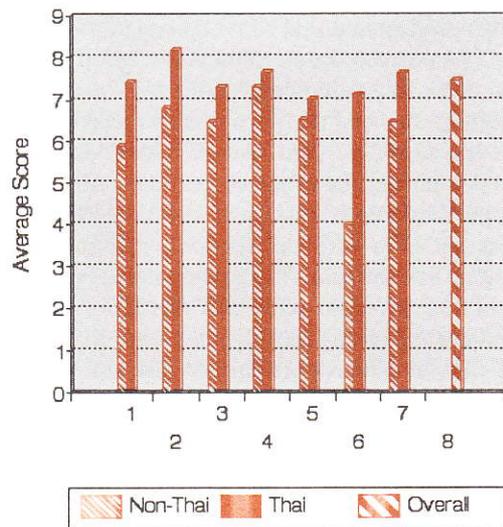
Only 6.6 percent of the participants rated the session as "excellent," 40.3 percent said it was "good," and 34.9 percent said it was "average." About 13 percent did not like this session, and they rated it "poor" or "very poor." Most people stated that they were pleased with speaker Mr. Jim MacNeill, whose speech was thought to be quite interesting: The other speakers were rated average, and participants said they did not discuss any information relevant to Thailand. Most participants commented that all of the speakers gave too much emphasis to their own country's or organization's experience, were too general, and failed to draw concrete

conclusions on the global perspective and its relevance to Thailand.

**SESSION 2 Natural Resources for the Future**

The majority of the participants liked this session; 56.6 percent rated it "good" and 12.6 percent rated it "excellent." Moreover, 21.6 percent of the participants said the session was "average," while few participants disliked this session. None of the non-Thai participants gave this session an "excellent" rating, while 15.6 percent of the Thai participants did. In general, the Thai participants gave this session a higher rating than non-Thai participants.

Participants said that all speakers were very good, informative, and precise, and that the session was well prepared and balanced. Many participants enjoyed the speech by the session's discussant – Dr. Prawase Wasi – and believed that the chairperson – Dr. Sumet Tantivejkul – was very good in summarizing the session's main ideas. However, some of them believed that the session did not allow enough time to discuss many important issues and that some speakers were too rushed.



- 1 Opening Session
- 2 Global Environmental Issues and Their Impact on Thailand
- 3 Natural Resources for the Future
- 4 Mineral Resources Development and Its Environmental Implications
- 5 Industrializing Thailand and the Impact on Its Environment
- 6 Open Discussion Session
- 7 Conclusion and Closing Remarks
- 8 Combined Overall Ratings for the Conference

**Figure 2 Comparison of the Conference's Average Ratings by Session and Nationality**

### SESSION 3 Mineral Resources Development and Its Environmental Implications

The overall rating of this session varied, as participants rated it from "very poor" to "excellent." The highest percentage of participants (36.1 percent) rated it "average"; 34.3 percent, "good"; 13.2 percent, "poor"; and 1.2 percent, "very poor." The Thai participants strongly believed that the session was "average," with 40.3 percent of them giving this score, while many non-Thai participants (43.7 percent) thought the session was good.

It was suggested that researchers should consider the cost benefit analysis of environmental conservation and improvement for the areas where mining industries are located. Participants complimented Dr. Panayotou for his outstanding presentation. Many participants commented that this session was not well organized, since some speakers spent too much time on general information instead of presenting practical policy recommendations. Commentators were also criticized for failing to address the issues in the conference papers.

### SESSION 4 Industrializing Thailand and the Impact on Its Environment

Ratings of this session were quite satisfactory; the overall ratings illustrate that the majority of the participants, or 55.4 percent, rated the session "good," while 25.3 percent of all participants said it was "excellent." Less than 10 percent of the participants rated it "average," and less than 2 percent rated it "poor" and "very poor." In comparing the rating score between Thai and non-Thai participants, it appears that Thai participants were more satisfied with the session's substance and presentation than the non-Thai participants. However, because of the problem with the translation service mentioned earlier in this report, it is rather difficult to conclude that non-Thai participants did not like this session because very few of them made further comments compared to the Thai participants. As in earlier sessions, foreign participants complained that the verbal presentation was not clear.

Comments and suggestions made by both Thai and non-Thai participants are summarized as follows: Many participants said that the session was interesting and informative; that TDRI presenters were effective and clear; and that the chairperson was effective, especially in summarizing the issues (even though he did not fully address several issues raised by participants). Participants said that the two discussants were effective and stimulating. Several people stated that the multivision presentation was redundant and believed that it did not

provide any new information. It was suggested that the substance of the slide presentation should have been better prepared and should have been used only when presenters needed to illustrate a new idea or when the verbal presentation was not clearly expressed.

In addition, participants noted that human resources development in relation to environmental issues was essential, and they were disappointed that this issue was not discussed during the session. TDRI's recommendations were found to be interesting, even though some people did not agree with some of them. Participants commented that they needed more time to discuss solutions, particularly regarding industrial pollution.

#### Open Discussion Session

About 80 percent of the participants answered this question. Almost 40 percent of them rated this session "good," and about 12 percent thought it was "excellent." We found that 22.3 percent said it was "average." Thai participants (who have the language advantage) enjoyed this session, and their ratings were higher than those of the non-Thai participants.

Most participants commented that the open discussion session was informative and interesting and that many important issues were raised. With the limitation of time and the large number of participants, many believed that several participants spoke too long. It was suggested that individuals who want to state their ideas during this session be given a time limit in the future and that more time should be allocated for this session because a number of participants from different sectors or organizations did not have an opportunity to make comments or to discuss their views.

#### Conclusion and Closing Remarks

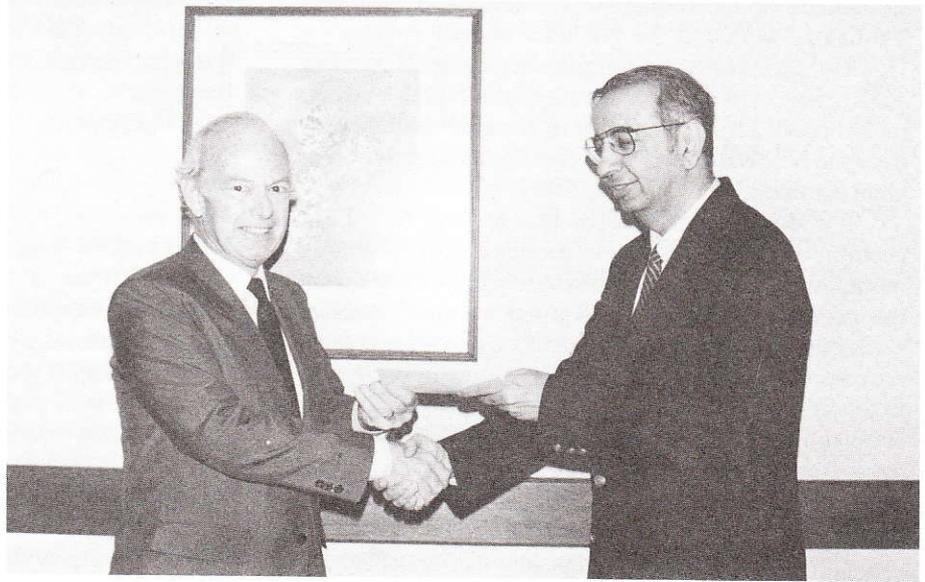
Of the total participants, two-thirds, or 66 percent of the participants, rated this session. Of this group, 33.7 percent gave the session a "good" score; 15.0 percent, an "excellent" score; and 16.8 percent, an "average" score. There was no significant difference between the ratings of the Thai and non-Thai participants. Only a few people commented on this session, and their comments were both positive and negative. Several people liked the concluding speech, although one participant suggested that the session should have been combined with the open discussion session. One useful recommendation was that the concluding speech by Dr. Snoh Unakul should also have mentioned what would be done in the future or what follow-up activities would be pursued after this conference.

## NEWSBRIEF

### British Government Provides Funds For AIDS Study

The British Government has given the Institute a grant of 940,000 baht to study the economic consequences of AIDS for Thailand. The study will analyze the broad macro-economic impact of AIDS and will be complementary with an ongoing TDRI study, funded by USAID, of the future incidence of HIV+ and AIDS and the resulting treatment costs.

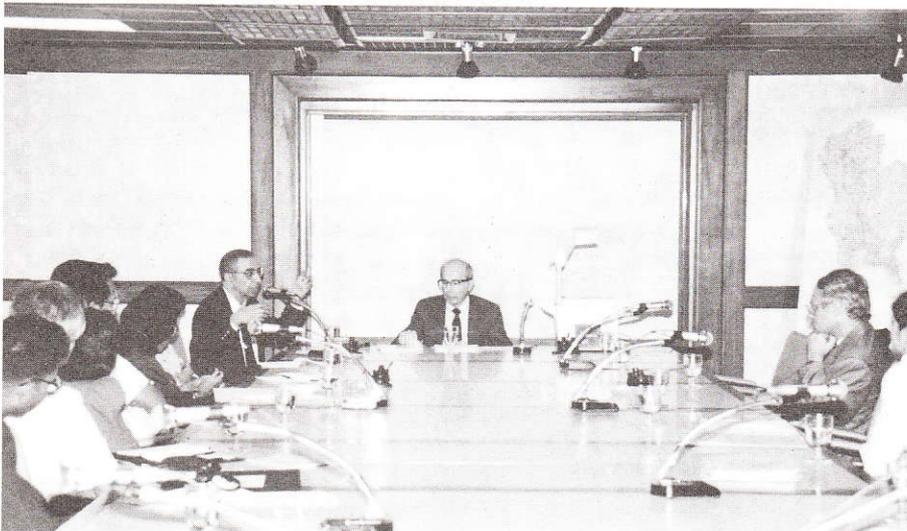
On January 23, 1991, Dr. Ammar Siamwalla, Dr. Chalongphob Sussangkarn, and Dr. Teera Ashakul went to the British Embassy to receive the grant from H.E. Mr. Michael Ramsey Melhuish, Ambassador of Great Britain to Thailand.



H.E. Mr. Michael Ramsey Melhuish presents Dr. Ammar Siamwalla with a check from the British Government for a TDRI study on AIDS

### Dr. Richard Eckaus of M.I.T. Speaks on Global Warming

Dr. Richard Eckaus, Chairman of the Department of Economics of the Massachusetts Institute of Technology, spoke to the TDRI staff about the economics of global climate warming in the Institute's conference room on January 15. Dr. Eckaus presented his version of an econometric model to structure the debate regarding the costs and benefits of controlling greenhouse gases hypothesized to cause global warming. He emphasized the need to consider the stock of gases emitted by various countries rather than future allotted flows. This approach favors countries such as Thailand that have yet to contribute substantially to the emission blend of greenhouse gases.



Dr. Ammar Siamwalla introduces Dr. Richard Eckaus to the TDRI Staff

## HRS Program Holds Seminar on Population

The second annual seminar of the project, "Promotion of Analysis and Consideration of Population Consequences of Development Planning and Policy in Thailand," which is an NESDB project funded by UNFPA with research components subcontracted to TDRI, was held at the Siam Bayshore Hotel, Pattaya, on February 22-24. There were about 80 participants from the NESDB, universities and other related government agencies.

The main purpose of the seminar was to present results from an economic-demographic planning model, which is one of the main research outputs from the project. The model integrates various pieces of work on population, education, labor market and macroeconomic modelling, which have already been used in the preparation of the 7th Plan. The current model leads to improved consistency between economic and demographic projections and was used to analyze the crucial issue of the impact of educational provision on the labor market and macroeconomic performance.

The seminar also presented findings on changes in the extended family system; trends and issues concerning the labor market during the Sixth Plan; and an international perspective on Thailand's human resource problems.

## NRE Program To Conduct Mineral Resource Study For the 7th Plan

TDRI's Natural Resources and Environment (NRE) Program has been contracted by the Department of Mineral Resources (DMR) to conduct a two-year study to formulate a mineral resource development plan for Thailand. This plan is part of the country's 7th National Economic and Social Development Plan. The study will point out the problems obstructing the mineral industry's development and will provide corrective guidelines for the industry's long-term development.



Mr. Visith Noiphan, Director-General of the DMR; Mr. Suwit Watthanachan, the DMR's Deputy Director-General; Dr. Ammar Siamwalla; and Dr. Dhira Phantumvanit sign the contract for the TDRI study on mineral resource development at the Asia Hotel on February 21.

## Projects Completed

### STD

The STD Program's project on Identification of Key Technologies for Industrial Development has been completed. This is the first of the three research projects that serve as inputs for the preparation of the S&T component of the Seventh National Economic and Social Development Plan (1992-96).

### ITR

The ITR Program's research project, "An Industrial and Trade Strategy for "Thailand's Seventh National Economic and Social Development Plan" has been completed.

The project was divided into four subprojects:

"Study of Selected Strategic Industries and Decentralization of Manufacturing"

"Trade Development Strategy for Thailand during the Seventh Plan"

"Study of Trade and Industrialization Policy Incentive for Implementation through Private-Public Sector Cooperation"

"Development of Infrastructure and Supporting Facilities and Prevention and Controls for Pollution and Environment."

The project, funded by USAID, aimed at developing an industrial and trade development plan. It had the ultimate objective of a continuation of growth in the industrial sector, which will help promote income and employment, and the diversification of industrial activities of Thailand.

ITR's research project, "Development Strategies," which was sponsored by the Institute of Southeast Asian Studies (ISEAS), has been completed.

The project's objective was to study the impact of various changes in internal and external socioeconomic conditions on the Thai economy and how to devise policies and instruments to respond to the changes.

## Seminars/Conferences Attended and Papers Presented

Dr. Ammar Siamwalla spoke on the need for government subsidies to Thai farmers at a discussion on Thailand's economic situation, held by the office of Agricultural Economics. He also spoke of the need for providing technological know-how to the agricultural sector and to farmers, who are suffering from price falls and high interest rates. Asia Hotel, February 11.

### ARD

Dr. Direk Patmasiriwat attended and presented a paper on "Land Reform and Rural Development in Thailand" at the Asian Land Reform and Rural Construction Conference, organized by the China Land Reform Association, Singapore, February 3-9.

Dr. Suthad Setboonsarng attended the ACIAR Conference held in Sydney, Australia from February 10-16.

### EIU

Dr. Tienchai Chongpeerapien of the EIU Program, together with National Energy Policy Office Officials and consultants from Monenco, held a load forecast seminar at Khao Yai during February 15-16. The objective of the seminar was to discuss major changes in load forecast methodology as well as the status of end-use databases. Participants in the seminar included officials from the Metropolitan Electricity Authority, the Provincial Electricity Authority, and the Electricity Generating Authority of Thailand.

### ITR

Dr. Narongchai Akrasanee presented a paper on "Thailand's Experiences with Rapid Economic Growth" at the Researchers Conference, organized and sponsored by the Nomura Research Institute. The conference was held in Tokyo during February 21-23.

Dr. Narongchai Akrasanee gave a dinner address on "Regional Investment Opportunities-Vietnam & Beyond" at the 6th Pacific Rim Executive Bankers Seminar (PREBS VI), organized by Pacific Rim Bankers Program and co-sponsored by the Pacific Coast Banking School and the Graduate School of Business Administration, University of Washington, Singapore, March 1.

Dr. Narongchai Akrasanee spoke on "The ASEAN Economics: Outlook for Growth" at an international conference on "The ASEAN Countries and the World Economy: Challenge of Change" co-organized by the Asia Society & the Centre for Strategic and International Studies, Jakarta, Bali, March 3-5.

The ITR Program's conference on "Industrial and Trade Development Strategy for Thailand's National Economic and Social Development Plan 1992-1996"

was held at the Royal Cliff Beach Resort, Pattaya, Chonburi, on February 27-28. The conference was attended by 180 Participants from the NESDB, TDRI working staff, academic institutions, the private sector, and governmental agencies.

### MEP

Dr. Damkirng Sawamiphakdi & Khun Nipat Somjitt attended and gave a presentation on "The Economic Outlook for Thailand 1991-1995" at the Spring Meeting of Project LINK, hosted by the United Nations. The paper was co-authored with Khun Pairuj Kanjanakaron and Dr. Chartchai Parasuk. New York, March 6-8.

Dr. Pakorn Vichyanond attended the Ninth Pacific Basin Central Bank Conference on Economic Modelling, Bangkok, January 21-25.

### NRE

During 4-14 February 1991, Dr. Dhira Phantumvanit participated in the Intergovernmental Negotiating Committee for a First Session Framework Convention on Climate Change in Washington D.C., organized by The United Nations. The participants included government representatives from 99 countries, 20 international organizations and 69 non-governmental organizations. The meeting emphasized the importance of global climate issues, focusing on the contribution of greenhouse gases from various countries and common views of future action to cope with this issue.

"Asian Pacific Seminar on Global Climate Change." Jointly organized by the Environment Agency of Japan, Aichi Prefectural Government, Nagoya Municipal Government and Overseas Environmental Cooperation Center in cooperation with ADB, UNCRD, and UNEP. The seminar brought together participants from a diverse group of environmental agencies and economic planning ministries/agencies. Somthawin Patanavanich of the NRE Program as a representative of the Ministry of Science Technology and Energy, Thailand, presented a paper on "Thailand's contributions to Global Emissions of Greenhouse Gases." January 23-26 Nagoya, Japan.

As a follow-up to the Ministerial-level Conference on Environment and Development in Asia and the Pacific, held in October 1990 in Bangkok, ESCAP organized a meeting of senior officials on Environment and Development in Asia and the Pacific with a view toward finalizing a regional strategy for environmentally sound and sustainable development and the regional input into the preparatory process of the United Nations Conference on Environment and Development, to be held in Brazil in 1992. Somthawin Patanavanich of the NRE Program attended, Imperial Hotel, February 13-19.

## STD

The STD Program organized a seminar to present a draft final report entitled "Identification of Key Technologies for Industrial Development," at the Imperial Hotel, Bangkok, on January 15. About 110 persons representing various government and private organizations attended the seminar.

Dr. Chatri Sripaipan visited new manufacturing facilities of Alpha Metals Ltd. and the Hong Kong Productivity Centre in Hong Kong during January 22-23.

The STD Program, in collaboration with the Science and Technology Policy Forum (STPF), organized a seminar on "Human Resources in Science and Technology: Issues from Various Perspectives," on January 31 at Chulalongkorn University. The panel discussion was led by Dr. Charuay Boonyubol, Dr. Ammara Pongsapit, and Dr. Chalongsob Sussangkarn.

Dr. Chatri Sripaipan gave a lecture on "Demand for Research on Development of the Thai Society from the Perspective of Science and Technology for Economic and Social Development" at the seminar, "Mahidol University Research to Develop the Thai Society," organized by Mahidol University, Salaya, Nakhon Pathom, on February 27.

Dr. Chatri Sripaipan presented a paper entitled, "Data Requirements for a Science and Technology Management Information System," at the "Meeting of the Expert Group on S&T Management Information Development-The Wollongong Workshop," hosted by Australia's Centre for Research Policy (the National Focal Point for STEPAN), funded by UNESCO and IDRC. The meeting was held in Wollongong, Australia, on March 18-20.

The STD Program, in cooperation with three provincial universities, organized the seminar, "Managing the R&D System to Support Industrial Development," in Songkla, Khon Kaen and Chiang Mai, respectively. The objective of the seminar was to report on research findings of each topic area of Thailand and to solicit the ways and means to improve S&T capacity for industrial development.

Under the Harvard Institute for International Development (HIID) technical assistance program, the STD Program has contracted Dr. Nawaz Sharif of the Asian Institute of Technology (AIT) to serve as an adviser to the program and its staff and to assist the Director in planning STD Program's research activities.

## New Projects

### MEP

The MEP Program has proposed the project, "Growth and Structural Transformation of Thai Economy," to USAID. The duration of this project is four months, from October 1, 1991 to January 31, 1992.

## NRE

The NRE-GIS unit has begun a project with the Ministry of Science, Technology and Energy (MOSTE) to develop a master plan for the establishment of a National Geographic Information System for natural resources management. NRE will prepare a five-year action plan, including budget estimates, to develop NGIS databases and to promote and coordinate usage of GIS technology in Thailand. A survey of present GIS users and applications will also be conducted as part of this project. The project is funded by MOSTE.

NRE-GIS has begun construction of a national index of spatial information. When completed, the index will allow researchers to determine the availability and general quality of the country's major thematic data, such as geology, soil, land use, infrastructure, etc. The project is funded by CIDA.

## STD

STD's project on "Development of the Machinery and Equipment for Information Industries in Thailand" has been initiated. The project's aims are: to study the past and present status of the machinery and equipment for information industries in Thailand, and to assess the prospects of demand expansion and the future course of development, taking into consideration the global and regional trends; to identify the impediments that limit the development of these industries; and to learn the lessons from the development strategies and policies of certain successful countries. The study will recommend policies and measures to alleviate the problems and enhance the prospects of growth and technological development of the two industries. This project is a joint-research project between TDRI and the National Institute for Research Advancement (NIRA) of Japan and is financially supported by NIRA.

The STD Program has been contracted by the Science and Technology Policy Asian Network (STEPAN) to conduct research on "Australia-Thailand Telecommunications Opportunities: A Study Exploring Prospects for Joint Collaboration." The research will assess strengths and weaknesses in telecommunications research, commercialization and application, with an aim to formulate policy modifications to enhance Thai-Australian telecommunications cooperation.

## ITR

The ITR Program has been contracted to conduct a study on Thailand and Economic Cooperation in the Asia-Pacific Region.

The project will be sponsored by the Canadian International Development Agency (CIDA).

Its objectives are to examine the future role of the Asia-Pacific region and to assess Thailand's international economic relations in this area.

The United Nations University/World Institute for Development Economics Research, UNU/WIDER, has contracted the ITR Program to conduct a study entitled "Trade and Industrialization Reconsidered." The study's objectives are to reconsider the trade and

industrialization experience and policies in Thailand; to examine its strengths and weaknesses; and to carry out research on major unsolved empirical issues related to the implications of the new trade theories for developing countries.

## NEWS ABOUT TDRI PUBLICATIONS

### TDRI RESEARCH MONOGRAPHS AND POLICY STUDIES

In order to disseminate its research findings to a wider public, the Institute began publishing a series of research monographs and policy studies in the fall of 1989. These books reflect the scope of our research efforts and are representative studies of the important policy issues facing Thailand today. These special publications are published in either Thai or English and range in cost from 100 to 350 baht. Topics include an analysis of the concept of privatization and its implementation in Thailand; a study of the background and future prospects of Thailand's unprecedented export-led growth; a comprehensive land policy strategy for Thailand; and an analysis of the country's rural credit system. A total of nine books have been published so far, and there are another sixteen books in the pipeline.

### THE FACT BOOK ON RICE (in Thai)

Authored by Dr. Ammar Siamwalla, this volume is a compendium that aims at providing the necessary data and pertinent information on: rice production, marketing, pricing structure and pricing policy; government intervention in the domestic rice trade; and the impact of government policy on the international rice trade. Its aim is to improve the flow of information to people who are involved in, or concerned with, the issue of rice, such as policy makers, business people, and the media.

### DIRECTOR OF SCIENCE AND TECHNOLOGY SERVICES IN THAILAND

This directory represents an update of the institutional resources compiled in the TDRI Science and Technology database. It will prove useful to industries and private firms that are seeking the assistance of external institutions in research and development, information gathering, testing, consultation and equipment usage. The data covered include personnel, area of expertise, S&T activities, R&D keywords and major equipment.

**PLEASE REFER THE BROCHURE THAT WE HAVE INSERTED INTO THIS QUARTERLY FOR MORE DETAILED INFORMATION ABOUT THESE TDRI PUBLICATIONS AND HOW YOU MAY ORDER THEM.**

### OTHER TDRI PUBLICATIONS

#### The 1990 Year-End Conference Papers:

A total of eleven papers were prepared for this year's conference, "Industrializing Thailand and Its Impact on the Environment." A complete set of the papers is available for a total cost of ฿3,000; papers may also be purchased individually as follows:

*Natural Resources for a Sustainable Future: Spreading the Benefits*, Dhira Phantumvanit and Theodore Panayotou, ฿300.

*Land and Forest: Projecting Demand and Managing Encroachment*, Theodore Panayotou and Chartchai Parasuk, ฿350.

*Deforestation and Poverty: Can Commercial and Social Forestry Break the Vicious Circle?* Sopin Tongpan, Theodore Panayotou, Songpol Jetanavanich, Ketty Faichampa and Charles Mehl, ฿400.

*Water Shortages: Managing Demand to Expand Supply*, Sucha Sethapurta, Theodore Panayotou and Vute Wangwacharakul, ฿250.

*Mineral Resource Development: Making the Best of a Limited Resource*, Duangjai Intarapavich, Quanchai Leepowpanth, Theodore Panayotou and Sunt Rachadwong, ฿200.

*Industrialization and Environmental Quality: Paying the Price*, Dhira Phantumvanit and Theodore Panayotou, ฿175.

*The Greening of Thai Industry: Producing More and Polluting Less*, Phanu Kritiporn, Theodore Panayotou and Krerkrong Champrateep, ฿350.

*Urbanization and Environment: Managing the Conflict*, Banasopit Mekvichai, David Foster, Sopon Chomchan and Phanu Kritiporn, ฿300.

*Energy and Environment: Choosing the Right Mix*, Tienchai Chongpeerapien, Somthawin Sungsuwan, Phanu Kritiporn, Suree Buransajja and Resource Management Associates, ฿400.

*Integrated Information for Natural Resources Management*, Paul Hastings and Chatchawan Boonraksa, ฿250.

For a complete list of all TDRI publications—the Thailand Economic Information Kit, the TDRI Quarterly Review, TDRI Offprints, Working Papers, Research Reports and other Year-End Conference Papers—please contact the Publications Office. You may use the order form attached to the brochure to request a publications list from TDRI.



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