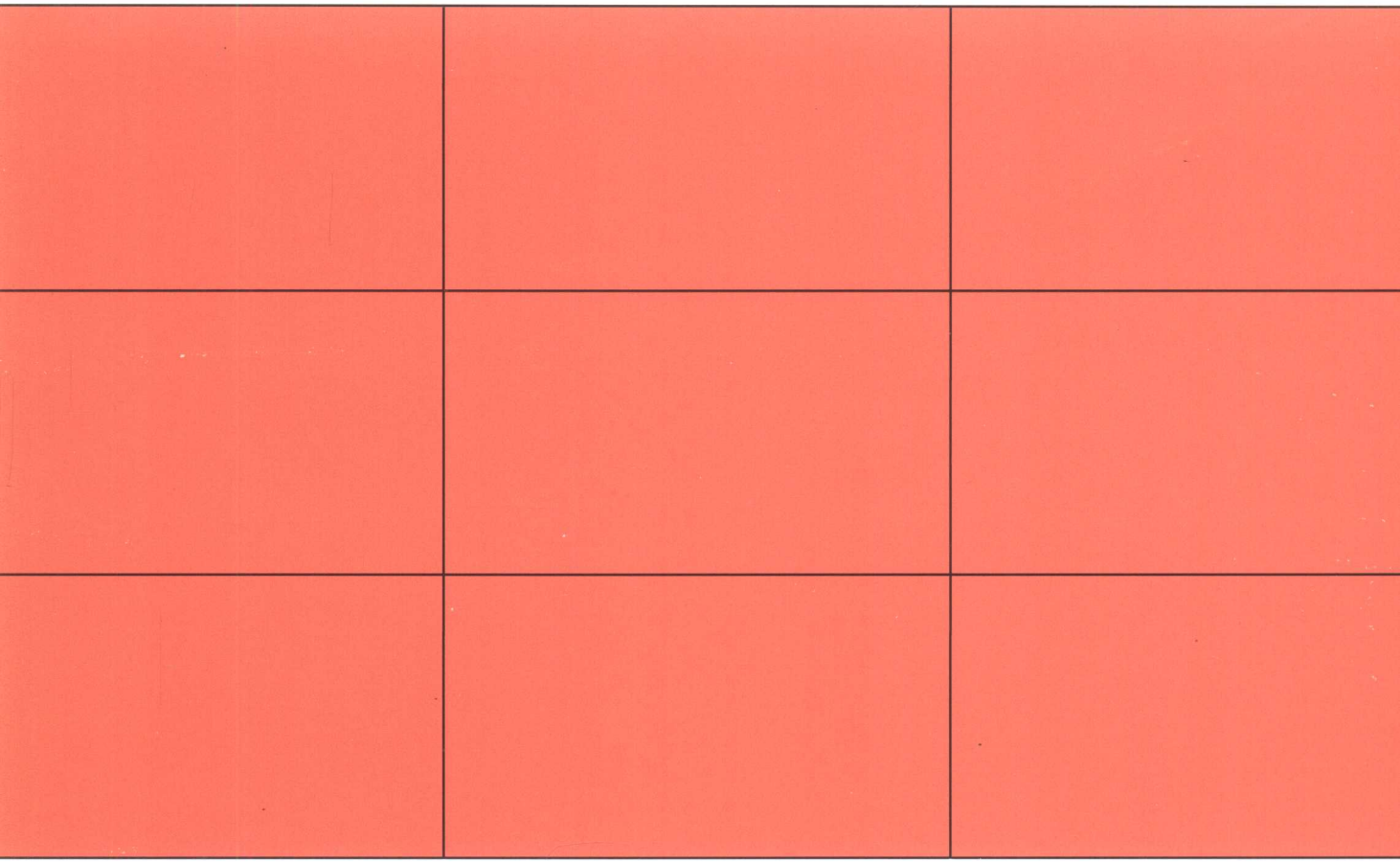
Economic Instruments for Water Resource Management in Thailand



Economic Instruments for Water Resource Management in Thailand

ECONOMIC INSTRUMENTS FOR WATER RESOURCE MANAGEMENT IN THAILAND

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ECONOMIC INSTRUMENTS FOR WATER RESOURCE MANAGEMENT IN THAILAND

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Water has been considered an abundant resource in Thailand. As with many tropical countries, water is a part of Thai life and culture. In Chiang Mai, the famous resort city in northern Thailand, it is expected that the Royal Irrigation Department (RID) will release water into the moats around the city on the *Loy Krathong* festival** day, so that the water level rises sufficiently for the local residents and tourists to release their candle-lit floats in the water. In the midst of the dry season in April, youths celebrate the Thai New Year by splashing water on each other. Water, by its very nature, is a symbol of abundance and happiness.

Recently, however, conflicts over water use and allocation have become increasingly common and bitter. In 1992 and 1993, while farmers were warned that there would not be sufficient water for the second rice crop, golf courses have been freely pumping water from irrigation canals. Incidents of conflicts between industrial plants and local communities, e.g. over discharges of industrial effluent into water courses shared by local communities, are increasingly publicized by local mass media.

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** A festival celebrated on the full-moon night of the twelfth Thai month (usually November), to pay respect to rivers, the country's lifelines. Young and old pay their respect by releasing floats (*Krathong*) lit with candles and joss-sticks in water.

It has become increasingly evident that the slowness in finding an appropriate means for water resource management not only results in economically inefficient uses long preached by economists but is also incurring simmering political and social disturbances.

This paper investigates two major problems related to the management of the water resource, viz., dry-season allocation and water quality. The paper argues that in its attempt to tackle market failures in water resource allocation, the government, through its own failures, has caused the situation to worsen. Water allocation problems have been considered administrative problems and hence economic instruments have not been used to solve them. In dealing with water quality, some economic instruments have been employed but most of these measures are in their early stages of implementation. The paper is organized as follows. The first section briefly reviews Thailand's recent economic performance. The second section provides information on the current status and the major problems of water resource management in Thailand. The third section outlines the framework of existing regulations and their constraints. The final section introduces some economic instruments which have been proposed to help improve the resource management, and indicates constraints to their application in Thailand.

THAILAND: GROWTH AND DEVELOPMENT

From 1987 Thailand attained double digit real growth rates for three consecutive years. It has since emerged as one of the world's fastest growing economies and is predicted to be an emerging Asian Tiger (Table 1). Although growth is predicted to slow down in

the 1990s, and has indeed since 1990, the economy is still expected to expand at the rate of 7-8 percent. The agricultural sector, which was Thailand's engine of growth in the 1970s, was replaced by the manufacturing sector in the 1980s. In 1991, the manufacturing sector accounted for more than three quarters of Thailand's export earnings.

Thailand has been relatively successful in curbing its natural population growth rate which dropped from 3 percent before 1980 to 1.4 percent at the end to 1991. As a result, per capita gross domestic product (GDP) growth remains relatively high at US$1,812 in 1992 (preliminary estimate).

The above growth performance has not been without cost. The country's natural resources and the environment have been exploited without regard to long-term income and livelihood. The social cost of the depletion of forest cover (from 50 to 26 percent of the total land area within the last 30 years) is now beginning to make an impact. Many rivers and streams have been running dry in summer. At the same time proposals to build large storage dams have often encountered antagonistic protests from local communities and environmental groups and hence options of increasing water supply are reduced.

STATUS AND PROBLEMS

The main source of water for Thailand is the monsoonal rains which averaged, for the last 40 years, to approximately 800,000 million m^3 per year, of which 24 percent (196,000 million m^3) flowed as surface water. About 29,873 million m^3 (about 15% of the surface water) can be stored in dams throughout the country.

The Central region of Thailand including the capital city of Bangkok draws water mainly from the Chao Phraya River. The two major storage dams, the Bhumiphol and the Sirikit have a combined storage capacity of 23,900 million m^3.

In the past, water from the two dams was sufficient to guarantee dry-season water supply for irrigating the Central plain and meeting Bangkok's needs. Of late, the levels of water in these two dams have been declining. The average flow into both dams has decreased from 10,360 million m^3 to 7,000 m^3, an approximately 32 percent reduction in the last 20 years. The loss of forests at the headwaters which act as a "sponge" that releases water to the streams in the dry season has been pinpointed as the cause of the decline. During the last three decades about half of the country's forest has been depleted, adversely affecting the micro-climate of local communities.

Of the four major uses of water, viz., domestic consumption, industrial, electricity generation and agriculture, the last category consumes the largest amount. Despite what seems to be dwindling stock of supply, most major projections of demand indicate oversupply until the year 2000. Thus the existing approach to water resource management has been limited to supply management.

Yet conflicts between water users, both within and between communities and economic sectors, have become more noticeable. For example, conflicts between the dwellers of upper and lower sub-watersheds over both quantity and quality of water have become more

evident. The lowland farmers of Chom Thong district, Chiang Mai, for instance, have requested that the government relocate hill tribes, who use water and chemicals intensively to grow cabbages at the headwater, to the lowland. This year, as farmers are being warned that there would not be sufficient water for the second rice crop, no attempts have been made to persuade large-scale users, such as hotels, golf courses and universities, to economize on the use of water.

In urban areas, particularly in Bangkok, the pressing water resource problem relates to the quality of water, increasingly threatened by population increase. Concentration of economic growth in urban areas has triggered migration from rural areas to urban centres. Public utilities in urban centres have inevitably lagged behind the accelerated growth of urban populations. Residential wastes are commonly discharged into waterways at such a rate that the water in Chao Phraya River, the nation's lifeline, has become unsuitable for domestic use (Table 2). The BOD (Biochemical Oxygen Demand) load was higher than official standards and the concentration of coliform bacteria is on the rise. It is estimated that about 93 percent of the total BOD load to the Mae Klong river in 1990 and 75 percent of the same to the lower Chao Phraya river in 1988 were attributable to domestic effluent (Thailand UNCED Report 1992).

The growth of the industrial and service sectors has not only increased demand for water but also released more effluent into waterways. A good example is the pollution of the Nam Pong river in Khon Kaen province in Northeastern Thailand. First, an accidental leakage of a molasses tank of a sugar factory in 1992 led to the death of the fish population in the river, and made the water unsuitable for

human consumption for months. In 1993, effluents including organic and inorganic pollutants such as dioxin from a pulp and paper factory were discharged into a freshwater lagoon and have affected the local communities who use this pond. The public outcry, especially from the affected communities, led to the closure of the factory for 36 days.

For long-term solutions, cleaner production technologies (which will reduce the use of chlorine dioxide) and the recycling of effluent for use in the bamboo and Eucalyptus plantations will need to be adopted.

Increasing conflicts at the national, sectoral and community levels have alerted even the more supply-oriented bureaucrats to probe more closely into the major water problems, namely dry-season allocation and water quality.

EXISTING LEGAL AND INSTITUTIONAL FRAMEWORK

Water supply and allocation

Currently, there are more than ten legislations related to water, of which only three deal with water allocation; they are: the Private Irrigation Act of 1939, the State Irrigation Act of 1942, and the Dykes and Ditches Act of 1962. Among these three, only the State Irrigation Act is the major one.

The State Irrigation Act of 1942 has been amended several times. This Act is designed to control the use of the State irrigation systems. It authorizes the Royal Irrigation Department (RID) to construct, manage, and maintain the State irrigation systems.

It also allows the RID to collect water fees from the water users.

Being under the Ministry of Agriculture and Cooperatives, the RID is directly responsible for supplying irrigation water to the agricultural sector. RID currently has 12 Regional Irrigation Offices (RIO) throughout Thailand.

Three other agencies are involved in a major way in water supply and regulation: the Electricity Generating Authority of Thailand (EGAT), the Metropolitan Waterworks Authority (MWA) which supplies water to Bangkok, and the Provincial Waterworks Authority (PWA). Apart from these three, 30 department-level agencies under eight ministries are also involved to a certain degree in water management.

Water from the two dams mentioned earlier is first used to generate electricity and then released into the Chao Phraya river. The MWA, the PWA and any government users can freely draw water from the river and irrigation canals. EGAT's responsibility is to make sure that there is enough water in the two reservoirs for power generation. Therefore, when planning water allocation each year the RID has to include the amounts which will be requested by these agencies.

Although the RID legally controls irrigation water, in practice it has little power over allocation to any users except farmers in its irrigation projects. Priorities are generally given to the urban sector for consumption and to power generation. After all other priorities are met, the remaining water goes to farmers.

In the rainy season, there is no water shortage and allocation of water is rarely a problem. In the dry season when the stock of water is down, open and free access to water accentuates the allocation problem. In Thailand, water utilization follows the first-come-first-serve principle. Those who are closer to the water resources can generally draw as much water as required even from the irrigation system. Although the existing State Irrigation Act allows the pricing of the irrigation water, the ceiling price fixed at 0.50 baht (approximately 2 U.S. cents) per cubic meter is considerably below the cost of operating the system. Moreover, charges are waived for public enterprises which supply potable water to the public. Water supplied to farmers is free of charge. The RID collects only a small sum of fees from a handful of large users amounting to about 10 million baht (approx. US$400,000).

Water quality control

Before 1982, there was no legislation that prescribed punishments for discharging effluent. Environmental agencies merely monitored ambient levels in the water stream. The Polluter-Pays-Principle was endorsed for the first time in the Seventh National Economic and Social Development Plan (1991-1996). The most important breakthrough was the enactment of the Enhancement and Conservation of National Environmental Quality Act B.E. 2535 (1992) which has many innovative features. First, it attempts to manage environmental problems in an integrated manner through an inter-disciplinary ministerial committee with short-and long-term plans. Secondly, it decentralizes authority and delegates environmental management to

provincial authorities. Thirdly, it recognizes and encourages the participation of the people and non-governmental organizations (NGOs) in environmental protection. Fourthly, The Environment Fund of about US$200 million has been set up to promote investment in pollution control and to translate the Polluter-Pays-Principle into practice.

In accordance to the Act, the end-of-pipe or point-source standard for water quality was established allowing environment monitoring agencies to take action against polluters, which could lead to imprisonment for up to one year. Moreover, individuals and NGOs are also allowed to take legal action against polluters. Enterprises discharging effluent are now explicitly required to pay service fees to central treatment facilities or set up their own treatment facilities. Unlike in the water allocation problem where no economic instruments have been used to alleviate the management problem, economic incentives have been used as carrots to induce concerned agencies to respond more positively to environmental conservation. Low interest loans from the Environment Fund are available for local administration (municipalities and sanitary districts) and private businesses which are required to set up treatment facilities. The city of Pattaya would be the first to utilize this fund for its central waste-water treatment plant.

Other promotional measures include the reduction of import duties to no greater than 10 percent for equipment used for any treatment facilities. This has been granted since 1983. Between 1984 and 1989 only 130.9-million-baht (US$5.14 million) worth waste-water treatment equipment has been imported under such incentives (UNIDO

1993).

At present the duty-reduction incentive is being dealt with case by case. Attempts are being made to tackle this constraint by classifying categories of treatment equipment for which automatic reduction could be granted.

As a precautionary measure, the government has also established a list of productive activities which are required to conduct an environmental impact assessment before the project is officially approved.

The most important constraint to the enforcement of the Act is the lack of manpower. Thailand now has more than 100,000 factories, and hence monitoring and enforcement is undoubtedly an uphill battle. Moreover, since most cities are located on the banks of major rivers, enforcement of the Polluter-Pays-Principle requires heavy capital investment in central wastewater treatment at a scale many times larger than the Environment Fund. To overcome the monitoring problem, the concept of environmental auditing is being considered. To cope with the second problem of the large number of polluters, across-the-board economic instruments could be used to reduce consumption and effluent.

ECONOMIC APPROACH TO WATER MANAGEMENT

Generally speaking, the market provides an efficient means for the allocation of resources and products. Price in a competitive market reflects the true cost of the product; the market mechanism ensures that those goods in high demand are highly priced. But many

products such as forests and water are not priced or are priced at a level that does not reflect their true cost. For these products, the market fails to be an efficient means for allocation because the property rights of these products are not defined and are not enforceable, leading to the products' over-extraction. The examples of deforestation and conflicts of highland and lowland farmers over water use mentioned earlier typify over-exploitation arising from open access. In the absence of an appropriate allocation mechanism, farmers and golf course owners who have free access to water will use water wastefully.

Underpriced water undoubtedly leads to inefficient use. Water tends to be overly used to substitute other relatively highly priced inputs such as land improvement and soil conservation, leading to water logging, salinization and alkalization. According to the Food and Agriculture Organization, about 50 percent of irrigated lands in developing countries are affected from salinization, alkalization and water logging (cited in Panayotou 1993, pp. 11). For industries and urban consumers, cheap water induces overuse, which unduly raises the cost of wastewater treatment.

Water pollution from the discharge of residential and industrial effluent into public waterways is an example of the "externality" type of market failure. In this situation, the economic activities of polluters affect other individuals who derive no benefits from those activities. Moreover, if the number of polluters is large, it is increasingly difficult and costly for individuals to identify the culprits and estimate the degree of damage

created by each polluter. Therefore, the incentives for the affected to unilaterally guard their interest decrease while the costs of organization of the affected parties increase.

When the market fails to function efficiently, there is a role for the State to play. The State may intervene by way of direct regulation, for example, by requiring polluters to set up treatment facilities and observe effluent standards. It can use economic instruments to shape the behaviour of polluters or it can create a market. It can also use combinations of the above.

It should be noted, however, that government measures can themselves be the causes of environmental degradation (Panayotou, 1993) if not used with adequate descretion and foresight. First, government interventions may unintentionally disrupt a well-functioning market. In the district of Tron, Uttaradit Province of Thailand, a local community used to make collective investments to pay for the cost of pumping water from a river for irrigation and share the cost by charging fees according to the volume required by each crop. The government later emulated the system in other villages but provided free water to everybody, thereby destroying the more efficient market mechanism that potentially exists in local communities.

Secondly, governments may fail to factor, in full, the true cost of the resource, including the environmental cost. As indicated earlier, the price of the irrigation water has been legally fixed at a level far below the operation and maintenance cost of the system. The difference is already large even without taking into account the cost

of fixed capital outlay and the environmental and social costs related to the construction of storage dams. Low fees coupled with the inability of the RID to use this revenue directly for further investments reduce the incentive of the organization to collect any fees, resulting in low revenues and inefficient operations, allocation and use.

Finally, governments may neglect market failures completely. This is demonstrated most clearly in the case of water allocation in Thailand where the government allows all parties to extract water freely until the taps run dry.

It is evident that in addition to market failures which are typical for a natural resource such as water, government failures have compounded the allocation problem. Currently two draft Water Codes have been prepared separately by the National Research Council (NRC) of Thailand and Thammasat University (TU). The latter was commissioned by the Department of Pollution Control, Ministry of Science, Technology and Environment. Although it is not clear, at this juncture, as to which draft will be (or whether neither may be) adopted, the two drafts nonetheless reflect the current thinking about the improvenment in water management. The following section outlines some key features of the two drafts.

Water allocation

The NRC draft deals only with water allocation and reflects the bureaucrary's perception that water allocation is merely an administrative issue. It aims to coordinate administrations by setting

up a national committee on water resources. Water is still a common property but the draft allows prioritization of water use in case of crisis.

The TU draft on the other hand specifies that "water" belongs to the State and a permit is required for its use except for domestic consumption. Water permits are tradable and transferable. A permit is also required for discharging effluent. The TU draft therefore attempts to create a market for both use and disposal. Water will be valued by the market leading to more efficient use.

Two broad types of reasons, technical and non-technical, are cited against the TU draft. First, to be able to issue water right, the stock of water must be predictable and reliable. Unreliability of water leads to hoarding rather than conservation. At present, the knowledge of availability of water in most water basins is relatively limited. Secondly, the authority in charge of water pricing must have at its disposal an efficient and relatively complete supply infrastructure. At present out of the 25 river basins only a few have, albeit incomplete, water distribution systems. Thirdly, in many parts of Thailand the monitoring of water use is difficult and expensive owing to topographical constraints. In addition, the small size of agricultural units in Thailand further increases the monitoring cost.

The last argument cited above is probably the easiest problem to overcome. Permits need not be obtained by an individual but can be obtained by a basin committee or by a group or association of users. The fact that there is no perfect infrastructure now does

not mean that appropriate infrastructure investment cannot be made in the future. These technical reasons should not prevent appropriate pricing mechanism from being applied in areas where it is ready. Most of these technical reasons can be solved given sufficient resources and time. More difficult is the political problem of charging water fees to the farmers who belong to the poorer segments of the economy but who together hold the largest political votes. Non-pecuniary charges for the use of water would have to be devised to promote more efficient allocation and use of water.

Water quality

The TU code stipulates that those discharging effluent must obtain a license and pay an effluent fee to the Pollution Control Department. It does not elaborate how the fee should be determined.

In practice, the process of establishing a market to conserve the quality of water seems to be more actively operative than that of water allocation market, as the Department of Industrial Works (DIW), under the Ministry of Industry, controls and monitors both factory licenses and industrial effluent. It could therefore at the same time issue effluent permits. The license fee could vary with the scale of operation (or the quantity of effluent discharged), the type and potency of the pollutants, as well as the location and the existing pollution level. Fees could also be lowered if the enterprise conducts research and development to reduce effluent discharge.

In theory, fees charged to an enterprise should be equivalent to the environmental damage it has incurred. In practice, however, it is difficult to estimate marginal environmental costs, so

that the fees are generally set at the level that would induce firms to reduce effluent (Vincent, 1993). This system provides firms with options to treat wastewater directly, to pay the fees or to change its input and output mix (Panayotou, 1993).

In a location where an industry is relatively concentrated, a target ambient standard needs to be maintained and the establishment of new factories may not be allowed if the existing ambient standard is very close to the target. In such a case, firms which have been able to reduce their effluent below what has been permitted may find it profitable to trade or sell their permits to newcomers.

Constraints here tend to be the quantity and quality of technical (both scientific and economic) human resources required. It can be argued that private auditing firms can be used but in Thailand technical human resources in the private sector are also lacking.

In conclusion, three major obstacles are said to prevent the application of economic instruments to water resource management. The first is the perception that water resource management is a technical and administrative problem. Despite increasing conflicts, demand management has not been considered an important part of the solution to water problem. Secondly, the reluctance to use prices as an allocation mechanism because of political reasons is heightened especially under an elected government which relies on rural votes. Thirdly, technical knowledge and a critical mass of technical personnel are required even if economic instruments are going to be applied. Capacity building in this direction is a pre-requisite.

As a country advances, many economic instruments such as other variations of emission charges and deposit-refund systems may be used. However, these are second-best solutions and there will still be the need for substantial monitoring and technical resources. Full cost resource pricing which will reduce water demand remains to be the most cost effective way of reducing inefficiency in water use and controlling effluent.

Table 1 Indicators of the Thai economy

	1983	1984	1985	1986	1987	1988	1989	1990	1991p	1992e
A. Production and Investment										
Real GDP growth	7.3	7.1	3.5	4.9	9.5	13.2	12.0	10.0	7.5	7.5
- agriculture and mining (%)	3.8	5.6	6.2	0.3	-0.2	10.2	6.6	-1.8	2.8	3.8
- industry (%)	8.9	8.9	0.7	7.7	11.9	16.2	15.5	14.8	10.3	9.4
- trade and services (%)	7.9	6.3	4.9	4.6	11.6	11.8	10.9	9.8	6.1	9.6
GDP at current prices ($ billion)	39.57	41.16	37.33	41.68	48.74	59.64	43.46	80.24	94.08	104.4
Domestic investment to GDP ratio (%)	25.9	24.9	24.0	21.8	23.9	28.8	31.5	36.8	37.9	38.3
National saving to GDP ratio (%)	21.2	20.6	19.4	20.9	23.7	28.6	30.2	30.4	31.4	31.7
B. Population										
- level (million persons)	49.5	50.6	51.8	53.0	53.9	55.0	55.9	56.3	57.0	57.6
- growth (%)	1.4	2.2	2.4	2.3	1.7	2.0	1.7	0.7	1.2	1.2
GDP per capita (US$)	799	802	710	776	893	1,076	1,231	1,410	1,628	1,812
Labour force (million persons)	25.9	26.4	27.1	28.0	28.6	29.5	30.3	31.1	31.9	32.7
C. External Sector										
Exports										
- Value (bil. US$)	6.3	7.3	7.1	8.8	11.6	15.8	19.9	22.8	28.3	32.5
- growth (%)	-7.7	16.4	-3.8	24.8	31.6	36.2	25.7	14.9	23.9	14.5
Import										
- Value (bil. US$)	10.2	10.3	9.3	9.4	13.3	19.7	25.2	32.6	37.8	40.7
- growth (%)	21.2	0.6	-9.0	0.2	42.0	48.7	27.7	29.1	16.1	7.2
Trade balance (bil. US$)	-3.9	-2.9	-2.3	-0.5	-1.7	-4.0	-5.4	-10.0	-9.7	-8.2
Current account balance (bil. US$)	-2.9	-2.1	-1.5	0.2	-0.4	-1.6	-2.5	-7.3	-7.6	-6.7
(as percent of GDP) (%)	-7.3	-5.1	-4.1	0.6	-0.7	-2.7	-3.6	-9.1	-8.1	-6.4
Net capital inflow (bil. US$)	1.5	2.5	1.9	0.4	0.8	2.9	5.9	8.1	11.5	8.0
Overall balance of payments (bil. US$)	-0.8	0.4	0.5	1.3	0.7	1.6	4.3	2.2	4.4	1.2
Official reserves (bil. US$)	2.56	2.69	3.00	3.78	5.21	7.11	10.51	14.27	18.42	21.2
(in months of imports)	3.0	3.2	3.9	4.9	4.7	4.3	5.0	5.3	5.8	6.5
D. Exchange Rate										
Baht/dollar exchange rate (average)	23.00	23.64	27.16	26.27	25.71	25.27	25.68	25.56	25.49	25.34

Notes: e estimated;
p provisional

Source: BOI 1992. "Key Investment Indicators of Thailand" Table 1.

Table 2 Water Quality of the Major Rivers, 1987-1989

River	Standard			1987			1989		
	Do (mg/L)	BOD (mg/L)	Total Coliform (MPN/100 ml)	Do (mg/L)	BOD (mg/L)	Total Coliform (MPN/100 mL)	Do (mg/L)	BOD (mg/L)	Total Coliform (MPN/100 mL)
Chao Phraya									
Upper	6	1.5	5,000	5.7	1.6	8,000	5.8	1.0	18,666
Middle	4	2	20,000	3.0	1.8	29.000	2.4	2.4	35,000
Lower	2	4	NA	0.3	4.0	71,000	0.2	2.8	705,000
Thachin									
Upper	6	1.5	5,000	5.1	2.7	91,666	5.0	2.9	24.000
Middle	4	2	20,000	1.0	2.4	39,500	1.6	2.6	240,000
Lower	2	4	NA	0.6	4.0	92,400	0.8	2.7	161,000
Mae Klong	4	2	20,000	5.0	2.2	53,300	5.3	2.0	25,800
Bang Pakong	4	2	20,000	3.7	1.3	9,680	4.1	1.2	9,800

Source : National Environment Board (1990)

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