

# TDRI Quarterly Review

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*Youth looks to the future as Vietnamese reforms move into high gear (page 3).*

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## Vietnam's Reform Process: Implications for Thailand

David Stifel

In response to Vietnam's 1978 Christmas day invasion of Cambodia to "liberate" the people from the Khmer Rouge, the non-communist world reacted decisively with measures to isolate Vietnam. A month later, China responded violently with a punitive military action. And the differences of opinion among ASEAN members over an appropriate approach to Indochina were resolved with a firm commitment to resist Vietnam. Yet today, Hanoi and Washington are at the negotiating table, formal Sino-Vietnamese relations have been restored, and Vietnam is to sign the Treaty of Amity and Cooperation to gain observer status in ASEAN.

The new environment has created a plethora of opportunities for Thais in Vietnam. This paper examines the reform process in Vietnam. The factors motivating the policy shifts of the leadership in Hanoi give an indication of the durability of reforms, which in turn affect the trade and investment climate. Assuming that reforms are irreversible, the second part of the paper examines prospects for Thai economic interests in Vietnam, and the competition Thailand faces from other Asian economies there.

The situation in Vietnam today has evolved in large part from the decline and fall of the Soviet Union, as well

as from fundamental weaknesses in its own economy. These circumstances have brought about a shift in policy, which places economic concerns over strategic and ideological matters. The collapse of the communist party in what was once the Soviet Union has reinforced the notion, weighing heavily in the minds of the Vietnam Communist Party (VCP) members: short term power may stem from the barrel of a gun, but long term power and political legitimacy stem from economic well-being. As one party member stated, "only as long as people see their life [sic] improve each year will they accept the leading role of the party."<sup>1</sup> The difficulties being experienced in the former Soviet republics and Eastern Europe in the transition from planned to market economies, however, are a caveat which has not been missed by the Vietnamese leadership.

The so-called "peace dividend," which has thus far eluded much of the world since the end of the Cold War, appears to be within the grasp of Thailand, Vietnam's closest capitalist neighbor. Now that the Vietnamese threat is no longer what it once was, and as economic reforms progress, Thailand can benefit from the prospects available there. The United States'-led embargo has also provided a grace period for Thailand



*Vietnam's youth offer hard work and innovation for the future prosperity of the nation's economy.*

to pursue its interests in Vietnam. A complacent approach to Vietnam, however, increases the likelihood of opportunities being missed.

## REFORM

*The central planning that enabled what was North Vietnam to beat the French and the Americans could not cope with peace.<sup>2</sup>*

Although no accurate figures on national income were available to the leadership before the Sixth Party Congress in December 1986, the visible disparities between Vietnam and capitalist countries in the region, as well as China, were striking. Per capita income in Thailand in 1985, for example, was over US\$720, and eight years of reform under the leadership of Deng Xiaoping had raised the level of per capita income in China to US\$320; the incomes of those living in the southern coastal provinces were undoubtedly higher. The success of Chinese reforms especially appealed to party leadership. "Seeking truth from facts" and developing the "forces of production" (the economy) before changing the "relations of production" (ownership of the means of production) appeared as face-saving means of extracting the Vietnamese party leadership from the quagmire they found themselves in following hasty attempts to put their country—one without a proletariat, per se—through a socialist revolution.

Under its system of bureaucratic centralism and state subsidies, Vietnam has suffered many of the ills symptomatic of centrally-planned economies. Vietnamese state enterprises with soft budget constraints have characteristically proven to be inefficient and a strain on the economy. Disparities between market and official prices have also provided incentives for cadres with control over the distribution of supplies to seek rents available through illegal arbitrage. This has gone unreported in many state enterprises because employees have been given shares of the takes in order to "reduce the potential for whistle-blowing."<sup>3</sup> Although the break-up of the two-tier price system and the crack down on corruption in recent years have helped to alleviate the problem, it is far from solved. In a state where government officials control the distribution of scarce goods and where a black market thrives, misallocations of resources will inevitably continue.

The agricultural sector has also suffered the woes inherent in the Maoist collectivization model and the party's bias toward industrial development. Despite making agriculture a top priority in the Third Five Year Plan (1981-1985), the sector continued to be viewed primarily as a part of the process of socialist industrialization. Industry continued to receive over 40

percent of gross fixed investment from the state in "productive sectors"<sup>4</sup> whereas agriculture received less than 23 percent during this period.<sup>5</sup> Hasty elimination of private ownership and implicit taxes in the form of skewed urban-rural terms of trade affected the incentive structure, resulting in sub-optimum crop yields.

Following appeals for international assistance to avert a famine, the Politburo issued a resolution in April 1988, on the "Renovation of Economic Management in Agriculture." The resolution, inter alia, restored traditional incentives by providing farmers with 15-year land use rights. Investment in new fields and existing irrigation systems was also boosted. Although an urban-rural dichotomy remains, the results of the reforms are impressive. Vietnam has been the world's third largest exporter of rice since 1989. But success has created new difficulties for the state. Crop procurements have placed an added strain on the state budget, and the country's limited and outdated processing capabilities have lowered the value of exports as rice quality has been below international market standards. Limited capital has impeded the development of modern rice mills and other agro-industries. The government is now encouraging foreign investment in these areas.<sup>6</sup>

Declining real incomes, as well as rising "shoe-leather" costs,<sup>7</sup> have been the consequence of the high rates of inflation afflicting the population since the war. Subsidization of state enterprises and urban populations has been a major source of the rampant inflation. After defense spending, subsidies have, in fact, been the largest single item in the bloated budget, the deficits of which have often been financed through the printing of money. The State Bank of Vietnam in recent years has maintained a tighter money supply policy. But until state enterprises are privatized or confronted with hard-budget constraints, this policy will continue to result in a shortage of capital for productive enterprises. Another major source of inflation has been the excessive growth of a bureaucracy which protects superfluous officials. It was estimated that, prior to the Sixth Party Congress, the bureaucracy could have been cut in half without affecting its operations.<sup>8</sup>

At the meeting of the Politburo in August 1986, the VCP decided to initiate a major policy shift by adopting wholesale economic reforms. The VCP leaders admitted they had been overzealous in their pursuit of socialist transformation and that the economy had suffered for it. A renewed emphasis was placed on strengthening the economy before addressing social issues, such as ownership of the means of production. The recommendations from this meeting were endorsed at the Sixth Party Congress, held in December of that year. Reformist Nguyen Van Linh was also elected Secretary General at that Congress. The reforms aimed at developing all economic sectors by permitting the private sector to operate. The revised constitution, passed in April 1992, helped to institutionalize the

participation of the private sector by fully legalizing private business ventures.

### FOREIGN ECONOMIC AND POLITICAL RELATIONS AND REFORMS

*Autarky and closed door policy is the path to backwardness and poverty. To cope with the challenge of history, the only path for us is to associate the Vietnamese economy with the world economy. That was the lesson drawn by the Sixth Party Congress...[Henceforth, Vietnam is] determined to broaden its [economic] relations with the outside world for the purpose of development.*

*Foreign Minister Nguyen Co Tach  
January 1989<sup>9</sup>*

The Stalinist-Maoist approach to economic development, originally adopted by the Vietnamese, emphasized import-substitution industrialization. In rejecting this strategy in 1986, the VCP acknowledged the need to attract foreign capital and technology to raise the competitiveness of the country's production capacities up to international standards. The foreign investment law passed in 1987, however, is typical of the party's determination to proceed with reform, while at the same time vacillating over degrees and specifics. The letter of the law is extremely liberal, but it lacks much of the fine print needed to interpret the statutes. Nevertheless, many foreign businessmen have shown cautious enthusiasm.

Vietnam has much to offer foreign investors and traders: coal, gems, rubber, coffee, rice, oil, a cheap, disciplined labor force, and a potential consumer market of 69 million people. There are, however, still many weaknesses and risks in doing business there. The shortage of lawyers, for example, is compounded by the absence of bankruptcy laws, a lack of a mechanism for international arbitration in commercial disputes, differing interpretations of existing laws, and laws which are too prone to change. The infrastructure is inadequate in most parts of the country. The cumbersome bureaucracy makes project approval a time-consuming process, subject to competition between local and central governments.

The economic woes of the former Soviet Union have compelled the Vietnamese leadership to allow, and even encourage, greater foreign participation. Hanoi—Moscow's third largest debtor—had for many years relied on economic assistance from the Soviet Union to subsidize the state sector and prop up its fragile economy. Since January 1, 1990, however, Vietnam is no longer accorded preferential treatment; goods purchased from the former Soviet republics must be paid for in dollars at world market prices.<sup>10</sup> In 1991, the

share of Vietnam's trade with the erstwhile Soviet Union fell to about 13 percent from more than 50 percent in 1990. To avert economic collapse, Vietnam has sought trade, investment, and financial assistance from the outside world. Much to the credit of the Vietnamese, the hardships were not as severe as might have been expected, thanks to higher agricultural production and the rapid growth of trade with, and investment from, the Asian capitalist economies.

Economic realities ensure that Vietnamese reforms are irreversible in the long term. The leadership has shown its willingness to pursue an open door policy and to address the system's many inadequacies. Steps backward do occur, however. For example, in an effort to stem the outflow of foreign exchange in the latter half of 1991, the Vietnamese government tightened its control over the handling of all foreign exchange. A "temporary ban" was also placed on the import of all consumer goods for the last two months of the year.<sup>11</sup> In another instance, an over-zealous attempt to hasten the development of the shaky banking system may have actually weakened it; in January 1992, the government banned the transfer of cash in excess of Dong 50 million between Vietnamese cities. Cash payments between clients who hold bank accounts have also been prohibited.<sup>12</sup>

The VCP finds itself in the uncomfortable position of being forced to pursue the separation of party and state to eliminate the arbitrary nature of decision-making in order to attract foreign investment. As the newly-revised constitution illustrates, the party is succumbing to pressures to create legal institutions which threaten its monopoly of power. In the party's effort to strengthen the rule of law, the document gives the National Assembly greater power to pass laws and to appoint officials—tasks previously carried out by the politburo alone. In fact, the new constitution has been labelled an "economic constitution."<sup>13</sup> Its numerous revisions clearly aim to create a more favorable trade and investment environment by strengthening the legal structure, setting up a more efficient decision-making process, and creating checks and balances within the government by separating the executive from the legislature.

Vietnam's efforts to open its economy to the international market have run into obstacles not only on the domestic front, but also in the international arena. As it has had to contend with the obstructionist policies of the United States, Vietnam faces a disadvantage most developing countries do not encounter. Although many countries have unilaterally disregarded the embargo, the Americans have the capability to influence economic powers such as Japan, and to prevent the International Monetary Fund (IMF), the World Bank, and the Asian Development Bank (ADB) from lending money to Vietnam. Lending from these institutions is important for two reasons. First, the Vietnamese infrastructure has

been stretched to its limit. There is a shortage of capital, which prevents Hanoi from investing in the large-scale projects needed to alleviate the infrastructural bottlenecks. Private sector loans are not expected to be forthcoming for these needed projects. Once lending resumes from the multilateral institutions, resources can finally be directed at the areas that have thus far impeded growth and the inflow of foreign investment. Second, lending from these institutions also serves as a guide for private investors. Once the IMF, World Bank, and ADB resume lending, official and private capital flows are expected to grow substantially.<sup>14</sup>

The United States' linking of assistance from multilateral financial institutions, and the lifting of its embargo, to the settlement of the Cambodian conflict, appears to have pressured Hanoi into seeking a resolution to the conflict. For their part, the Chinese have also been willing to proceed cautiously with peace efforts. As the former Chinese Vice Foreign Minister, Han Nianling, told Vietnam expert Nyan Chanda in 1980, "it is only when the Soviets can no longer support the Vietnamese that a political solution to the crisis will be possible."<sup>15</sup> That condition has now been met.

Shortly after the signing of the Cambodian comprehensive political settlement in Paris on 23 October 1991, Vietnam and China normalized relations and talks between Hanoi and Washington commenced. The peril of economic collapse had forced the VCP leadership to adopt a foreign policy conducive to economic interaction with the outside world. The fundamental impetuses behind this shift — over a decade of economic mismanagement and the drying up of Soviet assistance — have left the Vietnamese with no choice but to seek amicable foreign economic relations with other countries.

## THAILAND AND VIETNAM

Until recently, Thai-Vietnamese relations have been wrought with tension. The belligerence of Vietnamese foreign policy in the decade following the fall of Saigon prescribed Thai policy towards Vietnam. It also helped to legitimize the influence of the Thai military on the domestic political scene. The diminishing Vietnamese threat in recent years, plus pressures on the Thai infrastructure brought on by the surge in foreign investment since 1987, have hastened the improvement of relations between the two countries. Although there is evidence that factions in the Thai military continue to be suspicious of Vietnamese motives, civilian leaders now preach optimism about Thai prospects in Vietnam. Prime Minister Chatichai Choonhaven's aspirations to transform the Indochina region from a "battlefield" to a "marketplace" envisioned a leading role for Thailand in the development of these countries.

Thailand is still in an advantageous position to gain from the potential of the Vietnamese economy, but complacency appears to have limited these benefits thus far. Factors contributing to the difficulties Thais have encountered in Vietnam include: 1) personal distrust among the people, 2) lack of government initiatives and policy coordination, and 3) competition from other countries.

Before discussing these issues, we must first ask what Thailand wants from its relations with Vietnam. Many in the Thai government and private sector envisage the Kingdom acting as a "gateway" to Vietnam by providing financial, processing, and trade-related services. The Bank of Thailand (BOT), for example, has ambitious plans to turn Thailand into a financial hub for the whole region. Within the next few years, the Bank intends to establish an international banking facility to direct overseas funds into Indochina. Although these plans are, of course, aimed at benefiting Thailand, the BOT sees Vietnam as gaining as well, since Thai intermediaries would assume some of the risk, thus making it easier for Vietnamese entrepreneurs to attain international financing. The private sector has also contributed. Finansa Thai Limited, a small, Bangkok-based financial consultancy, is establishing a US\$20 million Indochina investment fund — the "Southeast Asia Frontier Fund." Finansa intends to invest the entire fund in Thailand, bypassing the uncertainties of the Vietnamese market until the U.S. embargo is lifted.<sup>16</sup>

The Board of Investment (BOI) is also formulating policy guidelines to promote Thai investment in Vietnam and the other Indochinese states. Possible incentives include income tax waivers for foreign exchange remittances from Thai investments abroad, duty waivers for imports of raw materials from Thai projects abroad, and exclusions from assessable income for operating profits of overseas investments.<sup>17</sup> The ease with which Vietnamese visas can be attained in Bangkok, and Thailand's proximity to Vietnam, are features making Thailand an attractive stepping-off point for multinational corporations (MNCs) interested in investing in, and trading with Vietnam. The idea behind the BOI initiative is that Thailand and Vietnam can fit favorably into corporate strategies. Thailand can attract initial investments in low technology production facilities and, as the Thai economy progresses upstream, these labor-intensive processes can be shifted to Vietnam, leaving the more technology- or capital intensive-factories in Thailand. An example of this is the Hong Kong-based garment company, Hua Fu, which established a factory (Hua Thai) in Thailand and has since moved part of its operations to Vietnam.<sup>18</sup> This need not be exclusive to foreign investors. Thai companies can also take advantage of the low labor costs in Vietnam by moving their low-end production

processes offshore, as Thai wages and costs inevitably rise. Thus Thailand has the potential of becoming a "gateway" to Vietnam for at least the short to medium term.

### Thai Performance and Limitations

Following the announcement of Prime Minister Chatichai's Indochina initiative, Thai business activity with Vietnam picked-up rapidly. As can be seen from Table 1, the value of trade between Thailand and Vietnam in 1989 grew by about four and a half times the value of trade in 1988. These figures, however, pale in comparison to the value of two-way trade between Vietnam and Singapore, Japan, Hong Kong, France, Australia, and South Korea, respectively.

The overall drop in Vietnam's exports in 1991, due to the collapse of the Soviet Union, was accompanied by the rapid growth of trade with all these economies. The bulk of this expansion came from Singapore, Japan, and Hong Kong – together accounting for half of Vietnam's trade in 1991. Singapore's trade with Vietnam grew from US\$111 million in 1989 to US\$868 million in 1991, while Japan's trade with Vietnam grew twofold to US\$709 million over the same period. Japanese purchases of Vietnamese oil accounted for much of the increase. Finally, Hong Kong's trade with Vietnam grew from US\$182 million to US\$502 million.<sup>19</sup> Even though actual two-way trade – including unrecorded illicit trade – between Thailand and Vietnam is undoubtedly underestimated, it does not approach the value of trade between these countries and Vietnam.

Table 2 shows the origin of foreign direct investment (FDI) in Vietnam. As of June 1991, Thailand was the twelfth largest investor, accounting for only 1.8 percent of pledged capital (figures are not available on actual investment). Nearly 60 percent came from Taiwan, Australia, France, and Hong Kong. These figures do not indicate whether the investments were made through third countries. It is, therefore, difficult to determine if neighboring economies, such as Thailand, act as conduits. Yet it is clear that Thai investment in Vietnam has so far fared relatively poorly.

The first of the three factors, as discussed earlier, explaining this lackluster performance is the historical, political, and cultural animosity which has engendered a general distrust between the peoples of Thailand and Vietnam. Regardless of the veracity of the accusations, the "ugly" reputation of Thai businessmen has not only hampered Thai business with Vietnam, but has also raised questions over the viability of Thailand as an operations center for MNCs in the subregion; "foreign executives warn that being Thai-based can prove disadvantageous."<sup>20</sup>

The Vietnamese leadership is wary of Thai business interests. They observe the way natural resources in the other Indochinese states and Burma are being extracted

**Table 1 Value of Trade Transactions with Thailand**

	(Millions of Baht)		
	Lao	Vietnam	Indochina*
1985	566.1	24.8	601.2
1986	818.7	119.0	938.1
1987	1,184.1	186.2	1,370.5
1988	1,868.7	350.2	2,233.3
1989	2,928.5	1,595.1	4,615.3
1990	2,817.5	2,866.9	6,002.7
1991**	1,561.3	1,649.7	3,370.0

\* Includes Cambodia

\*\* First and second quarters

Source: Board of Trade, December 1991.

by Thai businessmen and fear the same may happen to them.

Smuggling of gems and poaching by Thai fishermen do little to alleviate Vietnamese apprehensions. The Vietnamese want to develop their own capacities to process raw materials. They value Thai experience in agro-industry, aquaculture, and gems,<sup>21</sup> but fear that the illicit trade and business activities taking place undermine their own efforts. In a move apparently directed against Thailand, the Vietnamese government restricted the mining of gems, but did urge foreign organizations and individuals to invest in processing facilities.<sup>22</sup>

Second, despite the rhetoric of the Chatichai administration, Thailand has yet to be transformed into a "springboard" or "bridge" to Vietnam. The government failed to take advantage of this early initiative. The BOI, for example, was bogged down with investment applications until 1991 and has only recently begun defining its strategy toward Vietnam. The first round of foreign exchange liberalization – though not directed at investment in Vietnam alone – did not take place until May 1990. The continued reform of the Thai financial market and banking system helps to facilitate Thai investment flows, but it will take time for these markets to mature – time is not on Thailand's side, however, given the competition from its Asian neighbors and the industrial economies.

Third, the Asian NIEs (newly industrialized economies)<sup>23</sup> and Malaysia are giving the Thais a run for their money in Vietnam. Until recently, Thailand held an absolute advantage over its regional neighbors. Bangkok was the only gateway for direct flights from the non-socialist world to Hanoi and Ho Chi Minh City. Today, however, Cathay Pacific – Hong Kong's de facto flag carrier – has nine weekly flights to Vietnam, Singapore Airlines has six, and Malaysia Airlines two. And, as the Vietnamese rush to open a consulate in Hong Kong to process visas, Thailand's remaining advantages are weakening.

**Table 2 Foreign Direct Investment in Vietnam as of June 1991**

Country	Number of Projects	Percentage of Total Projects	Total Pledged Capital*	Percentage of Pledged Capital
1. Taiwan	32	11.7	439	21.0
2. Australia	16	5.9	278	13.3
3. France	25	9.2	272	13.0
4. Hong Kong	68	24.9	230	11.0
5. United Kingdom	8	2.9	144	6.9
6. Netherlands	3	1.1	124	5.9
7. Soviet Union	23	8.4	115	5.5
8. Canada	10	3.7	112	5.4
9. Japan	18	6.6	99	4.7
10. Sweden	3	1.1	54	2.6
11. South Korea	7	2.6	54	2.6
12. Thailand	18	6.6	37	1.8
Others	49	17.9	189	8.9
Total:	273	100.0	2,093	100.0

\* Millions of dollars

Source: State Commission for Cooperation and Investment.

While Singaporean investors maintain extreme caution in investing in the Vietnam market, Hong Kong, Taiwan, and—recent evidence suggests—Malaysia are taking advantage of the U.S. embargo to gain footholds there. Cantonese and Fukienese entrepreneurs from these countries use their ethnic ties with Vietnam's Chinese to launch business ventures.

Now that the refugee situation and deference to China no longer inhibit Hong Kong from improving its relations with Vietnam, the colony has become an appealing location for MNCs to base their Vietnam headquarters. Hong Kong's attraction stems from its well developed financial and telecommunications systems, its efficient duty free port, and its energetic investing class—well-versed in dealing with reforming socialist countries.

Credit Lyonnais, for instance, was attracted to Hong Kong's financial markets and has established the Vietnam Growth Fund in the colony. Similarly, the Vietnam Fund has also been set up in Hong Kong to cash in on Vietnam's privatization efforts. Hong Kong's reversion back to China in 1997, however, makes its economic future far from certain.

Singapore and Hong Kong both offer ports free of duties and red tape, as well as highly efficient trade-related services. This poses a challenge to Thailand's role as a possible center for re-exports of Vietnamese goods in the short to medium term. In the long term, provided that Vietnam continues to develop its port facilities, it will no longer need to direct much of its trade through neighboring countries.

Recent evidence suggest that Malaysian investment in Vietnam has now surpassed Thailand's. This is the result of a strong government policy which has included

Indochina as part of the country's overall industrialization strategy. Prime Minister Datuk Seri Mahatir Mohamad's delegation of 108 businessmen, 36 cultural attaches, and 20 government officials, which travelled to Vietnam in April 1992, was the largest foreign delegation to visit the Indochinese state, and is an indication of the Malaysian government's enthusiasm for the Vietnamese market. Like Thailand, Malaysia's experience in agro-industry is highly valuable to the Vietnamese. Malaysia's assistance is being sought to help revitalize Vietnam's rubber industry, with some 110,000 hectares of trees still untapped.

The Asian NIEs and Malaysia all have advantages over Thailand. Their leadership has remained stable and the sustainability of policies is not at issue. Furthermore, these countries—especially Singapore—provide successful models of growth and social discipline for the Hanoi government. Their "authoritarian-pluralist systems"<sup>24</sup> in which an elite maintains political power, while economic and social institutions remain relatively independent, and in which opposition groups exist but have little power, appeals to the Vietnamese leadership. The invitation to Lee Kuan Yew to act as an economic advisor to Vietnam illustrates Hanoi's thinking. Given Thailand's political uncertainties, the rapport between these countries and Vietnam is unlikely to be matched in Thai-Vietnamese relations.

### Thai Prospects

Thailand is currently in a position to gain from potential opportunities in Vietnam. However, aspirations to make Thailand *the* gateway to Vietnam are unrealistic. Too many forces act against such a scenario.

Competition from Hong Kong, Singapore, and Malaysia also assure that no one country will dominate as a regional middleman. Nor does Vietnam want to depend on a single country. Its experience with the Soviet Union taught the Vietnamese leadership that such excessive dependence is dangerous.

Thailand does have the potential to be a gateway, though. The Thai economy, on the verge of becoming an NIE, needs Vietnam's cheap labor pool and abundant resources. Seen as a package, both economies are attractive to foreign investors. Conflicting nationalist sentiments and mutual distrust, however, pose a threat to Thailand's role as a gateway to Vietnam.

Finally, in the medium to long term, Vietnam will be its own gateway. The Vietnamese are installing a state of the art telecommunications system which will make doing business from greater distances increasingly feasible and, when multilateral lending is resumed, the bottlenecks in the physical infrastructure can be realistically addressed. The government's efforts to open up the economy to market forces, although proceeding in starts and stops, and its enthusiasm for developing a market-oriented legal code, are making the country an easier place in which to invest directly. The implication for Thailand is that Vietnam is likely to be just another market with which the Thais can do business. Opportunities for Thai businesses indeed exist in many sectors, such as agro-industry, light manufacturing, and gem processing. Yet these prospects are by no means available to Thailand alone. A concerted effort on the part of both the public and private sectors is essential if Thailand wants to be a major player in Vietnam. This, however, will be difficult following Thailand's recent political unrest.

## ENDNOTES

- 1 "Will Success Spoil the Party?" *The Economist*, 25 May 1991, p. 38.
- 2 "Poised Between Marx and Market." *The Economist*, 24 February 1990, p. 68.
- 3 Porter, Gareth, "The Politics of 'Renovation' in Vietnam." *Problems of Communism*, May-June, 1990, p. 73.
- 4 The Soviet principles of national accounting used by Vietnam ignore some services as "unproductive." Furthermore, since much of the private sector is secretive about their activities, national accounts tend to be inaccurate. For example, the strong recorded growth during 1980-1985 has been attributed in part to the shifting of resources to priority state sectors, while the unrecorded informal sector is believed to have slowed considerably.
- 5 For a discussion of agricultural reforms, see Vo Nhan Tri's *Vietnam's Economic Policy Since 1975*. Singapore, Institute of Southeast Asian Studies: 1990, pp. 186-98.
- 6 Hiebert, Murray, "The Tilling Fields: Rice Glut Worries Vietnamese Farmers." *Far Eastern Economic Review*, 14 May 1992, pp. 57-58.
- 7 Shoe-leather costs refer to the incidental costs associated with high levels of inflation. These costs are conceptualized in terms of the wear and tear on one's shoes resulting from the many trips taken to the bank.
- 8 Porter, op. cit. 1990, pp. 74-75.
- 9 Vo Nhan Tri, op. cit. 1990, p. 248.
- 10 "Ho Chi Minh's Heirs, Their Heads in the Clouds." *The Economist*, 9 February 1991, p. 29.
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- 13 Interview with Raymond Eaton, Export Development Trading Corporation, 30 April 1992.
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- 15 McGregor, Charles, "China, Vietnam, and the Cambodian Conflict: Beijing's End Game Strategy." *Asian Survey*, Vol. 30, No. 3, March 1990, p. 269.
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- 21 Thai firms that have invested in these sectors include: Bangna Steel Works, which has set up a joint venture tapioca processing plant with an Indonesian firm; Indochina Innovation, which is processing Tiger prawns; Thai Pochana Food Cannery, which has invested in a feedmill; and the CP Group and Huay Chuan, which are trading agricultural products.
- 22 *Insight Indochina*, Business International, 20 November 1991, p.88.
- 23 The Asian Newly Industrialized Economies include Hong Kong, Singapore, South Korea, and Taiwan.
- 24 See Scalapino, Robert, "Political Trends in Asia and Their Implications for the Region," in Robert A. Scalapino, Seizaburo Sato, Jusuf Wanandi, and Sung-joo Han, *Asia and the Major Powers: Domestic Politics and Foreign Policy*. Berkeley: Institute of East Asian Studies, University of California, 1988.

# Greener Growth: Thailand's Road To Sustainable Development\*

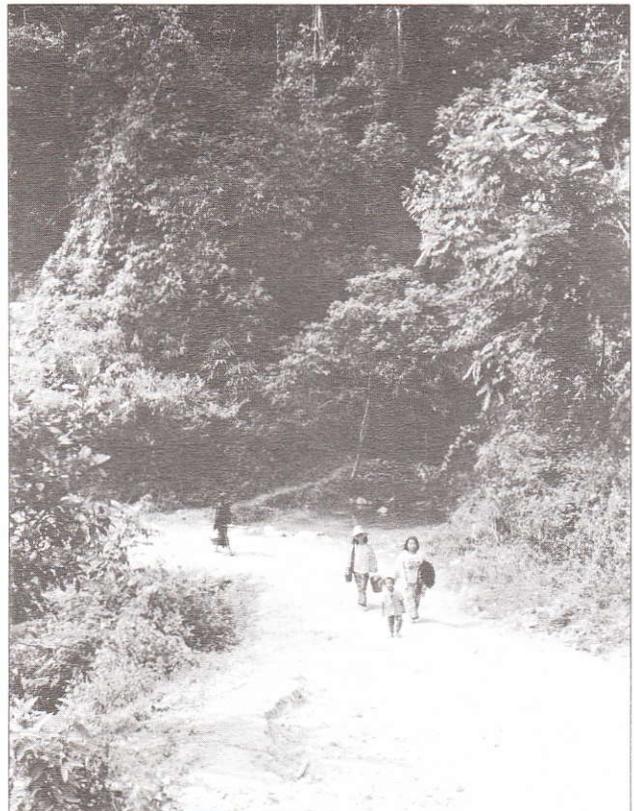
Chartchai Parasuk

*This paper discusses basic issues concerning the close relationship between development and the environment. The discussion will compare the Thai and Japanese economies.*

**T**hailand now stands at an important turning point in its history and the right balance between growth and environmental quality must be found. Thailand is still in need of further economic development. Rural and urban poverty must be eradicated and the standard of living of our citizens must be raised. This could gradually be achieved through a higher degree of industrialization. Yet the country also needs, unarguably, to rehabilitate its depleted natural resources and restore lost environmental quality. The question is how to marry these seemingly conflicting objectives? Many answers could be given, but few would dispute that greener growth is essential.

**The Environment Is Economically Important.** Our environment is already an important economic issue and will become more so in the coming twenty-first century. Depleted resources and a degraded environment have direct effects on the sustainability of any economy, not to mention the quality of human life itself. Unwise use of natural resources, among other ill effects, reduces income potential. Uncontrolled pollution translates into expensive clean-up costs and growing health risks. Environment even plays a part in international trade. The current yellow-fin tuna embargo by the United States, for instance, and requirements to identify the sources of timber used in furniture exported to some European countries are clear examples. Our environment and its health is certain to become more vital to our future international trade. No country can today afford to ignore environmental issues.

**Issues for Policy Planners.** To what extent should the environment be protected and to what extent should economic growth be forsaken? There is an unavoidable dilemma in choosing between development and



environment. Both are costly. Which should have priority? And to what extent?

Theoretically it can be argued that development and environmental protection are incompatible. Ignoring the environment jeopardizes long-term economic growth. In the short term, however, environmental protection is likely to slow down the economy. Structural adjustments are needed before an economy can compensate for the added costs of environmental protection with new technology and better economic management. What, therefore, should be done? How should these forces be balanced, particularly in a country

\* The author, a Research Fellow of TDRI's Natural Resources and Environment Program, presented this paper at the AT-9 Researchers' Meeting, held from February 13-14, 1992, in Yokohama, Japan.

in the early stages of industrial development? This point will be addressed in detail in this paper.

## DEVELOPMENT AND PROTECTING THE ENVIRONMENT: A DILEMMA?

### Theoretical Concept

#### Environmental Protection As An Added Cost.

Theoretically the environment should be considered as a factor in national production. The “public goods” character of the environment, plus the failure of the market to price the environment, however, leave this productive input unrecognized. If industry is freely permitted to emit pollution into the atmosphere, for instance, preserving air quality will certainly not be counted as a cost of production. Once air-pollution control measures are established, however, gaseous emissions are considered part of the national production cost. Environmental regulations thus impose additional costs on producers. Consider this textbook definition:

Output =  $f$  (Land, Labor, Capital, Technology; Environment)

Before the age of environmental awareness, manufacturers paid only rent, wages, interest rates and, perhaps, technology fees. The environment was considered a “free” good or “public good.” But if environmental regulations are enforced, manufacturers will have to consider the environment an additional production factor. Pollution prevention and clean-up costs must now be added. Examples of these new expenses include wastewater treatment facilities, air pollution scrubbers, and hazardous waste treatment fees. Production costs will, therefore, certainly become higher. Rises in production costs, however, could be compensated for by the adoption of *cheaper* and *greener* technology.

**The Opportunity Costs of Protecting the Environment Can Be High.** Developing countries are now facing pressure—both internal and external—to conserve natural resources and reduce pollution emissions. Environmental protection can harm the development potential of an economy for at least three reasons:

*Lower Capital Accumulation.* In the early stages of development, most countries derive their income from exploiting their natural resources, such as forests and minerals. Forests, for example, are cleared for valuable timber and wooded land is converted into farmland. The income generated from logging and agriculture is then used to finance development. If forests are not allowed to be cleared, then insufficient capital may be available for development;

*Lessen the Competitive Edge on the International Market.* If industries in the developing countries must follow environmental guidelines, their production costs will be higher than for countries with more sophisticated technology or with less stringent environmental laws. Prices of products from developing countries would, therefore, be higher and uncompetitive on the international market;

*Reduce Investment Opportunities.* Insufficient domestic savings force developing countries to depend on foreign investment as the principal source of funds for development. Strict environmental regulations may well make investment opportunities considerably less attractive. Foreign investors may look elsewhere to invest their money. For all developing nations, this is a serious problem.

With lower capital accumulation, less foreign exchange reserves, and insufficient foreign investment, it is difficult for developing economies to “take-off.” Without economic expansion, inadequate financial resources will be available for improving infrastructure, education, and public health care—key ingredients for true development. The timing of the take-off period is also critical. If the economy does not take-off fast enough, population pressure will overpower economic development and the country may well fall into a vicious cycle of widening poverty.

**Environmental Protection Is Still Essential to Sustainable Development.** The above does *not* imply that developing countries should needlessly go ahead with the exploitation of natural resources and the degradation of the environment. Over-exploitation of natural resources and over-degradation of the environment will unquestionably endanger the long-term health of the economy. Wise and balanced environmental protection is clearly called for.

**Balancing Development and Environmental Protection.** The question is how, when, and to what extent, development should be balanced with environmental protection? There is no fixed answer. Each country must find its own answer. In general, if resources are abundant and the environment is clean, it may be acceptable to exploit resources and pollute the environment to at least some degree. But income thus generated must be wisely used to finance development, so that the country does not become dependent on outside resources and protects its ability to restore the environment later on.

## THE EFFECTS OF DEVELOPMENT ON THE ENVIRONMENT: THE CASE OF THAILAND

**A Phase of Rapid Development.** In the last two decades, Thailand has been transformed from a predominantly agrarian to an industrialized economy. In 1970, the agricultural sector generated 27 percent of

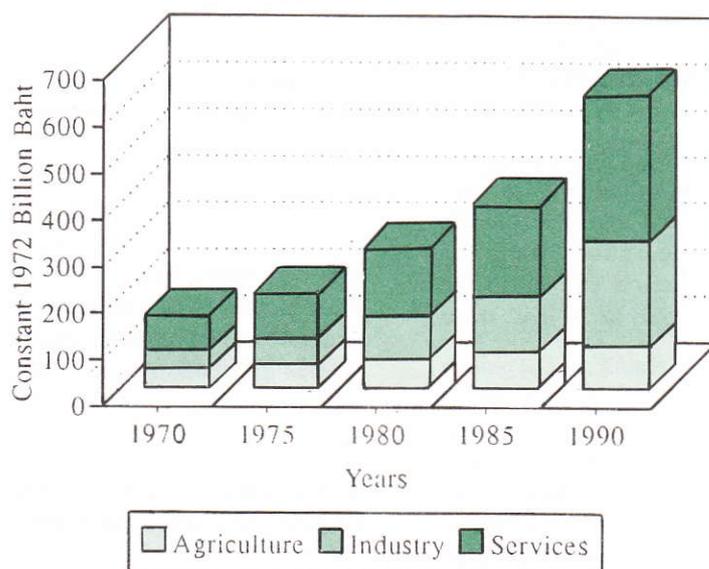
Gross Domestic Product (GDP). This sector's share of the economic pie has now plummeted to 14 percent (Figure 1). Agriculture has been eclipsed by the country's rapidly expanding industrial sector. The number of factories in Thailand has increased from 600 in 1970 to over 50,000 today. With industrialization, Thailand has become active in international markets. In 1990, the country earned US\$23 billion from exports, equivalent to 29 percent of that year's GDP. Three-quarters of export earnings come from manufactured goods. This rapid growth has quadrupled GDP. Real per capita income has tripled over the past two decades.

**Development at a Cost.** Economic growth does not come without cost. The expansion of Thailand's agricultural sector in the 1960s and 1970s caused severe deforestation (Figure 2). In the past thirty years, about 15 million hectares of forestland, or half of the country's original natural forests, have been converted to farmland. This has resulted in soil erosion, irregular water flows, drought, and flash floods. Industrial development has also rapidly polluted the environment. The country's carbon dioxide emission levels, for example, increased five-fold in just 20 years (Figure 3). In 1990, 75 million tons of carbon dioxide were released into our atmosphere, one million tons of BOD (biochemical oxygen demand) was discharged into our waterways, and 2 million tons of refuse were dumped into our landfills.

**Moving Toward Environmental Protection.** Thailand is now under strong pressure, both from within the country and from outside, to rehabilitate its

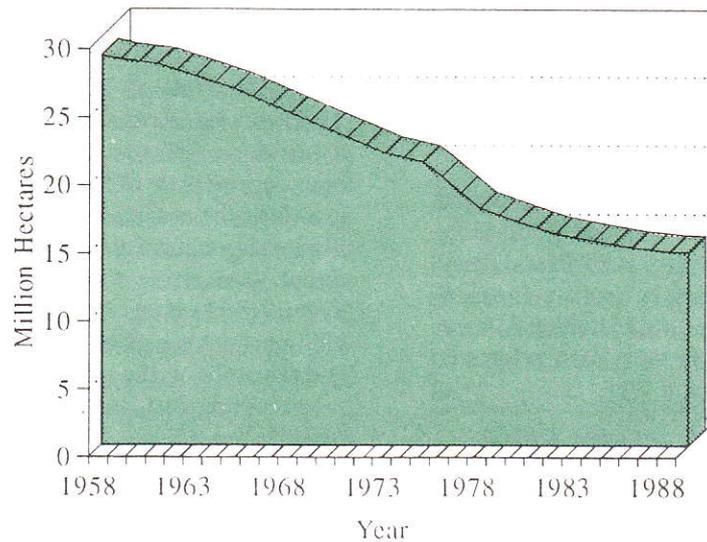
degraded resources and to restore the quality of the environment. The country's Seventh National Economic and Social Development Plan (1991-1996) calls for a better balance between economic growth and environmental quality. Apart from imposing stringent environmental regulations and providing more investments to environmental abatement projects, the Plan has adopted the "Polluters Pay Principle." Polluters, particularly manufacturers, now have to bear the cost of environmental protection and clean-ups.

**Is the Cost Too High?** Can Thailand really afford to protect its environment? Investments in pollution abatement and clean-up activities are very costly. The forthcoming wastewater treatment plant for the Bangkok Metropolitan Area alone will cost the tax-payers US\$800 million. Yet this expensive facility will be capable of treating only one-quarter of the total residential wastewater in the Bangkok area. Other environmental abatement projects also require substantial investment. Where will the financial resources come from? Moreover, US\$800 million spent on a single project means US\$800 million less is available for other urgent development needs—education, infrastructure, and public health-care. Apart from the financial burden, environmental protection poses other serious economic problems. First, stringent environmental regulations could drive away much-needed foreign investment. Given the Thai economy's resource gap—currently about 8.5 percent of the GDP—foreign investment is essential. It is evident that the double-digit growth rates of 1988 to 1990 were primarily financed by an influx of foreign capital.



Source: Bank of Thailand

Figure 1 Thailand's Gross Domestic Product



Source: Royal Forestry Department

**Figure 2 Thailand's Forest Area**

Second, adoption of the **Polluters Pay Principle** could widen this gap and levy sizable costs on our industries. Dependent as it is on exports of manufactured goods, is environmental protection a viable choice for Thailand?

## LEARNING FROM JAPAN

**Experience from the Developed Countries.** Thailand is certainly neither the first nor the only country to encounter such a difficult decision in choosing between development and protecting the environment. All developed economies have passed through a stage of rapid economic growth, coupled with deteriorating resources and environment. The difference is that back then environmental concerns were not a strong public issue, at either local or global levels. Governments then suffered little or no pressure about the environment. Development plans could, therefore, focus solely on maximizing economic growth. Because of a lack of incentive to protect the environment, a "Pollute First and Clean Up Later" tactic was inevitable. Japan is an example of this approach.

**Focusing on Economic Growth.** Japan's economic success has indeed been remarkable. Reconstruction of the Japanese economy began after World War II. Economic expansion was speeded when Japan adopted the Income-Doubling Policy of the 1960s. The Policy accelerated industrialization. Average real GDP growth rates in the 1960s, 1970s and 1980s reached 11.27 percent, 4.88 percent, and 4.18 percent respectively. Within a single decade, 1961-1970, the Japanese GDP increased 2.4-fold, while per capita income increased

2.2-fold. Industrialization has also boosted the country's international position. The value of exports increased from 2,000 billion yen in 1960 to over 60,000 billion yen in the early 1990s.

**The Price of Success.** Success does not come cheaply. Japan's adoption of the Income-Doubling Policy in the 1960s, though resulting in rapid economic expansion, was achieved at the expense of the environment. Environmental problems, in fact, became so severe that the Japanese parliament (Diet) passed laws to slow pollution in the early 1970s. It was feared, however, that these laws might jeopardize economic health. That did not happen in Japan's case.

**Compensating Added Cost with Technological Innovation.** Higher production costs due to added environmental costs were compensated for by the introduction of new technologies to reduce production costs while minimizing pollution discharges. Japan's real GDP is higher now that pollution controls are in place. New technologies, driven by environmental concern, have turned out to be beneficial to the economy. For example, the development of a low emission technology by the Japanese automobile industry – the result of strict emission laws – has contributed to a much higher mileage per unit of fuel. This fuel-saving technology has been a significant factor in the strong competitive position of Japanese auto-makers in the world market. It could be concluded that the development of *cheaper* and *greener* technologies is at least partly responsible for Japan's economic success.

**Achieving Both Development and Environmental Protection.** Japan not only excels in economic

expansion, but has achieved environmental protection while doing so. Even with the doubling of real GDP over the past three decades, carbon dioxide emission levels have increased by a mere 25 percent, while the sulphur dioxide emission level has been reduced from 5 million tons per annum to less than one million tons. The quality of Japan's rivers has also improved during this period. For instance, the level of dissolved oxygen (DO) in the Ishikari river increased from 8.9 mg/l in 1970 to 11.0 mg/l in the late 1980s. Reforestation is another Japanese success story. Ten million of the total 25 million hectares of current forest cover in Japan have been reforested since the end of the Second World War.

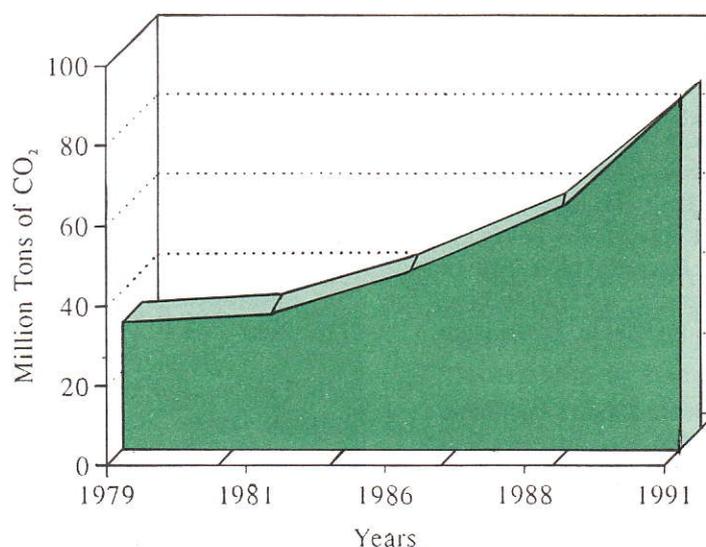
### THE INTER-DEPENDENCY OF DEVELOPMENT AND THE ENVIRONMENT

**The Relationship of Development and Environmental Protection.** The effects of economic development on the environment are now well publicized. The expansion of an economy invariably depletes natural resource endowments and pollutes the environment. But the exact effects of environmental quality on economic development have yet to be made clear. Is there empirical evidence that depleted resources and a polluted environment lower economic growth, at least in the long term? If the relationship between development and the environment is proven to be a two-way street, then environmental protection is an economically sound policy. The following is an empirical

example of the inter-dependency of development and environment.

**An Example of Inter-Dependency.** The Thailand Development Research Institute (TDRI) recently carried out a research project to study the inter-dependency of the environment and economic growth at the macro-level. The study focussed on the relationship between forest resources and agricultural output. Converting forestland into farmland has two contradictory effects on agricultural output. One is the additional income gained from expansion of agricultural land. The other is the income or output lost due to lower productivity. Deforestation results in soil erosion, irregular water flows, drought, and floods, etc. All these factors adversely affect agricultural productivity. Therefore, there is a trade-off between the two effects. Results of the study, showing empirical calculations of the trade-off between these two contradictory functions of Thailand's forests, are summarized in Table 1.

The TDRI study indicated that up to 1984 clearing an additional hectare of forest would positively contribute to overall agricultural output and boost the economy generally. The gain from land expansion outweighed the loss in productivity. After 1987, however, clearing the same amount of forest would negatively contribute to the overall economy. The severity of soil loss, the irregularity of water supply and other factors, turned out to be more costly than the potential income gained.



Source: Thailand Development Research Institute

**Figure 3 Carbon Dioxide Emissions in Thailand**

**Finding the Balance.** The trade-off indicates that there is a “balance point” between resource exploitation and economic expansion. The balance point implicitly reflects the *correct* level of resource depletion, or environmental degradation, which Thailand could tolerate. Using examples from the TDRI study, it should be concluded that the *correct* amount of forest cover for the country is approximately 30 percent of its total land area. Clearing the forests after 1984 thus resulted in a net loss for the economy. Using the year 1984 as a benchmark, Thailand’s forest cover should remain at the 1984 level—30 percent of the country’s total area. Thus when forest cover exceeds 30 percent, it is economically beneficial to expand the national farming area. But when the forest is cleared beyond the 30 percent threshold, it is wiser to do the reverse—preserve natural forests. It should be noted that the study only addressed loss of agricultural productivity exclusively in terms of deforestation. It ignored the value of biodiversity, carbon absorption capability, and other environmental services of the forests. If these were added, the cost of deforestation would be much higher than indicated in the table, and the *correct* amount of forest cover would then also become greater than 30 percent.

**Implications from the Study.** The study implies that there is a *correct* level of resource exploitation and a *correct* level of pollution that should be accepted for the sake of economic development. Environmental protection is not always economically optimal. In certain cases, over-protection of the environment will do more harm than good. The same study showed, for instance, that one solution to save the forests is to encourage labor migration to the industrial and service sectors. Less labor left in rural areas means less demand for farmland and less danger of deforestation. If Thailand had prohibited the conversion of forests to farmland, even when forests were abundant, the economy could not have become industrialized. Without industrialization—much less land-intensive than agriculture—forests can not be saved.

**Determining the Correct Level of Resource Depletion and Environmental Degradation.** Determining the *correct* level, of course, requires skill. The methodology used in the TDRI study, the

production function approach, is one way to determine the balance point between development and environmental protection. Currently, TDRI is expanding its studies on balancing development and the environment to cover more types of both natural resources and pollution. The bottom line is that economic gains must exceed economic losses.

### ACHIEVING A GREENER PATH TO DEVELOPMENT FOR THAILAND

**Learning from Others.** What lessons can be learned from other countries, particularly Japan? Should one conclude that “Pollute First and Clean Up Later” is the proper tactic for all economies? Without exploiting natural resources and thus polluting the environment in the early stages of development, an economy might not be able to accumulate the necessary capital for industrial development, and would be unable to compete on the international market. After successful development, financial resources could be spent to clean-up pollution and restore deteriorated resources. This is a practice being followed by most developed countries.

Or should one conclude that **Environmental Protection Pays?** Environmental controls stimulate industry to develop *greener* and *cleaner* technologies. Moreover, prevention is cheaper than cleaning-up. The Japanese Environment Agency estimates that the cost of health damages due to industrial pollution is 10 to 100 times higher than the cost of pollution prevention.

**Greener Growth is a Necessary Policy.** No economy can afford to forego economic expansion. Yet neither can any economy disregard environmental issues. Thus, there is a strong inter-dependency between economic development and environmental quality. A greener path to development simply has to be sought. The problem is to find the correct, and invariably delicate, balance.

**A Greener Growth Policy Is Being Adopted in Thailand.** Thailand’s economic success has permitted the country to look backwards, rethink its previous and future development strategies, prevent further environmental adversities, and repair whatever damage has already been done. New and more stringent environmental laws are being imposed to control waste

**Table 1 The Effects of Deforestation on Agricultural Income**

	(1972 Constant U.S. Dollars/Hectare)			
Gain/Loss	1978	1980	1984	1987
Gain from Land Expansion	52.25	45.77	43.73	44.70
Loss from Deforestation	44.92	39.03	39.58	55.72
Net Gain	10.33	6.74	4.15	-11.02

discharges. Governmental agencies are being restructured to accommodate new environmental policies. Market incentives are being introduced to lower pollution emissions. Cleaner technologies are being adopted by industry. These are just a few of the innovative ways in which Thailand can save its environment while continuing to advance economically.

**Growing with Caution.** From now on, Thailand's development policies must *always* take environmental concerns into consideration. New environment-friendly development policies, however, should not proceed at the cost of development. New development strategies should consist of two ingredients: choosing the right industry and adopting the right technology. Industrial expansion is still a must for Thailand. But only the industries that pollute least should be promoted. Industries with high environmental risks should not be welcome in our country.

**Transfer of Technology.** As mentioned earlier, the added cost of protecting the environment could be compensated by adopting *cheaper* and *greener* technology. Unfortunately, developing countries are seldom equipped to develop their own technologies. These "Cleaner and Greener" technologies must be imported from abroad. International co-operation in technology transfer is thus of major importance. The government must disseminate such technologies to local industries. Thailand's industrial sector is dominated by medium- and small-scale factories, lacking the necessary knowledge to develop the proper technology and the funds to pay for them. Government assistance, technical and financial, is clearly required to promote such technologies in our industries.

**Encouraging Better Management and Business Practices.** In many cases, pollution and environmental problems are caused by mismanagement. Good management could reduce waste levels and lower accident rates. Industries adopting good management practices thus should be rewarded. The current business ratings for environmentally-friendly industries, initiated

by some investment companies, are an innovative way to reward good business practice.

**Pricing the Environment Through Market Mechanisms.** The environment has traditionally been treated as a free or public good. In the absence of price signals, there is no indicator of the value of the environment. Pricing the environment, particularly through market mechanisms, will provide incentives for industry to control its own pollution discharges. If an industry, for instance, is charged according to the treatment cost of its waste, the price of maintaining the environment will be included in production costs. Then the industry will try to minimize pollution emission either through the adoption of a cleaner technology or through better management practices, or both. This idea, the **Polluters Pay Principle**, was adopted in Thailand with the establishment of the Environment Fund.

**Financing Protection Against Pollution.** Financing pollution protection is probably the most serious economic issue facing Thailand today. Public and private pollution abatement facilities are costly. Given the domination of medium- and small-scale companies in the Thai industrial sector, investment in pollution abatement may not be possible for many establishments. Financial assistance must, therefore, be provided. Financial resources from abroad are certainly welcome. The Industrial Finance Corporation of Thailand, a government-supported financial institution, has already allocated US\$12 million for industrial pollution abatement loans. This is still a rather small amount of money compared to the actual demand for abatement loans.

**Increased Role of Local Government.** It is a fact that nobody is more concerned about environmental problems than the people residing in the affected areas. Local governments should be given a greater role in administering natural resources and caring for the environment in their own localities. Financial resources should be made available to them for solving their own environmental problems.

# The Importance of Accounting for Natural Resources and the Environment

Claudia W. Sadoff\*

All countries rely to some degree on natural resources and the environment for their long-term economic well-being. Policy makers, when evaluating their countries' economic performance, often rely on indicators such as the Gross Domestic Product (GDP). The purpose of this survey is to examine the suitability of these indicators for the evaluation of economic performance in a long term, sustainable context. It will be argued that the definitions and construction of national income indicators do not fully account for the value of services provided by the environment, and that by neglecting to do so they mislead policy makers by presenting unsustainable environmental disinvestment as income generation.

While the interdependence of the economy and the ecosystem is undeniable, measurement is complex. The majority of services provided by the environment are inappropriately priced, or entirely unpriced, in the market. As inputs, natural resources are generally priced according to their extraction costs, without taking into account their inherent value or the value of their *in situ* functions. As a receptacle for waste, the services of the ecosystem are rarely priced at all. While many countries have established fees and fines for waste disposal, the majority of the world's waste is released into the ecosystem at no cost whatsoever to the polluter.

Measuring environmental costs is not simply an academic exercise. The trade-offs between economic production and environmental degradation cannot be fully understood, and hence optimally managed, until their costs and benefits can be measured by a common yardstick. If issues of the environment are to be taken seriously, they must be explicitly incorporated into economic evaluations, and included when calculating the true, sustainable income gains from economic production. The way in which the environment is treated, or more accurately, neglected, in the context of national income accounting must therefore be reassessed. Particularly in resource-dependent developing countries, trade-offs and environmental costs must be clarified, and to whatever extent possible, quantified, before long term development policies can be accurately evaluated.

Proper measurement is crucial; for as long as the environment remains undervalued, or unvalued, it will be over-exploited.

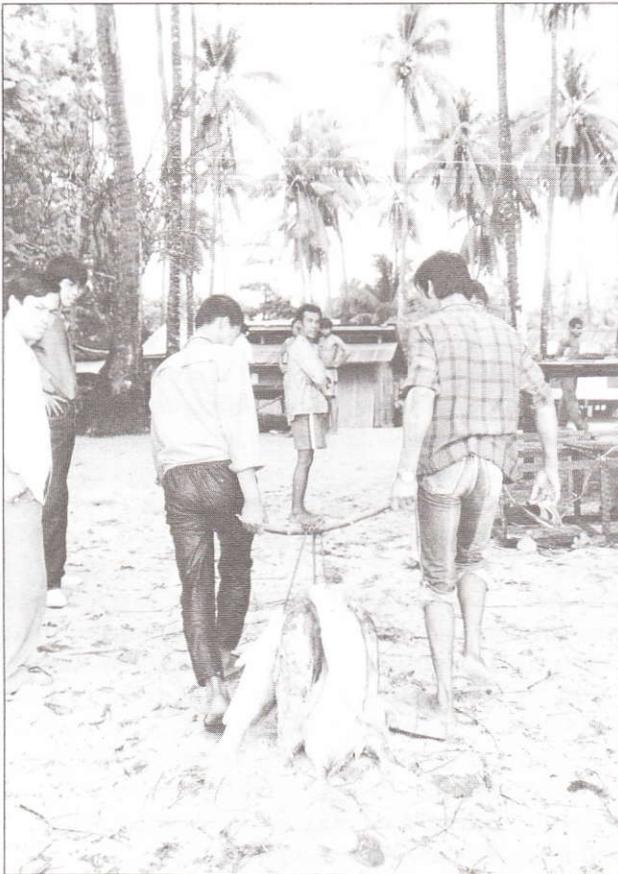
## INCOME, WEALTH, AND THE GDP

Measures of national income are quoted so regularly that their definitions are simply assumed to be understood, and rarely explicitly stated. This can be problematic. The GDP, for example, is derived from a country's national income accounts and constructed as a measure of economic activity. Yet, in practice, the GDP is frequently used to compare the wealth and welfare of different nations, and to record their trends over time. These uses of the GDP can be misleading. While academics are well aware of the caveats associated with various interpretations of the GDP, many policy makers are not. Few understand the history and construction of this indicator, and hence its suitability for such applications.

The concepts which underlie the calculation of GDP will have significant implications for the appropriate usage of the measurement. The concept of income itself is subject to various interpretations. The classical economists claimed that revenue or income simply comprised rent, wages and profit, which are the returns to 'land, labor and capital' (Smith 1776). This definition also reflects what is most likely to be the popular understanding of income. The neo-classical economists, however, defined 'income' in a way which differs in two important respects.

First, income was defined to be only that portion of gross revenues which could be spent while keeping capital intact. J.R. Hicks broadly defined income as that which we can consume today without becoming less well-off tomorrow. His justification for limiting the definition of income to this portion of revenues was that income should be a "guide for prudent conduct" in terms of consumption.<sup>1</sup> This corresponds to Adam Smith's notion of "net revenue" which subtracts the cost of capital maintenance from the gross receipts of production in order to establish the amount which can

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*The national income fails to reflect a decline in the country's natural assets and productive capacity when, for example, minerals are extracted or fisheries and forests are over-exploited.*

be spent on "...subsistence, conveniences, and amusements" without depleting the productivity of capital stock.<sup>2</sup>

The second way in which the neo-classical economists modified their calculation of income was to abstract or minimize the role of natural resources in their analyses. The earlier classical economists, Malthus and Ricardo, predicted that population would outstrip nature's power to provide sustenance, and that widespread famine would result. They wrote, however, at a time when commodity prices were at an historic high, when a bushel of wheat cost roughly two weeks wages.<sup>3</sup> Conversely, the neo-classical economists of the late nineteenth century experienced unprecedented international trade as transport costs fell and inexpensive grains were imported from the British colonies; and the Keynesian tradition was established in the era of the Great Depression at a time when commodity prices were at an historical low.

For the neo-classical economists of the late nineteenth and early twentieth centuries, labor and capital were the more binding constraints on growth. As

a result, the productive role of natural resources was largely ignored, and the marginal product of natural capital was assumed to be zero. Circumstances have now changed again. Rapidly growing populations and advanced technologies have eased the constraints of labor and capital, while accelerated growth and the exploitation of natural resources have created situations in which natural resource and environmental constraints have become binding.

Income in the context of the GDP does not precisely correspond to either the classical economists' definition of income, or to the Hicksian definition. The SNA, from which the GDP is derived, is claimed to be theoretically neutral and not aligned with any particular school of economic thought.<sup>4</sup> In the SNA, much of the cost of capital maintenance is subtracted from total revenues as intermediate expenditures, and depreciation of man-made capital is imputed to arrive at net domestic product (NDP). The resulting figures will not correspond to the classical economists' revenue/income, but rather reflect their concept of "net revenue."

To the extent that natural resource depletion or environmental degradation erode productive capacity and wealth, the GDP will not reflect Hicksian income either. While debits are made for the depreciation of man-made capital in calculations of net national income, the depletion of natural capital is not reflected in the current accounting system. The measure fails to reflect a decline in the country's natural assets and productive capacity when, for example, minerals are extracted or fisheries and forests are over-exploited. To measure true Hicksian income, the portion of revenues derived from the consumption or sale of capital must be charged against total revenues.

If GDP is interpreted as a measure of Hicksian income which can be consumed entirely without cost in terms of future production, when in fact it is calculated gross of capital consumption, economic signals will be misread and the ensuing level of consumption will clearly not be optimal. To avoid over-consumption, the definition and measurement of income must be consistent and well understood.

The GDP neglects to measure other important sources of economic production as well. Subsistence farming, for example, is imputed in some instances but not routinely included in measures of national income, despite its obvious value to the economy. In these cases, national income is likely to be understated. By neglecting the role of natural resources in the economy, however, Hicksian income will be overstated by an amount equal to the consumption of natural capital. The policy implications in the latter case are more serious. By overstating income from natural resource-related activities, policies which in fact draw down natural assets, degrade the environment, and decrease future productive capacity, appear on paper to be successful income-generating activities.

GDP as it is currently constructed tends to overstate the Hicksian income of resource-related activities by failing to separate capital consumption, which is a decrease in wealth, from income. The gross revenue from a sale of non-renewable resources, or from the sale of renewable resources without adequate concomitant regeneration, does not reflect income in a Hicksian sense. The seller will clearly have decreased his capital and, if he consumes the full revenue of the sale, will be less well-off after the transaction.

To calculate Hicksian income, any decrease in wealth must be charged against gross receipts. The sale of a non-renewable resource or the irreversible over-exploitation of a renewable resource, contains a component in its price which reflects the final nature of the sale. The GDP, which defines the total revenues of resource sales net extraction costs as income in the national accounts, fails to distinguish the capital component of such a sale, thereby overstating Hicksian income. It records as current production and income that which is, at least in some part, the sale of an asset and a decrease in wealth.

The failure to separate income from capital will also make the GDP a misleading indicator of welfare. The depletion and degradation of a country's natural resources will decrease its wealth and future productive capacity. The externalities associated with such activities often decrease welfare in more immediate ways as well, particularly in low-income countries. Deforestation, for example, will decrease the availability of fuelwood and minor forest products for households, and increase flooding and soil erosion affecting households and farmers in the area. Pollution will decrease the availability of free potable water and increase illness, which in turn will also decrease productivity and income. While it is not feasible to account for all externalities in adjustments to GDP, an attempt should be made to reflect these costs.

Income must be clearly defined and calculated so as not to confuse income generation with the erosion of natural capital and wealth. It is no longer appropriate to exclude natural resource and environmental accounts from measurements of growth and welfare. Resource depletion and environmental degradation have real implications for sustainable income and future wealth, and must therefore be included in the analysis of national income.

### **CURRENT CALCULATIONS OF THE NATIONAL INCOME ACCOUNTS**

The national income accounts are designed as a systematic and consistent set of data which registers the production, distribution and use of goods and services produced during a specified time. The System of National Accounts (SNA) was standardized by the United Nations in 1968 and its framework has been

almost universally adopted, though in some cases it has been slightly modified.

The SNA recommends the compilation of both flow accounts and balance sheet accounts, which are related through capital finance accounts. Flow accounts receive by far the most attention at a national level. Nowhere in the core flow accounts of the SNA are natural resources and the environment explicitly included. Balance sheets, according to the 1968 SNA, are not elaborated but are compiled under separate cover. Natural and environmental asset stocks are not included in these balance sheets.

The gross national product (GNP), which is calculated using the national income accounts, is defined as the market value of newly-produced final goods and services supplied by the residents of a country, *without* deduction for capital consumption. Final goods and services are those which are not resold in the specified accounting period. The gross *domestic* product (GDP) reflects only that production which takes place physically in the country, in contrast to the GNP which includes output produced abroad but owned by a country's residents. Remittances from nationals working abroad, for example, are included in the GNP but excluded from the GDP. The opposite is true for countries hosting foreign workers.

To avoid double counting, a value added approach has been adopted in the national income accounts which defines the income generated by each economic activity as the value of its output minus the value of all intermediate inputs. This process nets out the value of intermediate products which will necessarily be embodied in the value of final products. When production entails the extraction of natural resources, income is recorded as total revenues less extraction costs. No costs are deducted either for the inherent value of the resource, or for any damages associated with its removal. Failing to subtract such costs misleadingly inflates the value added generated by the resource-related industry, and translates the sale of a resource into income generation.

Inconsistencies also exist in the treatment of environmental cleanup or rehabilitation costs, which, in effect, are valued according to the actor, rather than the activity, involved. If a firm takes measures to reduce or mitigate the environmental impacts of its production process, the expense is considered an intermediate cost and is netted out of the firm's value added, thereby lowering national income. The same actions, when taken by a household or the government, are classified as final expenditures and actually increase national income.

The national income accounts are limited primarily to those producers in the formal market. Producers generally include enterprises, households and the government. For some activities, such as subsistence agriculture, the value of production may be imputed. The decision to include imputations, and the

methodologies employed, vary by country. There are other important activities, however, which are simply excluded. For example, the value of the services rendered by a household servant are included in the GDP, while the value of the same services performed by a family member are excluded entirely. In the case of household services, the United Nations claims that the level of services which would necessarily be imputed and added to national income would be so large that it would reorient the nature of the System away from its current purpose as a record of monetary transactions. Aside from this example, the general rule of thumb is that those activities which can be easily estimated by comparison to similar market activities will be imputed. But such coverage varies widely among countries.

Capital depreciation is the most commonly imputed measure in the national income accounts. The net national product (NNP) is the GNP less capital depreciation. Likewise NDP is defined as GDP less capital depreciation. Depreciation does not reflect an economic transaction, but is imputed to capture the declining income-generating potential of an asset over time. Allowances for capital consumption reveal the level of investment necessary for a country to maintain its productive capacity.

To measure income in a Hicksian sense, depreciation must be deducted from total income generated. Yet depreciation is only imputed and deducted for reproducible man-made capital. No analogous depreciation is imputed for natural assets. Particularly in developing countries which rely heavily on resource-related industries, the exploitation of resources and degradation of the environment clearly weaken the economy's productive capacity. If the depletion of natural assets weakens the productive capacity of a country in the same way as the depletion of man-made assets, there seems to be no justification for imputing depreciation in one case but not in the other.

As a consequence of the recognized deficiencies in the present accounting system, the construction of supplementary natural resource accounts has been widely debated.

### PHYSICAL VERSUS MONETARY ACCOUNTS

Resource accounts can be constructed in terms of either physical units or units of value. Physical accounts are advocated as indisputable measures of environmental change which can be used to influence public opinion and environmental policies. Physical accounts are simpler to construct and less controversial than accounts of value. Proponents of value accounts, however, argue that physical accounts would be an inadequate tool for policy making because trade-offs could not be clearly expressed, and effects on long-term income generation could not be illustrated.

In most cases physical accounts are a necessary prerequisite to value accounts. Important methodological and theoretical issues arise, however, when assigning monetary values to resources and the environment. Even when compiling physical accounts, resources are measured in different units which must be reconciled. When compiling accounts of value, an appropriate method of valuation must be found. Natural resources and environmental services are by their nature complex to value. Resources generate value when they are extracted or processed, but often they also provide valuable services by simply remaining in place. While the value of most capital assets will decline over time, in the case of natural assets, growth and regeneration may increase the value of a capital stock over time even without management or maintenance investments. The environment performs services with regard to life support and waste assimilation which are extremely difficult to measure. Specific methodologies, with clearly stated theoretical underpinnings, must be developed for different resources and environmental services.

Finally, assuming a goal of integrating valued natural resource accounts into national income accounts, a standard by which to determine the acceptable adjustment of national income must be established.

### THE EXPERIENCE OF DEVELOPED COUNTRIES

Norway has developed what are perhaps the most commonly cited and most detailed examples of resource accounts to date. The purpose of the Norwegian accounts was not to create a more accurate measure of true income, but to make information available to the government for the optimal management of resources. The Norwegian accounts are compiled in physical terms and include those material, biotic and environmental resources which are considered economically or politically important: petroleum, minerals, forest products, fisheries, and hydropower. Environmental accounts are also compiled to record land use statistics and the discharge of specific pollutants (Lutz and Munasinghe 1991; Repetto et al. 1989).

In France, similar efforts are being undertaken (Theys in Ahmad et al. 1989). In 1978 the French designed an ambitious system, referred to as the 'patrimony accounts,' to assess the state of the nation's natural and cultural heritage. The accounts attempt to describe all interactions between man and the environment; economic, ecological, and social. They extend beyond the physical environment to include objects of the nation's cultural and historical heritage as well.

The French accounts comprise seven levels of aggregation, ranging from actual field data to global indices of welfare. While the design of the system has been studied extensively, actual implementation of the

accounts has proceeded slowly. A consistent valuation method, for example, has not been clearly established. Opinion remains divided among market value, opportunity or replacement costs, and discounted future revenues as bases for valuation of the physical units. At this stage, only resource level data, similar to that found in the Norwegian accounts, have been compiled.

In the United States the most noteworthy developments may be those which have taken place in the political arena. Actual accounting has been limited to recording data on pollution control expenditures. In 1989, however, pressure from environmental lobbying helped to pass Public Law 101-45, which requires the Department of Commerce to calculate and publish a measure of "gross sustainable productivity." The Commerce Department is responsible for publishing the conventional national income accounts in the United States. In addition, the law requires the United States representatives to the United Nations, the Organization for Economic Cooperation and Development and the multilateral lending agencies, to encourage modifications of the current system of income accounting. While the political advances made in the United States are significant, implementation of the new law suffers from the lack of a clear definition of gross sustainable productivity.

### REVISIONS OF THE SNA AND INTRODUCTION OF THE SEEA

The widely used SNA is currently being revised. Recognizing that current treatment is inadequate, it will be recommended by the United Nations that balance sheet accounts be compiled to reflect changes in natural resources and the environment. This type of modification would preserve the integrity of the GDP as a time series, where a direct adjustment to the GDP itself would cause discontinuity and confusion.

In addition to the SNA revisions, the United Nations has proposed the establishment of a satellite System of Economic and Environmental Accounts (SEEA) which will be an extension of the SNA and will explicitly recalculate the modified indicators (Bartelmus et al. 1989). The SEEA will be more broad than the SNA and record all assets, such as air and water, which are affected by human activities. The accounts will include natural resource depletion and degradation, and transfers from the environment to the economy.

Some, however, argue that the establishment of satellite accounts will not create sufficient incentive for countries to calculate, nor policy makers to utilize, natural resource accounts. The revised SNA will also recommend that the NDP be given greater emphasis in policy analysis. The NDP, by subtracting capital consumption from the GDP, more closely approximates the Hicksian income each country generates and is,

therefore, a better measure of long-term sustainable development.

While the United Nations draft revisions recommend a relatively conservative approach by linking environmental accounts to national income accounts through satellites, others insist that to direct attention to resource accounts the national accounts themselves must be significantly adjusted. Recommendations along these lines include both the adjustment of the NDP and the GDP.

### DEFENSIVE EXPENDITURES

Suggestions have also been made to provide more consistent calculations for those environment- and resource-related activities, currently included in the SNA. The most obvious case is the treatment of environmental protection activities. In the current GDP calculations these outlays, if made by the government or households, are classified as final expenditures and increase national income. It has been suggested that because these activities do not produce but rather maintain environmental services, they should be considered intermediate expenditures, similar to capital maintenance costs, and subtracted from national income as inputs in the pollution-generating activities.

Yet treating all defensive programs in this way may be inconsistent with the basic SNA framework. Such programs would demand increased labor services and goods, which *should* increase the GDP.

### ENVIRONMENTAL STANDARDS

It could be argued that the defensive expenditures which actually *are* made may be less important than those which are *not* made. Another school of thought therefore proposes that the cost of achieving certain environmental standards, based on health and sustainability requirements, should be calculated. These costs reflect the investment necessary to maintain the environment, or conversely, the bill for the depletion of environmental assets (Huetting 1990). The estimation of costs required to maintain such standards entails a great deal of uncertainty as they are hypothetical expenditures and cannot be measured directly. Because it is difficult to predict the effects and linkages of economic activities on the environment, it is difficult to predict the costs and effectiveness of protection programs.

A proposed revision described by Harrison (in Ahmad et al. 1989) suggests that natural assets be treated as capital assets so that the defensive expenditures would be offset by capital consumption. The consumption of natural capital is not included in the current SNA. If capital consumption is defined to be equivalent to the cost of capital maintenance (defensive expenditures), no adjustment would be made to the GDP as long as the environment and resource base were

fully maintained. But if capital consumption occurred without an offsetting maintenance program, GDP would be understated by the amount of the missing program. NDP measures would not be changed as a result. This revision would be consistent with the SNA framework, and with the economic and accounting interpretations of 'gross' and 'net'.

### NATURAL RESOURCE DEPLETION AND DEGRADATION

The proposals outlined above advocate adjustment of the income accounts to reflect either those expenditures we *are* making to protect the environment, our defensive expenditures—or those expenditures which we *should* be making to attain certain agreed upon standards. A more widespread approach in the literature, however, is to attempt to measure and make adjustments for the actual damage done to the environment in the relevant accounting period. These proposals reflect the belief that degradation or damage sustained in a certain period will cause a decline in the future productive capacity of the environment, and should therefore be charged against current income.

There are two main approaches which address resource depletion and degradation directly in the national income accounts; they are the "depreciation" (Repetto et al. 1989 and Peskin 1989) and the "user cost" approaches (El Serafy in Ahmad 1989). Both attempt to address a basic asymmetry in the way the SNA treats natural and man-made capital.

Man-made capital is depreciated in the national income accounts, and the maintenance, management and operating costs of facilities are netted out of an activity's value added as intermediate costs. In the case of natural capital, asset stock accounts are not compiled, and hence not depreciated, to reflect natural capital consumption.

In addition, the cost of maintaining and managing natural capital does not necessarily fall on those who benefit from its exploitation. This asymmetry creates another channel for overstating the GDP. If, for example, the government establishes programs for environmental clean-up or regenerative activities such as reforestation, the costs incurred by the programs will increase national income. The national income will also be overstated to the extent that the costs of these maintenance activities fall on the government, rather than on those who profited by causing environmental damage, inflating the value added of the polluting/degrading activities as a consequence.

The depreciation approach seeks to impute the depreciation of natural assets in a manner analogous to man-made capital assets. Man-made capital is depreciated in the national income accounts so that the

loss of, or damage to, assets is charged against current income to reflect the resulting decline in potential future income. The depreciation approach requires that similar deductions be made for the depreciation of the natural resource stock as well.

The "user cost" approach is built on the assumption that exploiting resources involves a user cost or capital consumption component. It is claimed that subtracting the user cost from total revenues produces a truer measure of the value added which has been generated.

Both the depreciation and user cost approaches claim that national income indicators, as they are currently constructed, are deceptively overstated and likely to inappropriately encourage increased consumption of resources and environmental services. As a result of these accounting procedures, the greater the exploitation of the environment, the more profitable the activity appears. This apparent profitability will, in turn, provide an incentive to increase such activities. Unfortunately, what appears to be remarkable growth and profits may, in fact, be irreversible environmental disinvestment.

### CONCLUSIONS

The need is clear for an adjustment to be made in national income accounting procedures. Current accounting procedures overstate a country's true income and encourage exploitation of the environment by failing to fully value natural resources and environmental services as inputs and assets, and by failing to account for their depletion or degradation.

What is less clear is which approach to modifying the accounts will be most correct and effective in bringing about appropriate policy changes. The various modifications discussed above suggest broadening the scope of income accounting. In so doing, care must be taken to examine all relevant definitions and assumptions for consistency within the overall accounting framework, and within the context of economic theory. When working to integrate a system as complex and interrelated as the environment, care must also be taken to avoid 'second best' solutions. To partially integrate the environment, simplifying assumptions and abstractions are necessary. It is therefore possible that these partial modifications may produce measures at least as distorted as the current ones.

Hicks stated that: "The purpose of income calculations in practical affairs is to give people an indication of the amount which they can consume without impoverishing themselves" (Hicks 1937). If this is the case, then a direct comparison of the policy implications of the various methodologies might be the most appropriate measure of their worth.

## ENDNOTES

- <sup>1</sup> Hicks states: "The purpose of income calculations in practical affairs is to give people an indication of the amount they can consume without impoverishing themselves. Following out this idea, it would seem that we ought to define a man's income as the maximum value which he can consume during a week, and still expect to be as well off at the end of the week as he was at the beginning....Remembering that the practical purpose of income is to serve as a guide for prudent conduct, I think it is fairly clear that this is what the central meaning must be" (Hicks 1939).
- <sup>2</sup> "The gross revenue of all the inhabitants of a great country comprehends the whole annual produce of their land and labour; the neat revenue, what remains free to them after deducting the expense of maintaining; first, their fixed; and, secondly, their circulating capital; or what, without encroaching upon their capital, they can place in their stock reserved for immediate consumption, or spend upon their subsistence, conveniences, and amusements. Their real wealth too is in proportion, not to their gross, but to their neat revenue" (Smith 1776).
- <sup>3</sup> Commodity prices in early nineteenth century England were propped up by a sliding-scale duty system which prevented cheap imported grains from entering the domestic market, and prompted a heated free trade debate, focusing on the repeal of the 'Corn Laws.' The effects of the grain import duties were compounded by poor crop yields and the devastations of the Napoleonic Wars to drive commodity prices to unprecedented highs (Heilbroner, 1953).
- <sup>4</sup> "Although the System is designed essentially for market economies in which prices are determined and resources allocated mainly by the interplay of market forces, it is otherwise intended to be theoretically neutral. It is not geared to any particular school of economic thought – Keynesian, neo-classical, monetarist, etc. Economic theory does not always provide very clear criteria or guidelines, however, for implementation within the System. For example, the concept of income is not precisely defined in economic theory" (United Nations 1991).

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# Enabling Connections: Information Technologies for Rural Development in Thailand\*

Bryan Bruns

Telephone, radio, satellite-based communications and computer data networks can play a strategic role in improving communications for rural areas and for organizations providing services to rural people.

Computers, for instance, offer the potential to assist government agencies and private organizations to manage large amounts of information and to provide faster, more responsive services.

Computers can link together in networks, combining computers and telecommunications, to overcome distance. Networks carrying voice, fax, computer data and, eventually, video information, form the “infrastructure of the information age.” They will be a crucial factor influencing the course of development in both cities and rural areas over the coming decades (Williams 1991). Such an information infrastructure can enable people to improve their lives and actively participate in social and economic development (Pool 1990).

Telephones are often mistakenly viewed as luxury goods in development, relevant in urban areas only. Yet research in Thailand and elsewhere has shown that telephones provide major benefits in improving economic productivity and quality of life in rural areas as well (Chu, Srivisai, and McDowell 1985, Leff 1984, Hudson 1984). Similarly, telecommunications can help businesses and government agencies to provide better services and to deliver goods and services quickly in response to local needs. Telecommunications can allow people in rural areas to keep in touch with friends and relatives elsewhere, and quickly call for help in emergencies. Telecommunications can give farmers and other rural businesses better access to timely, specialized information about markets, leading to better decisions. Telecommunications can also enable

businesses to locate in rural areas while still being competitive in the global economy.

Current projects to add three million new telephone lines are an example of how Thailand is beginning to address the need for better telecommunications. The government has opened up many areas, such as cellular telephones, paging, and data networks for private participation, under concessions from state agencies. There is extensive debate over how to improve the performance of the agencies involved and the role the private sector should play. Plans are now underway for the launching of a Thai satellite. Almost all the activity and discussion has focused, however, on services for the Bangkok area. There is little discussion of telecommunications in the development of rural areas.

This report provides information from an exploratory study of information technologies and rural development in Thailand. Interviews were conducted at government offices, businesses and non-government organizations, as well as service providers—ranging from the Telephone Organization of Thailand (TOT) to operators of public telephones in rural areas. The results of this research suggest that there are many opportunities for information technologies in promoting rural development.

## VILLAGE TELEPHONES: THE BASIC LINK

The fundamental requirement for rural telecommunications is access to telephone services. The present distribution of telephones in Thailand is highly concentrated in Bangkok. According to the 1990 Census, 38 percent of private households in the Bangkok Metropolitan Area have telephones.<sup>1</sup> For other regions, rates range from 7.2 percent in the Central Region to 2.6

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percent in the Northeast. For non-municipal areas overall, the rate is 2.6 percent of households. These are mostly in district towns.

Of the 60,000 plus villages in Thailand, TOT has installed telephones in only about 3,000. By the end of the Seventh National Plan in 1996, telephones should be installed in 4,500 additional locations. Yet over 50,000 villages will still be without telephone services.

The present program concentrates on installing public telephones in the main village of each *tambon* (subdistrict), based on the assumption that the primary need is for calls outside the village.

The aim is to install three telephones per village, usually with one telephone at the home of the *kamnan* (subdistrict headman), and two public coin phone booths. In practice, however, often only a single telephone is installed—at the home of the *kamnan*. His household operates the phone as a public call service. They receive 10 percent of the revenue from calls. If there is an outside call, they notify the person concerned. Their fee may range from 10 to 50 baht, depending on how far away the person to be notified lives. The operator also receives 10 percent of the revenue from the call.

Often only a single telephone is installed, due to technical problems with the TDMA radio system, which usually links telephones with local exchanges.<sup>2</sup> Installing only a single telephone creates a local monopoly of sorts. This makes those villagers operating the phones unenthusiastic about more telephones, which would create competition. Locating the telephone in the *kamnan's* home further increases his power.

Emphasizing public services was supported by the research of the Thailand Telephone Study conducted by the East-West Center of the University of Hawaii (Chu, Srivisai, and McDowell 1985). The study estimated that benefit-cost ratios ranged from 2.0 to 8 or more, suggesting very large benefits from installing telephones. Most benefits come from reduced time spent travelling to deliver messages and are not reflected in telephone

revenues. Telephone organization officials, therefore, tend to view rural telephone services as a money-losing activity. They are accustomed to making investment decisions based on the revenues which can be obtained. They give less weight to equity issues or to the indirect economic benefits of telecommunications.

Leff (1984) argues that in developing countries the indirect economic benefits of telephones are high, and that current planning fails to take them adequately into account, thus leading to under-investment in telecommunications. This seems to be the case in Thailand, where the availability of rural telephone services is still very low. An alternative in rural areas is cellular telephones.

### CELLULAR TELEPHONES FOR RURAL SERVICE

Thailand is rapidly expanding cellular telephone services, which now include three services—at 470, 800 and 900 MHz. While these principally serve urban areas, they also provide an available, although expensive, alternative for areas currently lacking regular telephone services.

The service area of cellular cells is usually given as 10 to 20 kilometers. However, depending on terrain and other factors, cellular phones can often be used much farther away from base stations, particularly the 470 MHz frequencies. With a fixed antenna these can operate up to 100 kilometers from base stations. The cost of a 470 MHz mobile phone unit and antenna is 100,000 baht or more.

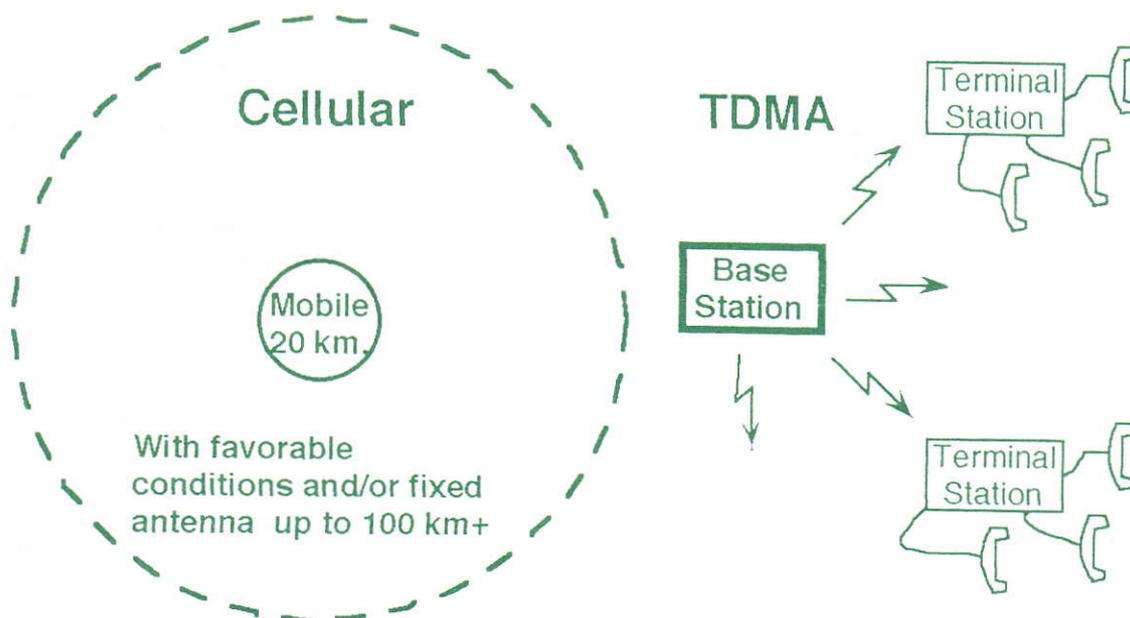
The number of base stations is rapidly expanding for all three networks. Planning for expansion could give more explicit weight to a cellular service as an alternative for areas where private wired lines are unlikely to be available soon.

Current plans are to begin a digital cellular service in 1993. This will provide a service compatible with a fully digital system and ISDN standards. Telecommunications theorists have suggested that in the long run almost all telephone services will use radio links as personal communications networks (PCN). Individuals will have their own telephones and the “intelligent network” will locate them—or act as an answering machine when they do not want to receive messages.

The growing global system of satellites, proposed by Motorola and its competitors, will probably make cellular-type telephone services available from anywhere in the world by the mid 1990s. As currently envisioned, this may require dual-purpose telephone sets which would use local cellular systems where possible, and satellite links where ground cellular base stations are too far away. Initial charges may be somewhat higher than current international telephone rates (perhaps \$3.00 per minute). While expensive,

- Save time spent travelling
- Ability to request emergency services
- Keep in contact with friends and relatives
- Better information for decisions, e.g. prices
- Increased availability of goods and services
- Wider markets
- Allow business decentralization
- Improve education

Figure 1 Benefits of Rural Telecommunications



**Figure 2 Cellular and TDMA—Alternatives for Rural Telephone Services**

telephone services should thus be available anywhere in the world before the end of this century.

Another emerging technology is the micro-cellular service. The clustered nature of villages in rural Thailand means that investment in this technology could become a viable alternative to eventually installing wired telephones. The costs of cellular telephones should continue to decline, while the greater flexibility, reliability, and lower maintenance costs of cellular telephony should continue.

### EXPANDING VILLAGE TELEPHONE SERVICES

The program to provide public telephones at the subdistrict level reportedly compares favorably with attempts to provide rural telephone services in many other nations. When set against the total of more than 60,000 villages, however, services for 5,000 subdistrict centers only fulfill about 10 percent of the need for even minimal services.

The question is how long will it take before telephone services can be provided for at least a few public telephones per village? At installation rates for 4,200 stations over five years envisaged in the Seventh Plan, complete coverage of public phone services for all villages would not occur until the year 2061 (B.E. 2604).

It seems likely that basic public telephone services should be considered a public service and subsidized to the extent necessary. Most benefits, however, are indirect and do not show up in revenues. The increasing pressures towards privatization and competition mean that using revenues from urban areas to cross-subsidize rural areas will be progressively reduced. Therefore, if village telephone services are to be made available, it will probably require an explicit subsidy, for example to cover the initial installation cost.

During interviews, the cost per station of the tambon telephones was reported to be about 1.5 million baht per station, with each station serving three telephones. However, the overall cost for installing 1,813 locations from 1984-92 was 1,200 million baht (US\$45.7 million) or about 662,000 baht per station. For the 1992-96 program, the average cost per station is estimated to be 800,000 baht, or US\$32,000 (Warachat and Wuttisarn 1990; Cusripituck 1987).

There is little information publicly available on this program and analyzing the costs per line quickly becomes complex.<sup>3</sup> Costs seem high compared to installations in other countries, where costs are reported as only 50,000 to 250,000 baht (US\$2,000 to US\$10,000) per line. If the cost of 800,000 baht per station is accurate, more consideration should be given to using cellular telephones instead of the current TDMA links.

Current policies provide little opportunity for further expansion of telephone services—to local businesses, schools, health stations, temples or other organizations—which might have the ability to pay. Nor do current policies allow much scope for local initiative and expansion.

The provision of rural telephones could be accelerated by making telephones available to those willing to pay. This is likely to be both more efficient and fairer than rationing telephones according to positions on a waiting list.

### TWO-WAY RADIOS

Many government agencies, including schools, agricultural extension and health services, are currently expanding the use of portable two-way radio transceivers. Local administration and police officials have used such networks for a longer time. Typically,

Total number of villages	62,000
Currently served	3,500
Planned 1992-1996	4,500
<hr/>	
Villages without telephones at the end of the Seventh Plan	54,000

**Figure 3 Villages With and Without Telephone Services**

such systems are composed of different levels—one to link officials working within a local district, and a separate network to link district offices with the provincial center.

For two-way radios, each person must pay for the radio unit on his own, a cost of nearly 10,000 baht. Willingness to spend this amount again shows the value placed on good communications, which help reduce travel, improve coordination of activities, and make emergency assistance more readily available.

Compared to telephones, two-way radios have the advantage that users do not have to pay service charges. They do have to listen for messages. The main disadvantage is that such radios only link a relatively small group of people on a single channel. Thus they are ultimately inferior to telephones, either fixed or portable. Yet, in the short term, they may be the only relatively cheap alternative in rural areas. In the long term, it will be more efficient to make rural telephone services more widely available. A decline in the price of portable telephones will also reduce the gap between the two technologies, making full-scale telephone services more affordable.

These networks are an example of the tendency of individual agencies and organizations to set up their own private networks. The Interior Ministry has received authorization for several billion baht to set up a trunked radio system, linking district offices all over the country in a national network providing phone, fax, and data services. It already has a network linking provincial offices with the Ministry headquarters in Bangkok.

In some cases, a private network may be the only choice. Creating private networks, however, reduces the number of larger, more technically-advanced users employing the public network, thus reducing pressure for innovation. Large users gain access to services unavailable to smaller businesses and individuals. Bypassing the public network also reduces the number of users contributing to fixed costs, thus losing economies of scale.

## DATA COMMUNICATIONS

Computer data can be transmitted over existing telephone lines, though the present maximum rate is only about 9600 baud—slow for high speed or high volume uses. Other alternatives are direct satellite links or packet switching networks set up specially for computer communications.

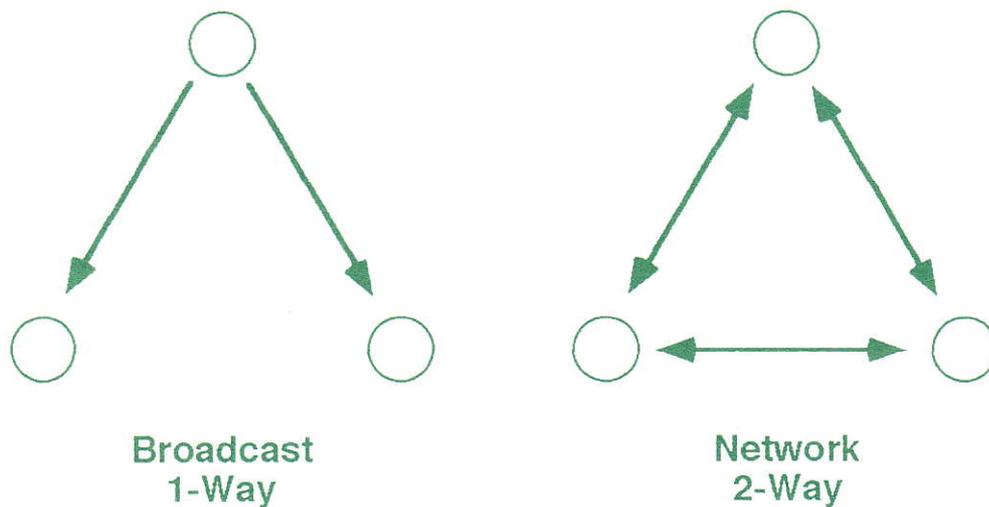
Satellites already relay telephone calls both internationally and between different parts of Thailand. Very small aperture terminals (VSATs) allow businesses to have access to satellite-based communications. Banks, factories, and other businesses, located in areas where regular telephone services are not available, already use VSATs. They are obviously an important alternative.

Most rural businesses and households cannot afford VSATs. As do private radio networks, VSATs *bypass* the public switched telephone network. Except for very high band width uses, such as video links, the public telephone network is likely to be a cheaper alternative. As fiber optic cables become more available, the band width from the public telephone network will continue to increase for areas within reach of cables. The increasing “intelligence” of the telephone network makes possible “virtual private networks” which offer large users the benefits of their own network.

The Communications Authority of Thailand provides a packet switching network (Thaipak), available both within the country and for international links. This offers reliable communications between computers. In theory, packet switching should allow more efficient use of communications networks, and thus lower costs. But the system’s rates are prohibitive for most users for services other than low volume electronic mail. There are no discounts for educational users or for times of day when demand is low. Rates are apparently set by a monopoly not particularly responsive to customers. At current Thaipak rates, high speed error correcting modems, operating over voice lines, offer competitive performance, at least for some uses.

The technology of packet switching data networks does not require a monopoly for domestic or international services (Ambrose, Hennemeyer, and Chapon 1990:11). Domestically, such value added services could be offered on a competitive basis. The increasing number of satellites means there is also no natural monopoly in international linkages and means an increasing potential for competition, although INTELSAT and the interests associated with it may try to block or delay liberalization (Hudson 1990).

One of the major uses for packet switching networks is to send and receive electronic mail. Electronic mail is rapidly growing in the U.S. and other countries. E-mail can be cheaper and far faster than postal mail. E-mail allows people to send and answer messages at their own convenience. E-mail can be cheaper than fax, while



**Figure 4 Telecommunications Allows Two-way, Network Communications**

providing higher quality. The recipient can store the message and manipulate data, without retyping it, or send it on without loss of quality.

Computer information services rely on data communications and are a large and growing business in the U.S. and Europe, and elsewhere. Early versions were on-line research services for bibliographic research or services to provide timely information, for example on stocks. Currently, Compuserve, GENie, Prodigy, America On-line, and other smaller, specialized organizations, provide electronic mail, special interest discussion groups, shopping, research and many other services. Government agencies, researchers and private organizations are linked by the worldwide Internet system. The Internet system provides not only electronic mail links between many different computer networks, but also real-time links to remote computers and access to a huge volume of on-line information, such as library catalogs and computer programs.

These services have great potential for helping people to connect with others who share similar concerns. There is still much to be learned about how to organize the availability of information in computer information services. It is, however, clear that, while the volume of information is potentially overwhelming, there are many techniques for helping to filter information so that people can more easily obtain only the information they need. Such services can have a major impact on activities, such as agriculture, where timely and in-depth information can be crucial. They could help enable such services as agricultural extension to shift from a largely one-way broadcast mode of operation to an interactive approach more responsive to client requests.

Computerized information services are still in their infancy in Thailand. Datanet provides a special service

allowing simultaneous use of a single telephone line for both voice and data communications. Datanet services include a computer bulletin board service, electronic mail, plus other services. At present, these are only available in Bangkok. A national project is in the process of linking together major universities and will provide them with a linkage to the Internet. An interesting proposal has been made, and efforts begun, to organize a public access data network which could open electronic communications to all users in Thailand, rather than just those with access to university or corporate systems (Tantsetthi 1991).

Facsimile machines have spread widely in Thailand. They are much used where available. Permitting individual users to buy fax machines, requiring no prior permission, seems a successful example of deregulation. Fax machines provide documents which can be either copied or saved, particularly important to government bureaucracies. Public fax services make technology available to those unable to buy a fax machine of their own. However, since fax communications usually depend on telephone links, they can only be used where telephone services are available.

All these technologies help make distance irrelevant, potentially allowing people in rural areas to connect with information resources and people wherever they are. This is important not only for farmers or businessmen in rural areas, but also for organizations providing services to rural areas.

## COMPUTERS AND DATABASES

The use of computers is transforming businesses and other organizations in the U.S., Europe, and Japan. Rapid, computer-based communications, for instance,

- Shortage of skilled personnel
- Loss of skilled personnel to other employers
- Difficulties in purchasing
- Multiple, incompatible standards for Thai language
- Shortage of Thai language software
- Lack of incentives to use computers to increase productivity
- Lack of organizational changes to take advantage of computers

**Figure 5 Constraints on Computer Use**

can play a key role in such innovations as “just in time” inventory management.

While there are many success stories of individual organizations using computers and communications to gain strategic advantages, there is also a growing concern that investments in computers do not necessarily increase productivity. The first lesson is that investments in hardware alone are not sufficient. A variation of Parkinson’s law may operate so that, rather than bringing benefits of higher productivity or lower costs, “work expands to fit the newly available time”.<sup>4</sup>

In Thailand, computers have yet to have much impact on the operation of most businesses, government or organizations outside Bangkok. Computers are being adopted relatively slowly. Most computers are used merely to make activities faster and more convenient. They seldom lead to new goods or services.<sup>5</sup> Banks are the leading private organizations using computers and telecommunications, mostly for automatic teller machines and on-line transfer of funds.<sup>6</sup>

Libraries may be the most advanced public sector organizations employing information technologies, particularly computerized data bases. This began with on-line databases. More recently, these have been largely replaced by CD-ROM discs. These hold huge amounts of data. The discs themselves are cheap to manufacture.

Provincial libraries in Thailand are establishing a network (PULINET) which will eventually enable computer searches of all libraries to help those libraries who need to borrow books from others. This network will offer better services and allow some libraries to specialize.

Within government agencies serving rural areas, a number of factors hinder the use of computers. Even though the national committee for screening computer purchases has been abolished, procurement is still relatively difficult, requiring much red tape.

Government purchasing requires detailed specifications and it usually takes a long time before funds become available. By the time it arrives, the equipment is too often obsolete. If decisions to purchase computers could be made at lower levels, this could lead to better choices of hardware, software, and support services.

There is also a bias toward capital investment, to the neglect of operations and maintenance costs. Banks have addressed this issue by contracting-out activities for installing and maintaining both hardware and software. This is likely to be a more realistic alternative than trying to build up a large capacity within the government. Service contracts offer predictable costs, and thus fit government budgeting procedures better than delaying maintenance until the equipment breaks down.

Lack of staff to operate computers was the most frequent complaint of people in government offices interviewed during the research. Existing courses train only one person at a time from any given office. These trained people then often transfer away or leave government service altogether. Wages are more attractive in the private sector. A possible solution might be to change the view that computers are specialized equipment, only to be used by highly trained persons. If computers are to be used effectively, all staff should know how to use them.

Computer use in government offices seems largely restricted to provincial offices. The two district offices visited during this study previously had computers, but

*Under present plans, over 50,000 villages will still lack convenient access to public telephone services in 1996. There would be large benefits, economic and non-economic, if the provision of public telephone services could be further accelerated.*

*Cellular telephones, local cost-sharing and other innovations could help improve the availability of private telephone services for rural businesses, individuals, schools, and other organizations which may be willing and able to pay the full cost of telephone services.*

*Government regulations and concessions in telecommunications should encourage competition, innovation, better services, and lower costs, rather than simply replacing government monopolies with private monopolies.*

*Education, training, and other measures are needed to overcome the scarcity of skilled people able to use computers to increase productivity and provide better, more responsive services in the private and public sectors.*

**Figure 6 Research and Policy Issues**

in both cases their computers had been borrowed, and not returned, by provincial offices.

According to those interviewed, the main use for computers is to store information. This could reduce the great mass of paper files currently kept. For records, computers are a convenient way to keep files up to date and accessible.

In many cases computers' potential go unrealized. Information is stored but never recalled. There is the appearance of computer technology, but little actual benefit. In theory, computers could help greatly in managing complex activities, such as budget planning and allocation. These activities are still largely done by hand or typewriter. Even planning systems have had little impact on operations at the provincial or district level.

The lack of a single standard for the Thai language commands on computers is another significant obstacle. Conversion programs exist, but are not widely available, making it difficult to combine information from different government agencies. As long as multiple standards exist, government or private efforts should try to ensure that conversion of data between standards is easy and widely available. Lack of Thai language software is another problem though it is now becoming available. What is needed are more incentives for producing software in Thai—either locally-written programs or localized versions of software from other countries.

The adoption of computers is far from a panacea. Hardware alone may go unused, or merely replace existing methods with little real gain. Making productive use of information technologies usually requires new skills and changes in how organizations work, if major increases in productivity are to be achieved.

## CONCLUSIONS

Thailand is currently making major efforts to increase the number of telephone lines available country-wide. This could be strengthened by providing public phones to all villages as soon as possible. Upgrading local contributions to cost could help expand networks beyond a few public telephones per village to also serve businesses, schools, health stations, and other organizations. Cellular telephones could play a significant role in providing a flexible, quickly available service without expensive investments in wiring.

Two-way radios provide communications for limited groups of users. VSAT satellite dishes allow businesses in rural areas good communications links, even when the local telephone service is inadequate. Such alternatives should be allowed, given the current limitations on expanding telephone services. Most users would, however, prefer to use a public telephone network were it available. Expanding the public network would broaden the customer base and help cover the

overheads in providing services and in fostering innovations in services available to all users.

By promoting competition, privatization could promote innovation, better services, and reduced costs. Competition pushes businesses to extend services to more customers, innovating and seeking new market niches, rather than just focusing on wealthier clients in urban areas.

But privatization, which simply replaces government monopolies with private ones, may combine the worst aspects of both—high costs and slow bureaucratic service. Technological changes have eroded many of these outdated, “natural” monopolies. Competition can now be encouraged in almost all areas except, perhaps, basic wired service. Pricing and service should mainly be left up to market forces. If subsidies are needed for basic rural telephone services, they should be funded directly, rather than hidden in cross-subsidies from urban or business users.

Investment in computer hardware alone, however, is unlikely to increase productivity. Investment in equipment must be accompanied by training and funding for technical assistance and maintenance. Given the scarcity of computer skills, service contracts are likely to be a more effective approach than trying to develop strong computer skills within each government agency. So far, most computer use—except for banking—seems largely directed at speeding up existing activities. Using computers to manage and deliver information will require training more people and reorganizing institutions. Better access to other people and to information resources can help people in rural areas to improve their lives, and take an active part in their nation's social and economic development.

## ENDNOTES

- <sup>1</sup> National Statistical Office 1991.
- <sup>2</sup> Some wireless links are also made using analogue multiple access, single channel radio and multiple system (cable and radio). Wired connections are used for sites up to about 10 kilometers from the telephone exchange (Sumrej Srestasathiern 1991).
- <sup>3</sup> The figures here are based on Kamrob Warachat and Tipawan Wuttisarn (1990). It is somewhat unclear, but these costs seem to be per location, i.e., per village served, where each location has an installed capacity of three lines.
- <sup>4</sup> Williams 1991: 34.
- <sup>5</sup> Hughes 1990.
- <sup>6</sup> The controls on the number of banks in Thailand still restrict competition, innovation and service improvement in this sector. The recent deregulation of banking in Indonesia demonstrates the potential of competition to improve the capacity of the finan-

cial system to mobilize capital and offer savers rewarding investments, using attractive interest rates, competitive services, and rapidly expanding branch networks to mobilize domestic savings into more profitable forms of investment. Competition pushes business to extend services to more customers, innovating and seeking new market niches, rather than just focusing on wealthier clients in urban areas. In the same way, competition in telecommunications could promote more economical and widely available services.

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## NEWSBRIEF

### KHUN ANAND PANYARACHUN ACCEPTS CHAIRMANSHIP OF TDRI

Former Prime Minister Anand Panyarachun has been elected TDRI's new Chairman. He has accepted the post and his term will begin 12 June of this year.

Khun Anand was elected by the Council of Trustees last month to succeed Dr. Snoh Unakul, a Deputy Prime Minister in the Anand administration, who tendered his resignation for health reasons.

Dr. Snoh was TDRI's Chairman since its founding in 1984 and has realized his ambition in seeing TDRI become the country's principal independent policy research institute. Khun Anand has also contributed to TDRI as an active member of the Institute's Council from the beginning.

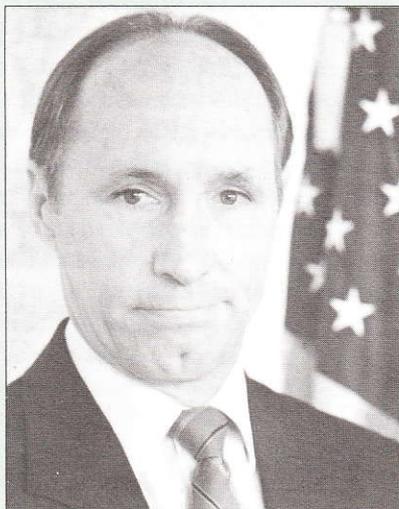
Khun Anand, who returned to his post in private business as Chairman of the Saha Union Corporation Limited after the general election of March of this year, is a leading member of Bangkok's business community. Before joining the private sector, Khun Anand was a highly-regarded diplomat in the international community, serving as Thailand's Ambassador to the United Nations, Canada, the United States and also as Permanent Secretary of the Ministry of Foreign Affairs. As a policy maker, he is highly respected for his competence and integrity.

Khun Anand's experience will greatly contribute to TDRI's future direction in moving from research on Thailand alone to the region as a whole.



*Deputy Prime Minister Dr. Snoh Unakul (left) and Prime Minister Anand Panyarachun attend a press conference after their audience with His Majesty the King.*

### AMERICAN AMBASSADOR JOINS TDRI'S GOVERNING BODIES



The American Ambassador to Thailand, David Floyd Lambertson, has accepted an invitation to join TDRI's Council of Trustees. Mr. Lambertson is a career diplomat who first joined his country's foreign service in 1963. Before his present assignment in Thailand he was, from 1990 to early 1992, Diplomat-in-Residence at the University of Kansas, his native state.

From 1987-1990, Mr. Lambertson served as Deputy Assistant Secretary of State for East Asian and Pacific Affairs in Washington D.C.

During his long career as an American diplomat, Ambassador Lambertson has served in various important posts: Liaison Officer and Press Spokesman for the U.S. Delegation to the Paris Peace Talks; Deputy Director of the Office of Japanese Affairs; Director of the Office of Korean Affairs; Deputy Chief of Mission, Canberra, Australia; and Deputy Chief of Mission, Seoul, among other posts.

## TDRi Hosts 1992 Pacific Basin Conference on Hazardous Waste

TDRi's Natural Resources and Environment Program (NRE), in association with the National Environment Board, recently co-hosted the 1992 Pacific Basin Conference on Hazardous Waste, held in Bangkok's Ambassador Hotel from 6 to 10 April, 1992. The Conference was sponsored by the Pacific Basin Consortium for Hazardous Waste Research and co-sponsored by a number of national and international agencies, including the U.S. Environmental Protection Agency, the United Nations Environment Programme, and the National Institute for Environmental Health Sciences.

This was the fourth in a series of conferences held on hazardous waste research in the Pacific Basin. The traditional view of hazardous waste management experts has been to treat such waste first and then dispose of it. At the third 1990 Pacific Basin Conference on Hazardous Waste Research, held in Honolulu, Hawaii, however, a new trend in this attitude emerged.

The focus on how best to deal with waste has now shifted, from ensuring that wastes are relegated to a safe disposal area, or "grave," to dealing with the wastes as they are first generated, or "in the cradle." The 1992 Bangkok Conference concentrated on this changing attitude, giving participants the opportunity to attend training courses, plenary sessions, presentations of technical papers, and discussions on the latest developments in hazardous waste management.

After a welcoming speech by Dr. Dhira Phantumvanit, Program Director of NRE, the opening address, "Environmental Management: Recent Experience in Thailand," was given by Dr. Phaichitr Uathavikul, former Minister of Energy and Environment. Speakers included David Wilson of the



Shown from left to right: Dr. Phaichitr Uathavikul, former Minister of Energy and Environment, gives his Opening Address; Dr. Richard Cirillo, Executive Secretary of the Pacific Basin Consortium for Hazardous Waste Research (PBCHWR); Mr. Malcolm Wilson, Chairman of the Board of Directors, PBCHWR; Dr. Dhira Phantumvanit, Director of TDRi's Natural Resources and Environment Program; and Mr. Randy Herold, Chairman of the Conference Technical Program.

International Solid Waste and Public Cleansing Association, David Nelson of International EnviroSearch, U.S., and Ronnie Tong of the Environmental Protection Department, Hong Kong. Among the training courses were "An Overview of Hazardous Waste Management," "Waste Minimization," "An Introduction to Environmental Toxicology," and "Risk Assessment." Topics discussed during the Technical Sessions covered, among others, "Country Experiences in Hazardous Waste Control," "Biological Processes," "Thermal Treatment," and "Human Health Effects."

More than 150 participants attended the Conference, including professionals in the field of hazardous waste from industry, government, universities, and other organizations.

## Dr. Walter Balk Gives Lecture at TDRi



During his visit to Bangkok, Dr. Walter Balk, an organizational specialist from the State University of New York at Albany, gave a lecture at TDRi, and led a discussion on "Operating Controls and Productivity in Public Agencies" on March 17, 1992.

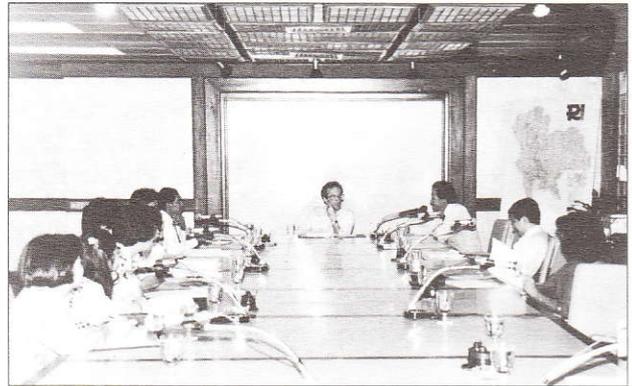
Dr. Balk, who has extensive experience in organizational design, productivity and operations improvement, focussed on productivity and its applications in public agencies.

Among the participants were representatives from the Bureau of the Budget, the Civil Service Commission, faculty members of Thammasat University, and TDRi researchers.

## Professor Reuven Brenner Speaks at TDRI Seminar

Prof. Reuven Brenner of the Center for Research and Development Economics, jointly sponsored by McGill University and the University of Montreal, visited TDRI from April 27 to May 8, 1992, as part of the institutional linkage program, funded by the Canadian International Development Agency (CIDA), between TDRI and Canadian institutions.

During his visit, TDRI's Human Resources and Social Development Program (HRS) organized an in-house seminar, on May 7, with Prof. Brenner as the speaker. Prof. Brenner holds the Repap Chair in Economics at McGill's School of Management and is an Associate Fellow of the Center for Research and Development Economics, University of Montreal. He is also the author of many articles for scholarly journals, newspapers, as well as five books



During this seminar, Prof. Brenner shared his views on two topics: "Measurement Problems and Macroeconomic Policy" and "Entrepreneurship and Innovations: Social Mobility and Property Rights." Since Prof. Brenner is a member of the Canadian Economic Policy Review Board and takes part in Canadian constitutional debates, he also commented on various countries' institutional and political arrangements.

Seminar participants included representatives from the National Statistics Office, the Office of the National Economic and Social Development Board, the Bank of Thailand, Thammasat University, Chulalongkorn University, the World Bank, and, of course, TDRI.

## NEW PROJECTS

### Asia Foundation Awards Research Grant to TDRI

The Asia Foundation has awarded a research grant to TDRI's Sectoral Economics Program (SEP) to undertake a study on "Protection of Software and Its Implication on Market Structure and Indigenous Capacities."

A TDRI research team will investigate Thailand's present protection measures, as interpreted by the local private sector, and their impact on the local market. The study will also provide information and perspectives on strengthening private sector research and development activities, and will recommend strategies to ensure the unhindered and much-needed growth of information industries.

### TDRI to Study Automotive Parts Industry

TDRI's Science and Technology Development Program (STD) has signed a contract with the Industrial Finance Corporation of Thailand (IFCT) to study the impact of trade-related investment measures (TRIM) in the General Agreement of Tariffs and Trade (GATT) on the automotive parts industry. A TDRI research team will study the general effect GATT has on the automobile industry and the impact that TRIM has had on the abolition of compulsory parts. The study will also recommend how best to restructure the automotive parts industry in light of the TRIM measures.

### TDRI to Evaluate Research, Development and Engineering Projects

The National Academy of Sciences (NAS) of the United States has contracted TDRI's Science and Technology Development Program (STD) to evaluate four of Thailand's RD&E (research, development and engineering) projects. These projects were supported by the Science and Technology Development Board (STDB) and Thailand's national centers: the National Center for Genetic Engineering and Biotechnology (NCGEB), the National Center for Metal and Material Technology (NCMMT), and the National Electronics and Computer Technology Center (NECTEC).

Objectives of the TDRI study are to learn from the successes or failures of selected case studies from the RD&E projects, and their policy implications. The study will also gauge the country's technology potential in RD&E, focussing on biotechnology, materials and electronics.

### New Contract with SEAMICO/BIR

TDRI's Science and Technology Development Program (STD) has signed a contract with SEAMICO/BIR to collect information on science and technology manpower educational programs and to publish the results in an information booklet.

## NEW TDRI PUBLICATION

### THAILAND ECONOMIC INFORMATION KIT



TDRI has just compiled its 1992 *Thailand Economic Information Kit*. It contains a wealth of statistical information on Thailand's economic development, such as Gross Domestic Product (GDP), broken down by region and sector. Trade statistics include trade with various foreign countries, Thailand's principal exports, and historical export/import levels. Financial information includes capital flows, country credit rating in the Asia-Pacific region, foreign direct investment, and investment promotion.

The Kit also contains social indicators, such as employment statistics by sector and education level, and employee wages per month. Produced by TDRI's Macroeconomic Policy Program, this publication costs just 100 baht (US\$4.00, plus US\$3.50 postage).



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