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Tourism in Thailand:

A Study of the Economic Impact of Environmental Degradation

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EXECUTIVE SUMMARY

Environmental quality is a major factor in the sustainability of the tourism industry in Thailand; it is therefore directly related to the state of the Thai economy itself. Tourism is one of the most important industries in Thailand and one of the largest and most important sectors of this industry is closely tied to the attractions of its coastal and riverine areas. Tourist expenditures are consistently the largest earner of foreign exchange in Thailand. These exchange earnings have helped Thailand to maintain an acceptable balance of payments even though imports, needed to develop the rapidly expanding manufacturing sector, have run major deficits.

As important and dynamic as the tourism industry is, it is also one of the most vulnerable and most heavily dependent on volatile changes in international public opinion. Tourism is an extremely competitive industry and as service industry wages rise, the importance of quality surroundings will become even more significant. Tourists are by definition very mobile and by reputation are extremely conscious of current trends and concerns. While this study was conducted with data collected prior to August 1990, the recent Persian Gulf crisis has given a taste of what might happen if tourists were discouraged from coming to Thailand. Tourist visits, which normally climb 10% to 20% per year, suddenly plummeted nationwide (in 1991) by 30% to 40% compared with the same time the previous year.

It is the contention of this paper that Thailand unnecessarily risks another devastating loss in the vital tourist industry not due to war but due to chronic environmental degradation. The same precipitous drop that occurred due to international security concerns could also potentially occur due to adverse public opinion resulting from progressive environmental degradation at its most popular tourist areas, particularly if this degradation also leads to outbreaks of cholera and/or other water borne diseases.

The real risk in Thailand's Environmental Policy is not that it may fail to adequately protect Pattaya Beach, but rather that Thailand may allow the current "Pattaya Policy" of environmental neglect to become a model for other resort areas as well. Because of its special situation, the financial risk to Pattaya may be limited, yet the risk to Thailand is enormous. Tourism is a critical force in the Thai economy and other tourist resort areas will not be able to so easily survive the inevitable impacts of environmental degradation.

All other tourists resorts in Thailand are far more dependent on their natural resource base than are those in Bangkok and Pattaya. Most have only limited nightlife, and none can compete in terms of ease of access. The popularity (and revenues) of these resorts has grown in large part because of their beautiful beaches and clean water. Failure to protect these assets will result in serious environmental and financial loss.

Environmental degradation is not inevitable. Reinvestment of a relatively small portion of the profits from tourism into water and waste treatment infrastructure can greatly increase the sustainable carrying capacity of popular tourist areas. Effective protection of the growing Thai economy will require carefully planned investments in the protection of the Thai environment.

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Purpose

The basic underlying goal throughout this paper is to help increase awareness of the importance of maintaining and improving environmental quality not only as an end in itself but as a means toward achieving sustainable economic development.

The purpose of this study is threefold:

1. To review the significance of tourism to the Thai economy,

2. To explore the relationship between tourism and the environment in Thailand, and

3. To estimate the potential impact on the economy if environmental degradation at major tourist resorts were to discourage new tourists from visiting.

Major Findings

Significance of Tourism

Tourism is possibly the most important industry in Thailand at this time. This rapidly growing industry already earns four times more foreign exchange than rice, the leading export until the 1980s.

Environmental Degradation

Failure to invest in basic environmental infrastructure (basic waste treatment and enforcement programs) has resulted in serious environmental degradation at the most popular beach resorts in Thailand.

Delayed Reaction

Despite growing pollution and adverse publicity, revenues at even the most polluted resorts continue to climb, and climb faster than the number of tourists (at least through 1989).

Warning Signs

The decline in domestic tourism, the decline in number of visits and the revealed preferences of high-spending tourists all suggest that polluted resort areas will begin to lose significant revenue over the next several years compared to their less polluted competitors.

Potential Economic Impacts

Even a small decline (15% to 20%) in tourist revenues at only one resort (Pattaya) for only one year, as a consequence of environmental degradation, could cost the country more foreign exchange earnings than the entire USAID Thailand environmental expenditure over seven years ($ 44 million). Put another way, the AID-funded Management of Natural Resources and Environmental Systems (MANRES) program could potentially pay for itself in one year if it could help to reverse the decline in environmental quality at some of the major tourist areas.

Affordability of Control

Environmental degradation is not inevitable. Significant environmental improvements can be achieved at reasonable costs and paid for through modest fees on the tourists themselves. For example, a 2% environmental service fee levied on tourist expenditures could adequately cover the incremental cost of wastewater treatment and improved trash collection and disposal.

Availability of Alternatives

There are a wide range of potential funding options for environmental infrastructure including: tourist fees, property taxes, and central government cost sharing. Given the strong arguments on both sides of the infrastructure funding issue, the most feasible solution may be to offer a central government rebate to the local governments. This rebate would represent part of the central government's share of business taxes on hotels and restaurants. Local governments would be eligible for a rebate provided they establish and implement programs for investing these revenues in environmental infrastructure. Such rebates could be provided as matching funds to encourage local initiative and assure that the fee programs were actually implemented as planned.

Analytical Problems Encountered

The significance of the findings listed above notwithstanding, the study encountered a number of problems not anticipated at the outset:

1. It was believed that environmental degradation had already taken its toll on tourist revenues. It was therefore expected that analysis could at least show some direct correlation between environmental degradation and lost revenues. It came as a significant surprise and a setback for the study to learn that the official records from the Tourist Authority of Thailand actually showed an increase in tourist revenues at even the most polluted resorts. Subsequent analysis, however, did reveal that environmental degradation was probably already having some impact on the number of tourist visits and the distribution of high-spending tourists. Nevertheless, the failure to be able to show a direct correlation with tourist revenues significantly increased the complexity and time required for this portion of the project.

2. The data available from the Tourist Authority of Thailand was considerably less detailed and less current than initially anticipated. This meant that the pairwise comparisons between resorts similar in all but environmental quality was far more difficult and less conclusive than first envisioned. Although several different beaches exist in Phuket with different levels of environmental quality, for example, many of the reports on tourist trends simply lump all of the Phuket resorts together into one category. A similar situation was often found in other provinces where tourist data was aggregated by district, often combining tourist, commercial and manufacturing areas into one zone for reporting purposes.

3. Had the data limitations been recognized at the outset far greater emphasis would have been placed on personal interviews, possibly including an estimate of "willingness to pay" for various environmental protection activities. Surveys of this type were beyond the scope of this study but should be considered for similar situations in the future.

4. Although the staff and management of TDRI have been consistently very cooperative with all environmental studies, the fact that this study was undertaken at exactly the same time that TDRI was preparing for its National Environmental Conference meant that some resources (otherwise planned for this study) could not be made available in time.

INTRODUCTION

Environmental protection and economic development have often been viewed as mutually exclusive processes, particularly in developing countries. While conflict obviously arises, the emphasis on this competition may blind policy makers and analysts alike to the substantial interdependence that also exists. The goal of this paper is to examine the relationship between tourism and environmental quality in Thailand with special emphasis on the potential economic costs to the nation resulting from failure to adequately protect the environment.

Many argue that economic development inevitably begets environmental degradation while others stress that environmental quality is a luxury that developing countries can ill afford. The prospect of diverting scarce resources to preserve such luxuries often appears, at best, as an inefficient development path and has been regarded by some as a plot by industrialized countries to continue the dependent status of the developing world.

To overcome these misunderstandings, organizations concerned with the environment must work to identify and emphasize those aspects of environmental quality most important for sustainable growth. Highlighting the role of environmental resources in providing for continued economic development will often be the only effective means of mobilizing the necessary financial and political support required for environmental protection in developing countries.

Similarly, those concerned with development must be prepared to recognize environmental systems as vital ingredients in long-term economic growth. Viewed in this light, environmental protection can be seen as an investment in the protection of environmental resources. This resource protection will often take the form of an investment in urban infrastructure that increases the economic and environmental carrying capacity of the developing region.

Tourism is, of course, only one of many economic sectors that are significantly dependent on sustainable environmental quality. Other obvious candidates include resource-based industries such as agriculture and fishing. In addition, strong but less obvious linkages also exist in other industries such as food processing, metal finishing and electronics with their dependence on ample supplies of clean air, water, and a healthy work force.

Tourism is Thailand's single largest earner of foreign exchange and one of its most rapidly growing industries. Clearly, what impacts tourism impacts the national economy as well. While tourism is only one of many resource-dependent industries, given the relatively limited data available and the importance of this industry to the overall economy, this may be the one industry where a clear linkage between environmental investment and economic gain could be illustrated most readily.

As discussed in this paper, the data limitations combined with conflicting variables precluded the clear demonstration of the economic impacts anticipated. Nonetheless, the investigation does identify several significant issues and effectively raises strong warning flags about the future of tourism in Thailand if the environment continues to be neglected.

1 IMPORTANCE OF THE TOURISM INDUSTRY IN THAILAND

1.1 Significance of Tourism as an "Export" Industry

Tourism is a critical industry in Thailand. It is the single largest earner of foreign exchange,[1] currently representing over 13%[2] of gross annual exchange earnings, and one of the most rapidly growing industries in the country. It currently earns over $3.5 billion per year[3] and has averaged over 25% real annual growth in revenues over the last five years. During this time period Thailand's share of world tourism earnings has also grown from 1.02% in 1985 to 1.67% in 1989 and it is now the 13th largest earner of tourism revenues in the world.

While tourism is an important earner of foreign exchange, it can also be a particularly volatile industry. Being both price and income elastic, it responds disproportionately to changes in these variables. Heavily influenced by changes in international fashion and security, it is hostage to changes in international conditions largely independent of local control. Tourism is therefore both a major asset and, if not sustainable, a potential liability. While the last several years have been extremely good for the tourism industry in Thailand, the growing dependence on tourism, combined with the failure to protect the resource base, becomes an area of legitimate concern.

Exhibit 1 illustrates the recent rapid growth in tourism earnings together with the growing dependence on this industry for foreign exchange earnings.

Thanks to recent rapid growth in this industry, Thailand has become a leading tourism country with a major stake in the viability of this industry. In identifying significant "Tourism Countries" internationally, two criteria are commonly employed:[4]

1. **Impact on Balance of Trade:** Tourism revenues that represent greater than 10% of Visible Exports[5] and

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[1]Thammanun Pongsrikul, *Thailand in the International Economic Community: Trade in Services*, TDRI, 1989.

[2]Tourism is actually far more significant as an earner of foreign exchange than the 13% figure would suggest. Thailand typically runs about a 25% deficit on merchandise trade alone. This is brought about in part by imports required to initiate and support the manufactured exports. In 1989 for example, merchandise trade resulted in a net deficit of $5.5 billion. In that same year the Tourism industry, by contrast even after compensating for imports needed to support itself, still achieved an estimated surplus of over $2 billion.

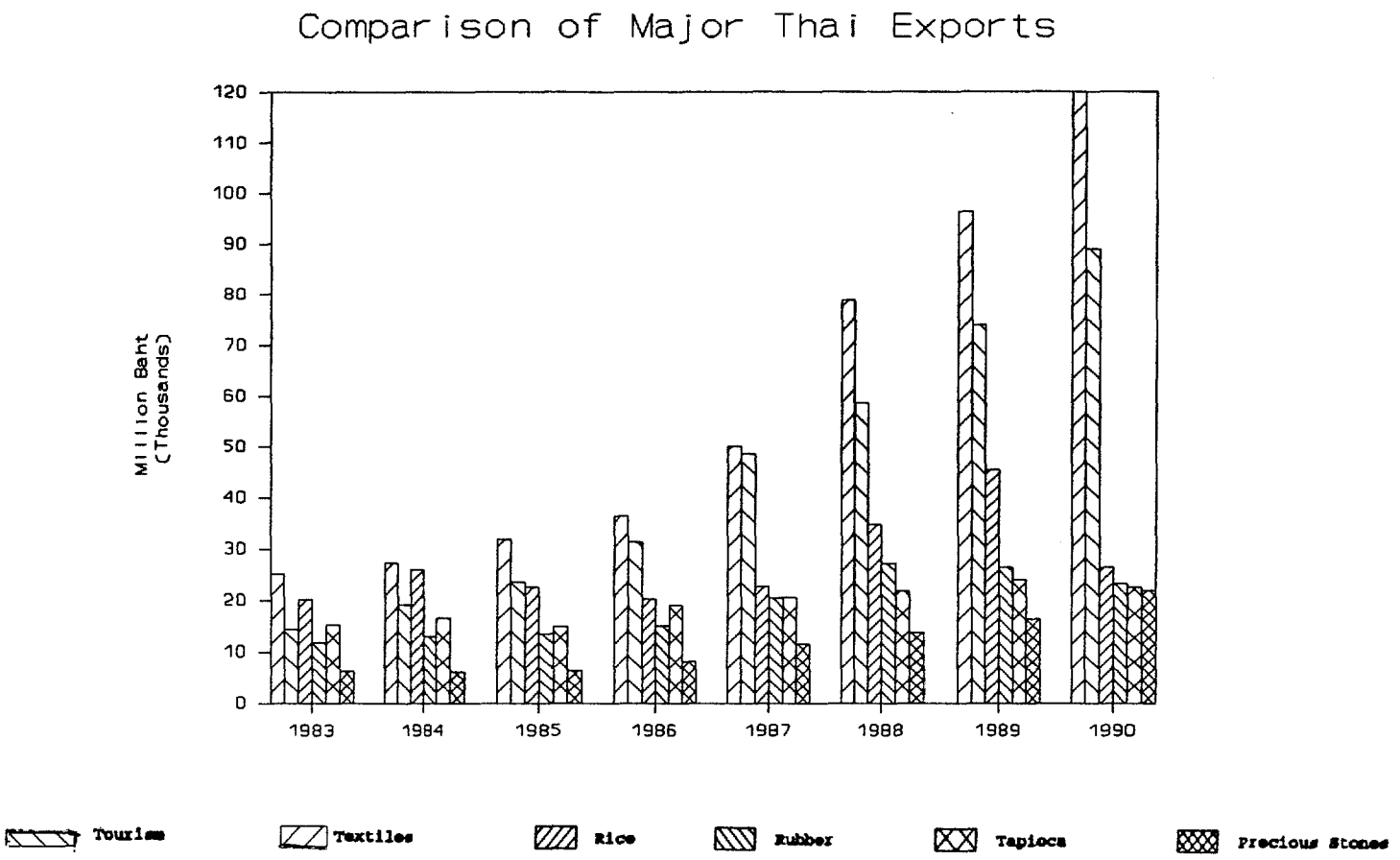
[3]World Tourism Organization.

[4]Bryden, J. M., *Tourism and Development*, Cambridge University Press, 1973.

[5]"Visible exports," as the term is commonly used in trade literature, refers to physical goods, both raw materials and manufactured goods, as distinguished from tourism, worker remittances and sale of services abroad.

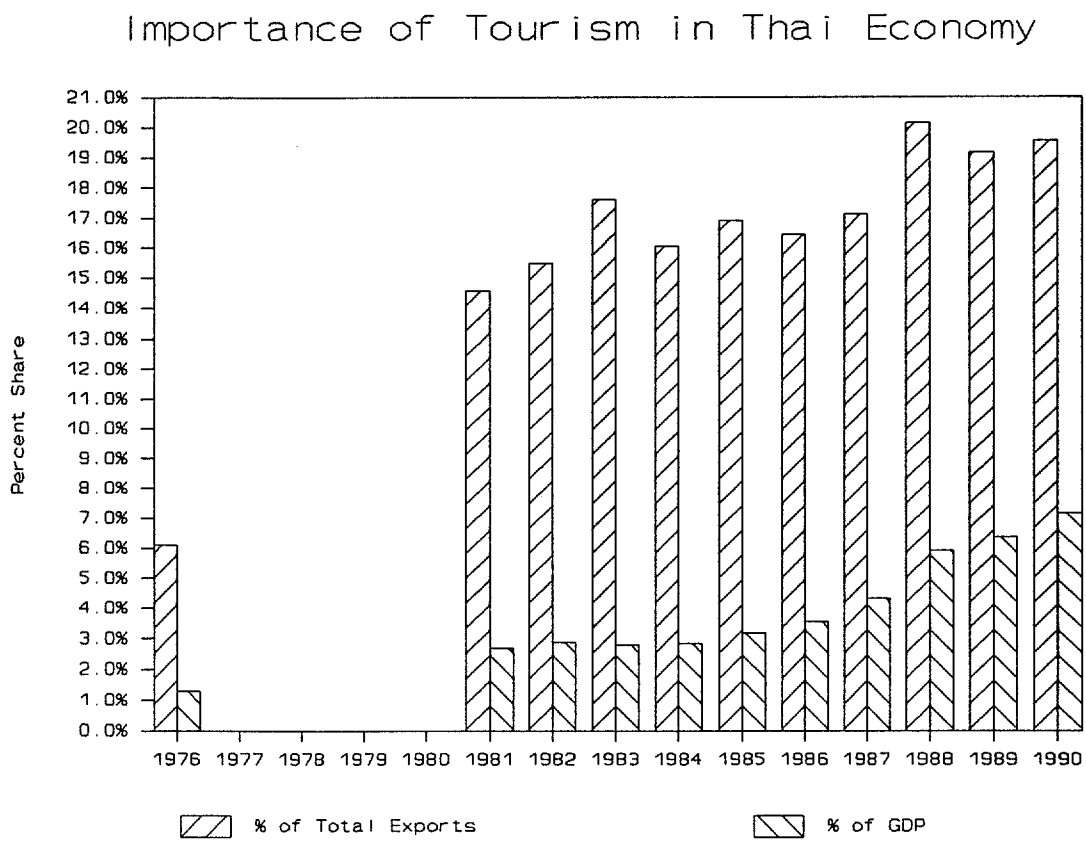
2. **Impact on GNP:** Tourism revenues that represent greater than 5% of Gross Domestic Product.

EXHIBIT 1



Thailand is one of the few countries in which tourism meets both of these criteria. Tourism is consistently the largest export and currently represents over 19% of exports and over 7% of Gross Domestic Product. This represents a dramatic increase in the relative importance of this industry since the mid 1970s, as seen in Exhibit 2.

EXHIBIT 2[6]



Thailand is unusual in terms of its high dependence on tourism. Most tourism dependent countries are small island nations (such as Malta, Fiji, or Jamaica) with little in the way of industrial or agricultural capacity. Thailand, by contrast, while developing its tourist industry has also enjoyed rapid manufacturing expansion as well as maintained its position as a major exporter of agricultural commodities. In fact, because rapid industrialization requires major imports of manufacturing equipment (often in excess of manufactured exports), it can be argued that Thailand's tourism earnings are what allowed the development of the manufacturing base in the first place. Were it not for the foreign exchange earned through tourism, Thailand's perennial trade deficit during the 1980s would have been more than twice as large.

[6]Bank of Thailand.

1.2 Concept of Foreign Exchange "Leakage"

The true significance of an industry such as tourism is dependent upon far more than simply the gross revenues. Particularly for small developing nations that must import much of the goods and services needed to support their industry, the actual contribution to the economy may be only a small fraction of the gross revenues. The remaining share of gross revenues that must be expended on imports to support the industry is commonly referred to as "leakage." Leakage is an estimate of the portion of the local revenues that are ultimately lost to the local economy and can theoretically vary between 0 and 100%. Not surprisingly, countries vary widely in terms of the amount of leakage associated with international tourism, depending both on the average degree of self sufficiency and the class of tourists that predominates. Exhibit 3 illustrates a range of tourism leakage factors.

EXHIBIT 3[7]

Tourism Leakage Factors

Leakage Factor	Import Characteristics
90 percent:	Totally import reliant (e.g., Mauritius)
50-90 percent:[8]	Heavily import reliant (e.g., less developed Caribbean and South Pacific islands)
30-50 percent:	Imports of luxuries and a few necessities (e.g. better-developed Caribbean Islands, Bermuda)
10-30 percent:	Imports principally for luxuries (e.g. countries with an advanced manufacturing sector with good resources - Tunisia, Greece, Yugoslavia, etc.)

Detailed analysis of these leakage factors is beyond the scope of this study. Based on the work of Cleverdon and of Archer et al. (1977),[9] Thailand appeared to fall within this last category with a leakage of no more than 30%. More recent work, including that done by Indhapanya and Atikul in 1985[10] suggests that the import content of income from tourism in Thailand may be as high as 35%. For purposes of estimating national economic impacts in this report, the more conservative leakage estimate of 35% will be used.

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[7]Cleverdon, Robert, *The Economic and Social Impact of International Tourism on Developing Countries*, The Economist Intelligence Unit, Ltd., 1979.

[8]G. Thomas Kingsley reports that in many Caribbean islands 58% of tourist spending is now lost to the local economy. "Urban-Economic Nexus," 1990.

[9]Archer, Brian, *Tourism Multipliers: The State of the Art*, Bangor Occasional Papers in Economics, University of Wales Press, 1977.

[10]Thammanun Pongsrikul, *Thailand in the International Economic Community: Trade in Services*, TDRI, 1989.

While most tourist analysts advocate greater emphasis on the "high-end" luxury tourist so as to increase the ratio of tourist expenditures to tourist visits, it must be recognized that if those high-spending tourists can only be satisfied by large quantities of imports then leakage will also increase. Therefore, increases of even relatively high-spending tourists could result in relatively low net increases in foreign exchange. Perhaps a more effective strategy may be to emphasize tourism that is primarily based on local inputs, including natural resources and cultural events.

It should also be recognized that while the leakage for the nation of Thailand overall may be no higher than 35%, the leakage for a single resort area such as Pattaya or Phuket would be much more comparable to the 90% found on Mauritius. Resort communities and their surrounding provinces are so dependent on goods and services from outside their own boundaries that their economies resemble those of small island nations. This is not meant to suggest that the nation of Thailand retains only 10% (100% minus 90% leakage) of gross earnings at these resorts, but rather that the resort communities themselves retain only a very small portion of those earnings. For the purpose of this analysis, it is assumed that no more than 10% of earnings are retained in the province containing the resort while the remaining 55% (100% minus 35% minus 10%) is retained elsewhere in Thailand.

1.3 Concept of Income "Multipliers"

Tourism expenditures, like any other expenditure for locally provided goods or services, can theoretically generate an income effect substantially greater than the original expenditure. This is so because the original money spent by tourists, less the amount spent on imports (leakage), is then spent a second time by hotel and restaurant owners and merchants. This second round income (less leakage) is then spent a third time and so on. A "multiplier" is created by summing up all the income generated by each successive expenditure (less leakage) and then dividing that by the original expenditure. This is often expressed as a change in income (ΔY) divided by a change in expenditures (ΔE):

$$\frac{\Delta Y}{\Delta E}.$$

Obviously, the higher the multiplier the greater the benefit in terms of national income. While the multiplier does not directly impact the aggregate change in foreign exchange, it does directly influence the contribution of an individual industry's contribution to gross national product.

Tourism multipliers are found to range from 0.5 for heavily import dependent island nations (with little local content contribution other than wages) up to between 1.7 to 2.0 for countries such as Canada and the U.K. The exact level of the multiplier depends on the diversity of the economy and the degree to which tourism is integrated into the national economy. For purposes of this study a multiplier of 1.3 was used for Thailand, which is also consistent with Archer's findings that "even in larger developing countries tourism multipliers were unlikely to exceed 1.4."[11]

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[11]Archer, Brian, *Tourism Multipliers: the State of the Art*, Bangor Occasional Papers in Economics, University of Wales Press, 1977.

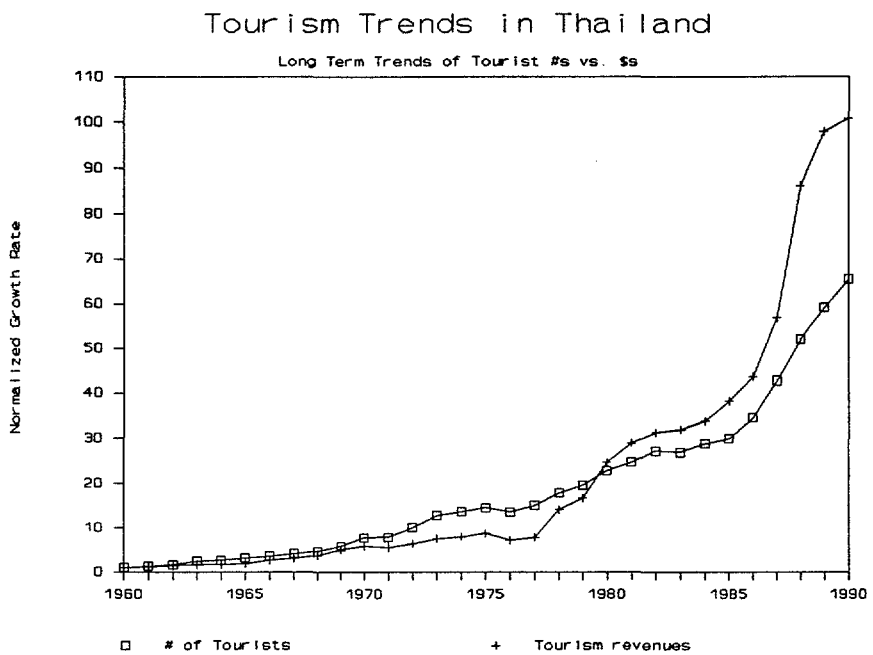
The determination of the "true" tourism multiplier is a complex issue and one often subject to abusive manipulation. Some artificially high multipliers are generated through double counting of transactions without accounting for leakages. Other errors can arise through failure to address the opportunity cost of the resources drawn into tourism. If, for example, government subsidies and high wages at an import-dependent luxury resort were to draw scarce resources away from another export industry with high local value added, then the net impact could well be negative, regardless of the tourism multiplier calculated. While this latter possibility is important, given the relatively free economy in Thailand and the limited subsidies currently available to the tourist industry, it is unlikely to become a significant issue.

2 IMPACTS ON TOURISM DESTINATIONS

2.1 Tourism Trends

Tourism growth in Thailand, particularly during the last few years is regarded as a major success story. Hotel occupancy rates are high. The number of visits, the length of stay and tourism revenues are all increasing dramatically. Exhibit 4 illustrates long-term trends in tourist visits and revenues in constant dollars. Growth rates on this and many other charts in this paper have been "normalized" by dividing the quantity in each year by the quantity in the first year observed. This allows for relative comparisons over time and also allows for comparing otherwise disparate indices on the same chart. It shows, for example, that during the last 30 years the number of tourists grew sixty-fold while the tourist revenues grew a hundred-fold.

EXHIBIT 4



Data provided by Tourist Authority of Thailand.

The classic fear in tourism management is that growth in tourist numbers may, at some point, begin to outstrip growth in tourist revenues. This problem has become a serious issue in Spain and many other areas in the Mediterranean. Although it has not yet happened in Thailand (see exhibit 4), trends in the last few years indicate that it is clearly a possibility.

Exhibit 5 illustrates a range of possible growth rates from the 1980s. Higher numbers represent continued revenue growth proportional to projected tourist growth. The lower numbers represent scenarios that, in an increasingly competitive market, could easily occur if hotel owners with vacant rooms and the Tourist Authority both act to move "down market" by holding prices down while continuing to promote increased numbers.

The consequence of growing numbers of tourists outstripping growth in revenues is that, inevitably, growing numbers will leave some adverse impact and if there is not an equally growing revenue stream with which to compensate or mitigate that impact then at some point the costs of tourism will eventually begin to outweigh its benefits.

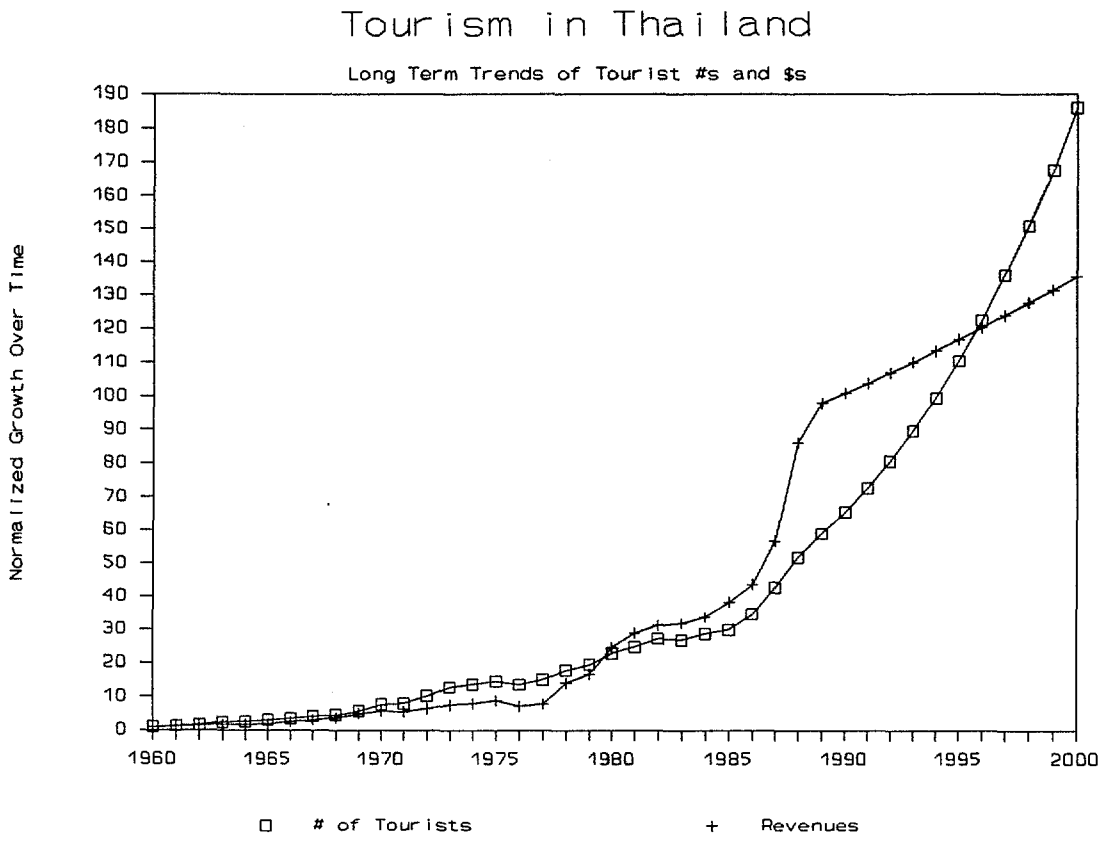
Potentially adverse impacts of tourism include at least the following:

- Increased pressure on limited natural resources;
- Increased demand for public infrastructure that may be inconsistent with other national priorities;
- Heavy emphasis on low-skilled, low-wage employees (waiters, maids, gardeners, etc.);
- Increased emphasis on seasonal employment (although in some circumstances this can be used to balance out seasonal agriculture);
- Erosion of social and cultural values; and
- Increased dependence on external demand with a consequent decrease in control over the domestic economy;
- Increased conflict and irritation resulting from inevitable cross-cultural conflicts.

The exact "cost" of each of these impacts is clearly subjective. Nearly all analysts would agree, however, that there is some point of diminishing returns at which the adverse impacts become so significant that they exceed the value of increased revenues and cultural benefits of tourism.

Numerous attempts at identifying this point of diminishing returns or "tourist saturation level" have been attempted. The most common approach relies simply on the ratio of tourist days or nights to total population. Exhibit 6 shows the changes in common indicators during the period 1976 to 1989 for Thailand.

EXHIBIT 5



1960 - 1990 data: Tourist Authority of Thailand
1990 - 2000 Tourist #s: Estimates by Thai Development Research Institute
1990 - 2000 Tourist $s: Estimated by linear extrapolation from 1989.

EXHIBIT 6[12]

Changes in Common Indicators, 1976-1989

Year	Population	Tourist Visits	Visits/ 100 pop	Area sq mi	Tourist Days	T Days/ sq mi	T Days/ 100 pop
	(millions)	(thou)	(thou)	(thou)			
1976	44,040	1,221	3.0	200	5,505	28	13
1989	58,000	4,934	8.5	200	30,097	150	52

Although there has been a five-fold increase in tourists per square mile and a four-fold increase in tourists per 100 population, these numbers are still relatively small as tourist countries go. The ratio of tourist to native population in Thailand today is approximately what it was in the U.S. in the 1970s. Comparable ratios of tourists per 100 of native population are roughly ten times greater for Spain, Cyprus and Israel and nearly 100 times greater for Bermuda and the Bahamas.

In addition to the simple linear ratios commonly employed, Erik Haites[13] has attempted to calculate the optimum ceiling of tourism. The formula employed for estimating tourism "saturation" is as follows:

$$S = \frac{T}{p^{.19} \times a^{.36} \times c^{1.79}}$$

Where
- S = saturation
- p = host country population
- a = area in square kilometers
- c = per capita income in $
- T = number of tourists.

While it is beyond the scope of this paper to assess the validity of this particular formula, it is significant that this technique for estimating saturation levels still generates a relatively constant number after 14 years, showing relatively little increase in aggregate impact. The "Haites Saturation Index" calculated for 1976 was 54 and in 1989 the index was 56 (an increase of less than 4%) despite a 300% increase in tourist visits during the same time period. If current trends continue, i.e. GNP growth at 8% per year or above and tourist growth at 15% or below, then the saturation index will actually decline. Obviously, these analysts felt that the rising per capita income during the

[12]Tourist Authority of Thailand.

[13]Haites, Erik F., "Levels of Tourism at Which Adverse Social Impact Occurs," University of Western Ontario, 1974.

intervening years would substantially contribute to mitigating any adverse impacts resulting from increased tourist numbers.

Conspicuously absent from this index is a measure of investment in infrastructure. While rising per capita incomes may serve as a rough surrogate for infrastructure affordability, unless Thailand actually makes the required investments, then the "Haites Index" will tend to understate the burden imposed by tourism on Thailand.

The issue here is not that tourism growth in Thailand has reached its limit, or even that it is too rapid, but that failure to invest in increasing the tourist carrying capacity threatens the sustainability of a fragile but critical industry.

2.2 Thai Trends in Infrastructure Investment

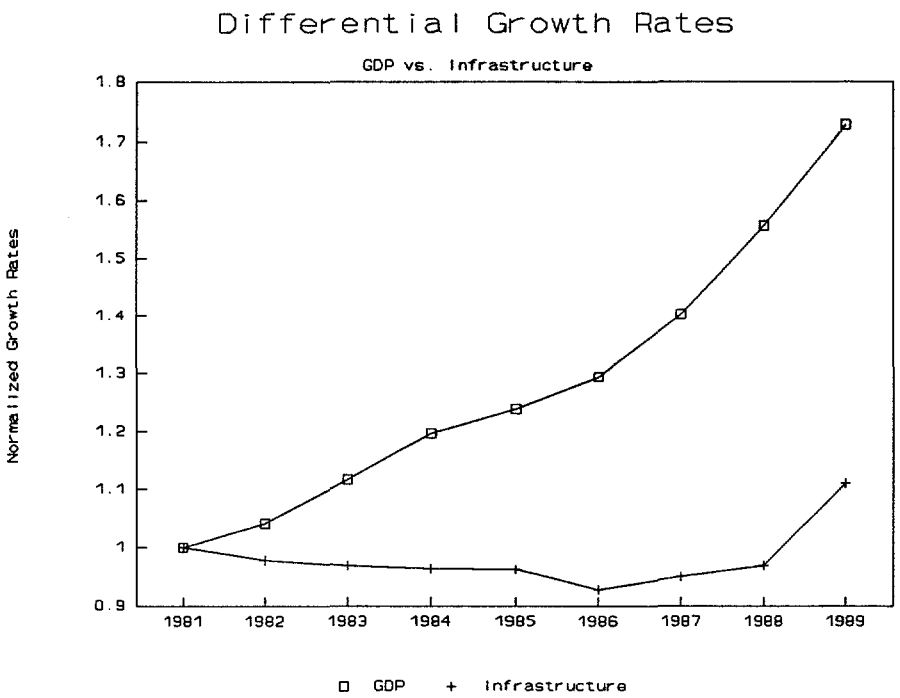
Failure to provide sufficient investment in public infrastructure is by no means a problem limited to the tourist sector. Environmental degradation in the Bangkok Metropolitan Region is not so much a consequence of urban industrial growth as it is the result of failure to supply urban and environmental infrastructure consistent with the demands of economic growth:[14]

- High-density development without adequate provision of mass transit and road networks has led to traffic congestion.
- High water demand without adequate municipal water supply has led to excessive groundwater pumping and consequent land subsidence.
- High-density development without adequate drainage and sewerage has led to flooding and water pollution.
- Industrial development without adequate pollution control and enforcement has led to increased air, water and solid waste pollution.

These are not inevitable consequences of urban and economic growth but the result of failure to develop adequate institutional mechanisms to assure that development beneficiaries also pay for the necessary infrastructure and pollution controls needed to protect the environment. Exhibit 7 illustrates the differential growth rates of Thai GDP and infrastructure.

[14]Mekvichai, Banasopit, and David Foster, *Urbanization and Environment: Managing the Conflict*, Thai Development Research Institute, 1990.

EXHIBIT 7[15]



2.3 Significance of the Environment in Attracting Tourists

Environment plays an important, if still unquantifiable, role in attracting tourists to Thailand. Representatives of the Tourist Authority of Thailand (TAT,) as well as numerous newspaper articles, identify the pleasant environment as being a major factor in promoting tourism. Other factors commonly mentioned also include: good transportation and accommodations, good food, reasonable prices, and a hospitable and interesting culture.

Tour operators say that today's tourists come seeking relief from the problems of urban areas and hope to find relaxation and fresh air in a peaceful rural setting.[16] There is also some objective evidence for this theory in recent tourism data: Bangkok, which prior to 1985 always received more than half of the international tourist nights spent in Thailand, missed out on the big tourist boom of the 1980s. During a five-year period that more tripled the total tourist nights in Thailand, Bangkok received only 24% of that increase.[17] Three quarters of the increase went to beach resorts, mountain resorts and smaller cities.

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[15]Mekvichai, Banasopit, and David Foster, *Urbanization and Environment: Managing the Conflict*, Thai Development Research Institute, 1990.

[16]*Bangkok Post Year End Economic Review*, 1990.

[17]*Annual Statistical Report on Tourism in Thailand*, 1989.

Tourists, particularly European tourists, also show a strong preference for visiting Thailand during November through March, a time when life outdoors in Thailand is far more pleasant than in northern climes. During these months, tourist visits to Thailand from Europe are roughly 45% higher than during other months.[18] The *Bangkok Post* points out that the most rapidly growing tourist activities at this time are golf, river tours, marine tourism and trekking.

2.4 Environmental Trends and Issues Associated with Tourism

Despite the importance of environment to the tourism industry, rapid growth in tourism and private investment has occurred alongside very low investment in environmental infrastructure. A variety of environmental problems now pose potentially serious threats to Thailand and to the Thai tourist industry. While no one has successfully quantified the precise impact of environmental degradation on tourism revenues, members of the tourism industry are increasingly aware that tourists, particularly high-income/high-spending tourists, are seeking a clean, quiet and healthy environment for their vacations.[19] As competition for these tourists increases, those resorts failing to provide such an environment will begin to suffer.

Some of the current and potential environmental issues impacting tourist areas are described below. Although none of these problems listed are unique to tourist areas, their potential threat to this important source of revenue may help to elicit more effective controls nationwide.

2.4.1 Air Pollution

Air pollution, particularly lead from gasoline, is a very serious problem in Bangkok, although airborne pollutants are not normally the major concern in most tourist areas. The comparatively low population outside of Bangkok combined with the coastal breezes at beach resorts tend to mitigate this problem. Rapidly growing fleets of older vehicles travelling on inadequate roadways can still create significant problems in some isolated locations. Likewise, dust from poorly controlled construction sites and open burning create some particulate problems, especially for those who sought tourist resorts as a respite from urban air pollution.

2.4.2 Water Pollution

Although there is a growing risk in Bangkok of water pollution with heavy metals from electroplating facilities and chemical dyes from textile factories, the primary concern in most tourist areas is organic and bacterial contamination from domestic waste and garbage. Water pollution is particularly significant in coastal areas. The Office of the National Environmental Board recently reported measured concentrations at major coastal resorts of E. coli bacteria (a standard measure of fecal concentration) at three and four times the accepted level of health safety.[20]

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[18] *Annual Statistical Report on Tourism in Thailand*, 1989.

[19] *Bangkok Post*, "Year End Economic Review: Visitor Boom Up In The Air," December 1990.

[20] *Bangkok Post*, January 27, 1990

Drainage patterns from beach-front restaurants and hotels preclude gravity flow systems and necessitate more expensive pumped systems. Flow of untreated wastes in coastal areas, of course, contaminates the beaches and ultimately degrades the tourist resource. Where pollutant loading is low and both the water quantity and level of dissolved oxygen of the receiving water are relatively high, this problem may not be too serious until the population density becomes significant. With the doubling and tripling of population (and consequent pollutant loadings) in many tourist areas during the 1980s, sites once thought to be immune to this problem are suddenly threatened. The problem is further exacerbated by warm tropical waters that contain less dissolved oxygen even when uncontaminated. Low dissolved oxygen combined with high biological oxygen demand from wastewater will ultimately create septic anaerobic conditions. In addition to conventional wastewater treatment, these conditions can be mitigated by in-stream aeration, low flow augmentation (increasing the quantity of the receiving water), or wave action in large bodies of water.

2.4.3 Solid Waste

Solid waste (trash) collection is probably the most ubiquitous problem in Thailand's tourist areas. Unlike water pollution, it can become a significant problem even when population densities are low. Land disposal can be particularly difficult on island resorts such as Koh Samui and Phuket, and even Chiang Mai is seriously looking at incinerators as an alternative solution. Land disposal costs do become significant in tourist areas. It is not yet clear whether the real issues is the cost per se of landfills or the now universal "NIMBY" (Not in My Back Yard) issue.

2.4.4 Hazardous Waste

Because industry is largely concentrated in Bangkok, hazardous waste is not expected to become a significant problem in most tourist areas. However, it is still possible that hospital wastes, cleaning solvents, paints and waste oil could be improperly dumped just upstream of important aquifers. Thailand has regulations on most of these materials but enforcement is uniformly inadequate.

2.4.5 Noise Pollution

Most Americans tend to consider noise a relatively low-priority issue for Thailand. Most Thais interviewed, however, voluntarily listed this as a high-priority item and every Thai agreed that this was significant when the issue was raised. Frequently, the discussion of noise evoked a far more emotional response than the discussion of water pollution. Noise was raised as an issue, not only for Bangkok, but also for traditionally quiet rural resorts where jet skis, motorcycles and construction projects are now common. For many Thais, noise pollution has grown to symbolize what they dislike about the entire urbanization/industrialization process.

2.4.6 Destruction of Coral Reefs[21]

Through a combination of biological destruction brought on by the dumping of raw sewage, inadvertent damage by tourists and fishermen, and direct destruction with picks and dynamite, the coral reefs off Thailand's coasts are being irreparably destroyed. The reefs that grew over thousands

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[21]USAID, Office of National Environmental Board, *Coastal Resource Management Project*, 1988.

of years, attracted tourists and protected tourist resorts from storm damage are being mined and sold in gift shops.

2.4.7 Destruction of Mangroves

Mangrove swamps that provide highly productive fish breeding grounds, wildlife habitats and buffers from storms are being used as waste dumps in Phuket and burned for charcoal throughout Thailand.

2.4.8 Beach Erosion

Through a combination of storm erosion, exacerbated by loss of the protective coral reefs and mangrove swamps, plus the "mining" of beach sand for construction projects, the very beaches so important in attracting tourists are being destroyed to make way for the tourists.

2.4.9 Depletion of Marine Resources

Through a combination of destruction of vital fish habitat (see mangroves and coral reefs) and over-fishing, the once productive Gulf of Thailand is now largely depleted and can no longer provide a livelihood for even the dwindling number of fishermen who depend on it.

2.4.10 Incompatible Land Uses

Potential conflicts over land uses are now developing in at least four major tourist areas in Thailand.

1. An industrial estate has been established in Chiang Mai precisely designed to attract industry from the Bangkok Metropolitan area to provide industrial employment in this tourist area.

2. Tin mining in Phuket has now exhausted the readily available ore on the island and is now proceeding offshore near many of the beach areas.

3. The Eastern Seaboard development project, which represents the largest concentration of manufacturing, rail and port facilities, is now being created just north of Pattaya with a third major port facility being constructed just to the south.

4. A "land bridge" (combination of highway, rail, pipeline and port facilities) is being planned to cross the Thailand peninsula at Kraabi, a popular quiet tourist resort just northwest of Phuket.

Most of these developments represent major investments with substantial long-term financial and employment benefits, but the dismal Thai record for enforcement and land-use control strongly suggests that many of these projects will result in significant environmental destruction and competing natural resource demands in close proximity to important tourism resources.

2.4.11 Tourists

Tourists are, themselves, a major source of destruction of vital tourism resources. Tourists litter, destroy coral, disturb wildlife, add to traffic congestion, and in many other ways inadvertently destroy the very resources that attract them in the first place. While some of these impacts may be mitigated, many others are an inevitable byproduct of the tourist industry. Ultimately attention must be given to determining the appropriate quantity and quality of tourists to be sought so as to maintain the combination of sustainable tourism revenues and the quality of life desired by Thailand.

3 ROLE OF ENVIRONMENTAL DEGRADATION IN TOURISM

Despite the leading role that tourism has played in the development of the Thai economy and the apparently important role that natural environment plays in tourism, relatively little has been done to protect and enhance the environment even in tourist areas. Almost every major tourist resort in Thailand has serious pollution problems. Only two municipal wastewater treatment systems exist in all of Thailand and both of these are woefully inadequate. Bangkok, a city of over six million, has no wastewater treatment and the once picturesque canals are now open sewers. Pattaya, consistently the largest source of tourism revenue outside of Bangkok, discharges raw sewage on its once pleasant beaches and is littered with trash. Phuket, a fabled "pearl of the Andaman Sea" and still quite beautiful, is rapidly following in Pattaya's wake.[22]

While the difficulty of proving a clear cause and effect relationship between declining environment and declines in tourism was well recognized, it was still felt that strong correlations could be illustrated and that causality could often be inferred. What was not anticipated was that the variables of environmental quality and tourism growth would often appear to be inversely correlated. The following section seeks to identify and explain these circumstances by contrasting recent trends in Pattaya with other less polluted resorts in Thailand.

3.1 Correlation of Environmental Quality with Tourism Revenues

Pattaya Beach is the closest major resort to Bangkok, located within a two-hour drive of the Capital. It is located on the eastern side of the inner Gulf of Thailand and became popular with foreigners during the Vietnam War. It is regarded as the most polluted of Thai resorts[23] and is also the largest source of foreign exchange. In 1989 this one resort was responsible for more than 13% of total tourism revenues.

Popular wisdom holds that as a tourist industry ages and as the prime locations become less attractive, then the numbers of tourists may continue to increase but the revenues per tourist will ultimately fall because the resort is attracting a lower class of tourist with lower per capita spending. This was reported in Spain and several of the Mediterranean islands, and clearly was anticipated in Pattaya, if not in Thailand as a whole. Given all of the newspaper articles on pollution in Pattaya, it was strongly anticipated that there would be a marked decline in revenues if not in number of tourists as well. In fact, precisely the opposite has occurred in the last few years; the number of tourists has begun to level off and even decline a bit but the total revenues have continued to increase. Exhibit 8 illustrates recent trends in Pattaya tourism growth.

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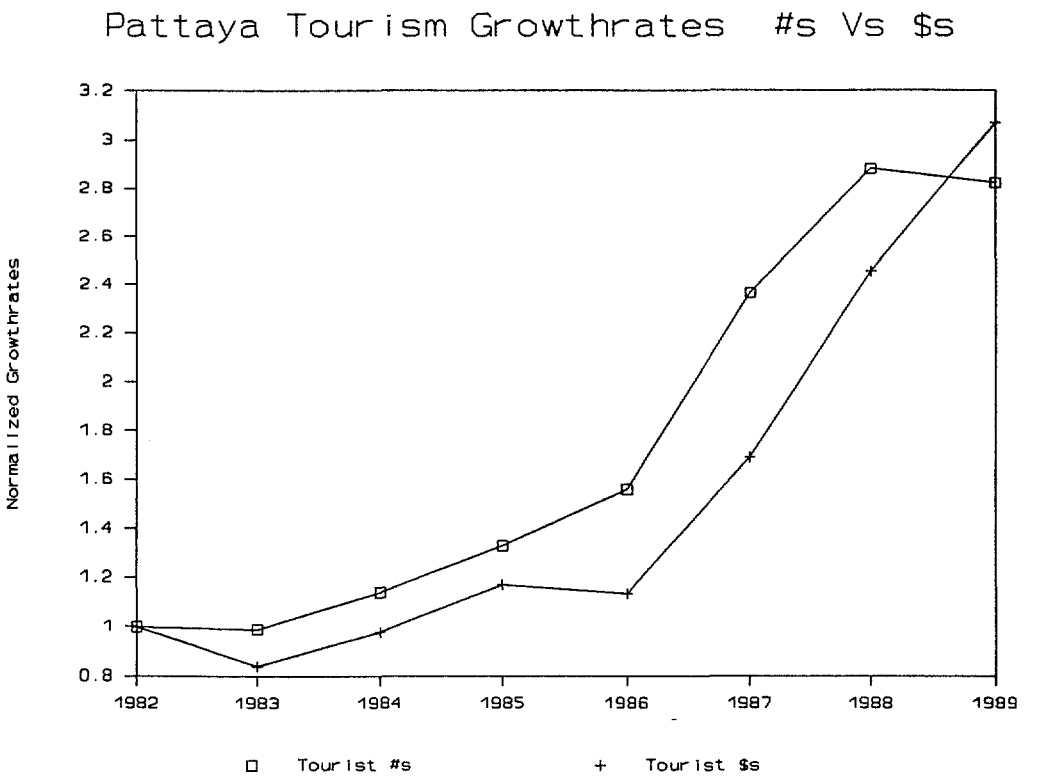
[22]Interviews with TAT, ONEB representatives and hotel managers in Phuket, November 29 and 30, 1990.

[23]Although ONEB publishes no ranking system of environmental degradation and despite the fact that monitored pollution levels in the Chao Prya River in Bangkok are clearly the highest in Thailand; interviews with tourists, hotel managers, and representatives of ONEB consistently confirm that Pattaya is the most severely polluted of Thai resorts.

EXHIBIT 8[24]



Ironically, it is in Pattaya where recent trends indicate that the growth in revenues are finally beginning to outstrip the growth in total numbers of tourists, just when the environment is at its worst. This trend is exactly the opposite of what was anticipated. Closer inspection, however, reveals that this apparent trend was accomplished by a substitution of higher-spending American and German tourists for lower spending Thai tourists. Given that the Thai tourists have already decreased substantially and the relatively high-spending Japanese and Taiwanese tourists have shown little interest in Pattaya, this surplus revenue growth is likely to be a short-lived phenomenon.

Exhibit 9 illustrates the recent changes in the makeup of Pattaya tourists. After growing in unison for a great number of years, the Thai tourist visits began to fall behind foreign visits in 1987, leveled off in 1988 and began an actual decline in 1989. It is significant that this decline in Thai tourism occurred despite the fact that 1989 was one of the economically strongest years in Thailand's history. This change clearly represents a change in Thai revealed preferences. No comparable

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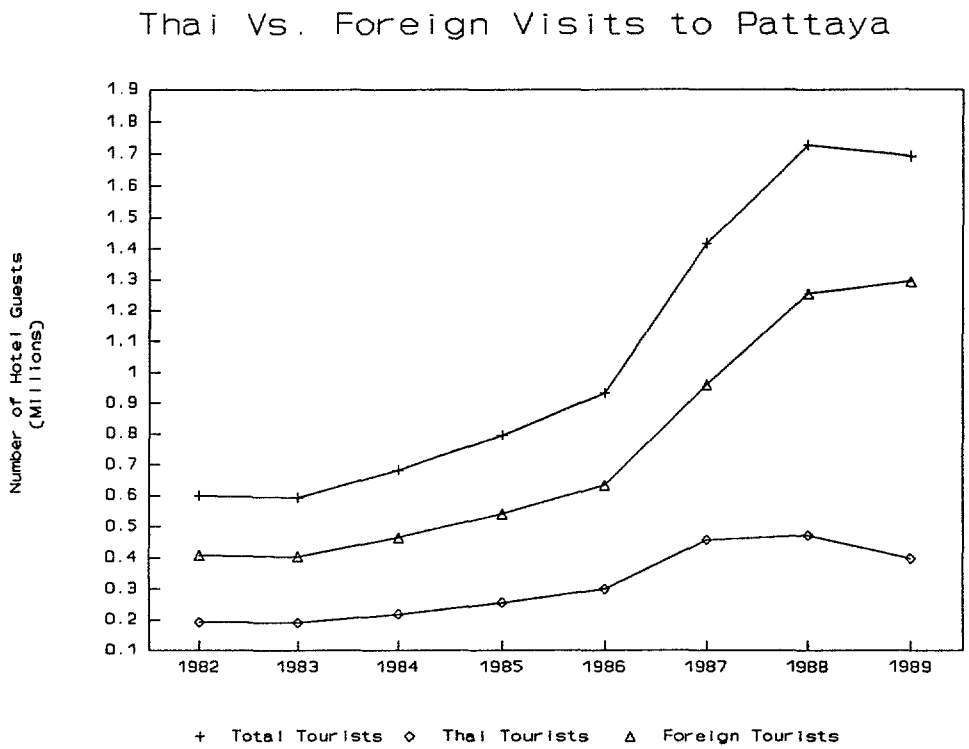
24 Annual Statistical Report on Tourism in Thailand, 1986, 1989.

EXHIBIT 9[25]



reaction was observed during this time period at other Thai resorts, so it is unlikely that the change is simply a reaction to too many foreigners. Most observers believed that it was predominately a response to what Thais had been reading in their own press and seeing with their own eyes about environmental deterioration in Pattaya.[26]

Although not a direct contributor to foreign exchange, Thai tourism is significant for at least two reasons:

1. As tourists who presumably best know the conditions of the resorts they visit, domestic tourists are an important indicator of future trends, and

[25] *Annual Statistical Report on Tourism in Thailand*, 1986, 1989.

[26] Pollution problems at Pattaya Beach have been a common feature in the English press for the past two years. Ann Usher, a Thai reporter on environmental issues for *The Nation* newspaper, confirms that although environment has historically been less significant in the Thai press, Bangkok Thai newspapers are also increasingly concerned with pollution problems at nearby resorts.

2. Given the volatility of international tourism, particularly during times of economic recession or international tension, domestic tourism is an important source of stability, helping to pay the bills until the foreign tourists return.

Ironically, the initial hypothesis was that foreign tourists, because they came from cleaner environments, would be more sensitive to pollution and thus reject polluted resorts faster than native Thais. Actually, in the case of Pattaya, the visits by Thais were the first to show a leveling off and then a decline. Only after this trend was first well established by Thais did the growth rate for visits by foreigners begin to follow (see Exhibit 9). With still further irony, many Americans as well as Thai tourist agents[27] frequently indicated that American and German tourists were among the most selective, while Asian tourists (particularly those from Hong Kong and Taiwan) were more likely to tolerate or ignore environmental degradation. In fact, just the opposite trend is revealed in Pattaya.[28]

3.2 Correlation of Pollution with Length of Visit

Not only is the average tourist now spending more in Pattaya, but they seem to be staying there longer. The hypothesis was that environmental degradation would take its toll in shortening the average length of tourist visits but no such trend is evident. In fact, in the most recent years when the pollution and congestion have been at their worst, length of visit has shown its most significant increase. Quite probably this increase is related to a growing emphasis on package tours to European tourists and their gradual replacement of the domestic tourist on holiday weekends. Similarly, we would have thought that Phuket, because of its more difficult access and cleaner beaches, might have enjoyed consistently longer visits. In fact, as shown in Exhibit 10, Pattaya held the record for longest average visit exactly half the time. While some variation may be explained by differential pricing, there is still no evidence to suggest that tourists have been cutting their visits short because of pollution.

3.3 Correlation of Pollution with Hotel Occupancy

Although there is obviously no claim of a causal relationship, there is apparently a strong positive correlation between observed pollution levels and hotel occupancy rates in Thailand. While hotel occupancy in Pattaya dropped off slightly during 1989, despite a continuing increase in the other areas examined, occupancy in Pattaya has been consistently higher than in Hua Hinh or Cha Am and was higher than Phuket during five of the eight most polluted years in Pattaya's history. Similarly in Bangkok, clearly the most polluted of all, the occupancy rates are consistently the highest in the country (above 80%). Obviously, it is not appropriate to compare occupancy rates in major cities with those observed in seasonal tourist resorts, but it does point out the difficulty of conducting statistical analysis on this subject.

Exhibit 11 illustrates the pattern of hotel occupancy rates during the 1980s.

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[27]Interview with Pairat Banchai, Director See Tour Tourist Agency, December 1990.

[28]*Annual Statistical Report on Tourism in Thailand*, 1989.

EXHIBIT 10[29]

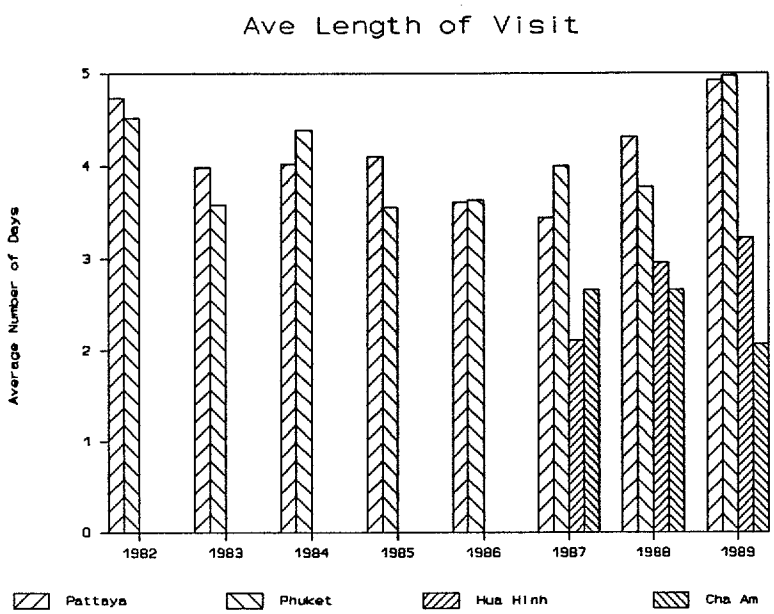
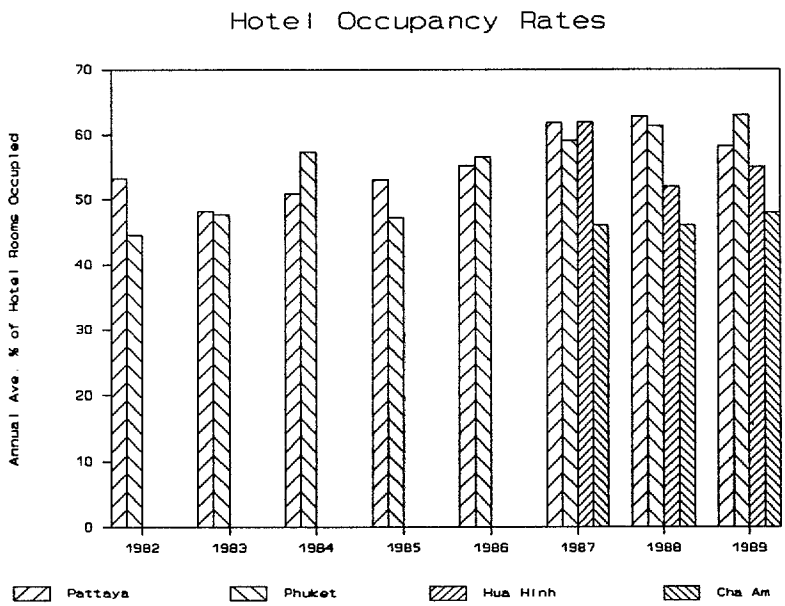


EXHIBIT 11[30]



[29]Tourist Authority of Thailand.

[30]Data obtained from Tourist Authority of Thailand and the Thai Hotel Association.

Phuket, Hua Hinh and Cha Am are all significantly less polluted than Pattaya. Hua Hinh, Pattaya and Cha Am are all within a 4-hour travel radius of Bangkok.

3.4 Potential Indicators of Long-Term Tourism Trends

The environmental degradation of Pattaya has still had no demonstrable immediate impact on tourist revenues, length of visit, or hotel occupancy, although in 1989 hotel occupancy rates did fall over the previous year, as shown in Exhibit 11. It is therefore theorized that environmental degradation may be generating a lagging effect that will only begin to impact revenues a few years after the environmental conditions become widely known. In order to test this hypothesis several other indicators were examined in greater depth.

3.4.1 Trends in Tourist Visits as an Indicator of Future Tourist Revenues

Studies of tourism often draw distinctions between two or more types of tourists[31]. The first type is frequently referred to as the "explorer" and the second as the "mass tourist." While the explorer category is heavily composed of relatively low-spending students and drifters and thus does not contribute that much to total revenues, explorers often act as trailblazers and establish the trends that future mass tourists may follow. Mass tourists, by contrast, tend to be more responsive to the advertizing campaigns of travel agencies and follow an organized plan mapped out by air lines and tour operators. Tourist visits by explorers are often precursors of future mass travel.[32] Exhibit 12 illustrates current trends in tourist visits, contrasting growth rates in Pattaya, Phuket and Thai national averages.

Not only has the growth rate in tourist visits to Pattaya lagged behind that of Phuket during five of the last seven years, but in 1988 it barely kept pace with the national average. In 1989 growth in tourist visits actually fell behind the national average for the first time. Although revenues continued to climb thanks to foreign package tour promotion, the declining trend in tourist visits suggests that future "mass tourists" will become increasingly difficult to recruit. The number of visits is perhaps the best indicator of local reputation and when the number of visits decline this could be a clear indicator of declining revenues in future years.

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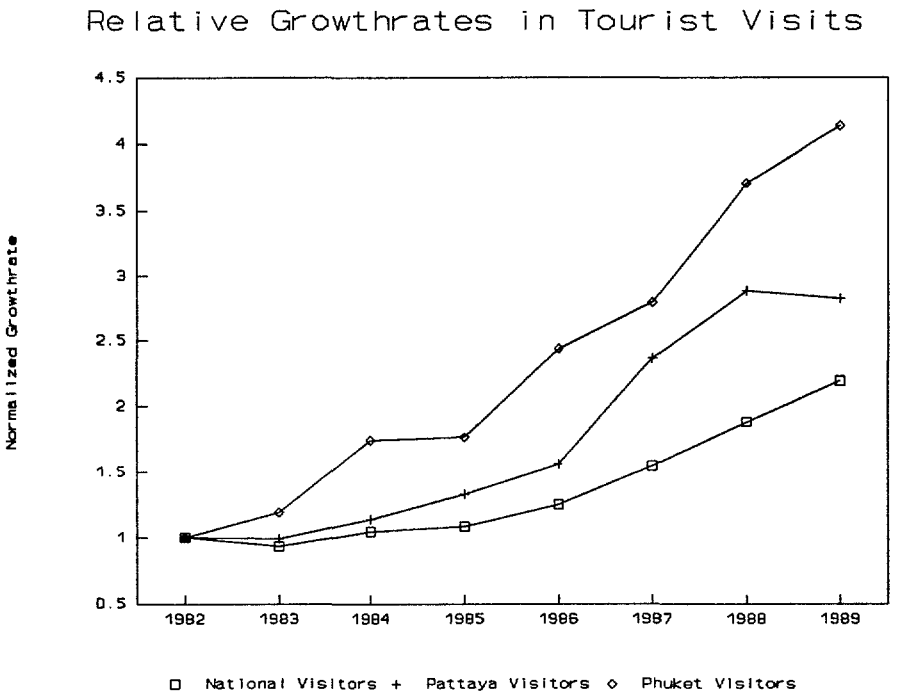
[31]Cohen, Erik, "Toward a Sociology of International Tourism," *Social Research*, Vol. 39, No. 1, 1972.

[32]Cleverdon, Robert, *The Economic and Social Impact of International Tourism on Developing Countries*, 1979.

EXHIBIT 12[33]



3.4.2 Trends in Tourist Nationality as an Indicator of Future Revenues

As illustrated in Exhibit 9, there has already been a significant decline in Thai tourism to Pattaya. This decline was partially compensated for by a simultaneous increase in German and American tourists and thus had no immediate impact on total revenues. Other trends may be still more ominous. Despite the increase in total revenues, Pattaya is now falling behind the national average in growth rates for 17 out of 22 nationalities. Exhibit 13 presents comparative growth rates for tourists from 22 countries. Of greatest concern is the fact that Pattaya is now falling substantially behind Phuket, as well as national averages, with respect to tourists from Japan, Hong Kong, Taiwan, and Singapore. These tourists have an average per capita expenditure of more than $130 per day. By contrast, the nationalities for which Pattaya seems to have an edge have an average daily expenditure of only $82 per capita.

[33]Data obtained from *Annual Statistical Reports on Tourism in Thailand*.

EXHIBIT 13[34]

Shifting Patterns in Tourist Visits

Nationality of Tourist	Average Daily Expenditure	PERCENT CHANGE IN TOURIST DAYS		
		National	Phuket	Pattaya
Thailand	$45.00	15%	32%	-16%
U.S.	$115.16	10%	-31%	39%
Canada	$84.28	20%	-30%	-23%
Austria		18%	26%	14%
Belgium		10%	-45%	39%
Denmark		8%	15%	-15%
France	$80.99	20%	-22%	-16%
Germany	$68.17	16%	-22%	37%
Italy	$78.48	7%	25%	-2%
Netherlands	$67.72	12%	-31%	17%
Sweden		19%	10%	20%
Switzerland	$73.70	19%	-24%	18%
U.K.	$81.07	4%	-13%	3%
Middle East	$98.54	10%	-24%	-10%
Australia	$98.16	46%	-20%	9%
Hong Kong	$106.10	66%	10%	-25%
Japan	$167.16	22%	7%	-15%
New Zealand	$79.24	40%	-31%	-11%
Taiwan	$144.76	110%	85%	29%
Malaysia	$83.25	5%	-13%	-34%
Singapore	$104.43	10%	-7%	-35%
Others	$125.45	25%	205%	7%
WEIGHTED AVERAGE	$100.22	14%	10%	-2%

While Phuket is certainly doing better than Pattaya with regard to attraction of high-spending tourists, both Phuket and Pattaya are beginning to fall behind the national averages. It is difficult to determine whether this latter phenomenon is really related to the environmental quality at the tourist resorts. At least two other plausible explanations are available: First many of the "tourists" may actually be investigating business opportunities in Bangkok and other urban areas; second, Asian tourists tend to be less attracted to sunbathing than their European counterparts, regardless of the quality of the beaches.

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[34]Data derived from *Bangkok Post* 1990 Annual Report and Annual Statistical Report on Tourism in Thailand, 1990.

4 ASSESSMENT OF POTENTIAL BENEFITS AND COSTS

4.1 Methodology for Estimating Impacts

Given the limitations on data and the difficulty of accurately distinguishing between a myriad of factors influencing tourism revenues in Thailand, calculations of economic impact are at best a presentation of plausible estimates. Nevertheless, there are at least four possible ways in which these estimates could be generated:

1. Opinion surveys drawn from a panel of "experts;"

2. Projections based on tourism trends and comparisons among relatively polluted and unpolluted resorts;

3. Analysis of willingness to pay as expressed through additional travel cost and/or time expended in order to visit a resort differing primarily in environmental quality (this analysis was not done in this paper due to time and data limitations);

4. Opinion surveys from a statistically valid sample of tourists (this analysis was not done in this paper due to time and resource limitations).

Each of these methods has significant weaknesses as well as strengths but they may provide useful estimates of the potential range of impacts.

4.1.1 Opinion Survey

An opinion survey from a panel of experts (Appendix B lists names and affiliation of panel members) was used to estimate the percentage impact on tourist revenues at a given resort (Pattaya) resulting from environmental degradation.

Advantages. The merit of this approach, in addition to its relative ease, is that these resident experts may be able to intuitively factor in the multiple influences based on their own professional and personal experience.

Disadvantages. The disadvantage, of course, is that it is practically impossible to "certify" experts or to assure that they have taken all appropriate factors into consideration. In addition, the "experts" selected for these interviews proved to be particularly reluctant to quantify their estimates.

Composition of panel. An informal panel of Thai professionals was identified with recognized expertise in environment, tourism or both. A list of questions was prepared and each member of the panel was informally asked essentially the same questions. The questions and their responses are recorded in the appendix. The members of the panel included the following:

- Three employees of the Office of the National Environmental Board (ONEB);
- Two employees of the Tourist Authority of Thailand;
- Two USAID employees;
- Two managers of resort hotels;
- One manager of an international tourist agency; and
- Two employees of the Thai Development Research Institute.

In addition to the experts, about ten informal interviews were conducted with tourists themselves. The information obtained from the tourists was primarily of value as an aid in identifying potential issues and in formulating questions for the experts. Although there were no major discrepancies, the limited sample size and the informality of the interviews themselves precluded these interviews from forming a satisfactory data base. Time and resource limitations precluded the use of a statistically relevant sample of tourists.

Major findings.[35]

- All interviewed panel members felt that environmental quality was a significant factor influencing growth of tourist numbers and revenues.

- Interviewees generally agreed that the significance of environmental quality depended on the nature of the resort, with Pattaya (because of the other attractions available) being least influenced and Koh Samui most influenced.

- While all interviewees were reluctant to quantify the potential tourism impact of environmental quality at Pattaya Beach, estimates ranged from 10% to 35% with the most common estimate in the 15% range.

4.1.2 Tourism Trends

The second method employed for estimating impacts involved the analysis of tourism trends. As previously discussed, the most obvious trends show little significant impact of environmental quality on tourism. Pattaya, the most seriously polluted resort, has steadily climbing revenues and exceeds the national average for tourism growth. Even though occupancy rates did fall slightly in 1989 and may be an omen of problems to come, the overall occupancy trend for the 1980s remains positive. Only when one looks beyond these factors into underlying trends is there significant cause for concern. Underlying trends used for the purpose of projecting future impacts include the following:

- Using changing growth rates in domestic Thai tourism as a predictor of foreign tourism;

- Comparing growth rates in tourist visits between Pattaya and Phuket as predictor of future total tourist days; and

[35]More detailed findings are included in the appendix.

- Comparing projected revenues based on current shifts in national expenditure patterns.

Advantages. The data are relatively available and each of these underlying trends offers more plausible explanations of the conditions surrounding Pattaya than does a reliance on current revenues alone.

Disadvantages. The trends selected are at best predictors of future revenue impacts. Although the underlying trends are plausibly correlated with environmental degradation, there remains no clear proof of causality.

Major findings.

- Growth in domestic Thai tourism in Pattaya closely paralleled that of foreign tourism up until 1987 (see Exhibit 9). In that year, the first year when the local press really began to focus on pollution problems in Pattaya, domestic tourism growth began to lag behind foreign growth. In 1988 the domestic tourism growth at Pattaya declined to zero and in 1989 growth declined by 16%. Throughout this time, growth in domestic tourism at Phuket, Hua Hinh and Cha Am continued to exceed national averages.

- Although foreign tourism at Pattaya has continued to grow, 1988 foreign growth rates correspond closely to 1987 domestic rates and 1989 foreign rates correspond closely to 1988 domestic ones. If these trends continue, foreign tourism in Pattaya can be expected to decline in 1990 by around 16% as a plausible consequence of environmental degradation.

- Although Pattaya has managed to maintain its growth in revenues so far, Phuket's growth rate in tourist visits has exceeded Pattaya's in five out of the last seven years. In 1988, while Pattaya still had the lead in revenue growth, Phuket's growth in visitors exceeded Pattaya's by 11%. By 1989 the gap in tourist visit growth rate had increased to 14% and Phuket's revenue growth exceeded Pattaya's by 40% vs. 25%. Pattaya has already fallen 15% behind Phuket in total revenue growth and is likely to fall even further behind if current trends continue.

- While total tourist days spent in Pattaya continue to increase slightly, there is a substantial shift underway in national make up of the tourist population. This is significant to the long run revenue picture because the tourists whose nations' shares are increasing in Pattaya spend substantially less than the tourists whose nations' shares are decreasing. In 1989, national tourist sectors on the decrease spent an average of $120 per day per capita, while increasing national sectors spent only $85. In Phuket, the situation is just the reverse: Those countries with increasing shares spend an average of $124 per capita per day while those with decreasing shares spend only $78. If current trends continue, the average tourist attracted to Pattaya will spend 15% less than the national average and 46% less than the average tourist attracted to Phuket.

Each of these trends suggest that future revenue growth at Pattaya beach, the most polluted of the major tourist resorts, will soon be falling behind revenue growth at other less polluted and

congested resorts. Both Pattaya and Phuket are equally well known. Pattaya is more easily accessible and slightly lower priced. The primary advantage of Phuket is one of environmental quality.

4.2 Estimating Potential Benefits and Costs Associated with Environmental Protection at Pattaya Beach

4.2.1 Assessment of Potential Benefits

The benefit assessment is based on the following assumptions:

1. **Impact** of environmental quality on tourism revenues at Pattaya Beach is assumed to be at least 15%. While neither of the techniques employed were conclusive, they have the advantage of being plausible, mutually reinforcing, and relatively conservative. The trend projections may tend to overestimate the impact in the initial years but as their impacts will be cumulative, 15% may be a significant underestimate in the long run.

2. **Leakage** from the tourism industry in Thailand overall is assumed to be no more than 35% (see the discussion on "leakage" in Chapter 1, The Importance of Tourism Industry).

3. **Leakage** from tourism in Pattaya is assumed to be analogous to that of a small Caribbean island, or 90%.

4. **The Tourism Multiplier** for Thailand is assumed to be 1.3. (see the discussion on "Multipliers" in the section on the Importance of the Tourism Industry, Chapter 1).

5. **The Tourism Multiplier** for Pattaya is assumed to be .25.[36]

In addition to the assumptions listed above, the following data from the Tourist Authority of Thailand[37] was used in estimating economic benefits.

1. Foreign tourists in Pattaya: 1,293,847
2. Average expenditure/day for foreign tourists while in Pattaya: $60[38]
3. Average length of stay for foreign tourists in Pattaya: 4.92
4. Total tourism revenues (foreign and domestic) in Pattaya: $499,538,000

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[36]The tourism multiplier for Pattaya is quite small because only a relatively small portion of the revenues are retained within the province (see Chapter 1 for more detailed discussion of "multipliers."

[37]*Annual Statistical Report on Tourism in Thailand*, 1989

[38]The average daily expenditure while in Pattaya will not necessarily be the same as the average daily expenditure by those same nationalities while in Thailand as presented in Section 3.4 or 4.1.2. Both data sets were obtained from the Tourist Authority of Thailand but the chapter 3 data was taken from nationwide surveys.

Based on the assumptions above and 1989 tourist data, the impacts on income and foreign exchange can be calculated as shown in the following sections.[39]

Impact on foreign exchange.

1. Gross Foreign Exchange from Pattaya = **$382,000,000 per year**

# of Foreign Tourists	×	Ave. # of Days	×	Ave. Expend./Day
1,293,847	×	4.92	×	$60

2. Net Foreign Exchange from Pattaya = **$248,300,000 per year**

Gross Foreign Exchange	×	(1 - National Leakage)
$382,000,000	×	(1 - 35%)

3. If environmental quality has at least a 15% impact on revenues at Pattaya, then an average of about **$37 million per year** (0.15 × $248,300,000) in national foreign exchange is lost due to failure to more effectively protect the environment at Pattaya.

Impact on national income.

1. National Income from Pattaya = **$650,000,000 per year**

Total tourist revenue in Pattaya	×	National Multiplier
$499,538,000	×	1.3

2. If at least 15% of this income stream is related to environmental quality then an average of about **$100 million per year** (0.15 × 650,000,000) in national annual income is lost due to poor environmental quality at Pattaya.

3. Assuming a useful life of 20 years for capital improvements (including sewers, drainage and wastewater treatment) and an average 10% rate of return, then a $ 100 million per year income stream implies that environmental quality in Pattaya represents a national asset with net present value of at least **$800,000,000.**

[39]Calculations here of national impacts assume that revenues lost at Pattaya are not simply diverted other resorts within Thailand.

Impact on local income in Pattaya.

1. Local Income from tourism in Pattaya = **$125,000,000 per year**

Tourism Revenue in Pattaya	×	Local Multiplier
$ 499,538,000	×	.25

2. If at least 15% of this income stream is tied to environmental quality, then an average of about **$19,000,000 per year** in annual income is lost just to the people of Pattaya due to failure to protect the environment.

3. Assuming a useful life of 20 years for capital improvements and a 10% rate of return then the local net present value of this wasted asset is **$160,000,000.**

Implications of benefit assessment. There are at least three important implications to derive from this assessment:

1. The benefits associated even with a 15% level of impact are still very substantial. For example, just one year's lost national income ($100 million) resulting from failure to adequately protect the environment in Pattaya is more than twice the total USAID environmental expenditure in Thailand. The MANRES program (USAID Thailand's largest current activity) is currently budgeted for $44 million over seven years.

2. Given the substantial impact ($37 million) that even a 15% shift in revenues at one tourist resort can have on foreign exchange earnings, well planned investments in environmental protection may actually increase net foreign exchange earnings even when investment capital is borrowed on the international market.

3. While the local income benefits potentially derived from improving the environment of Pattaya are substantial ($19 million per year), the national income benefits are far more significant ($100 million). This clearly suggests that the national government may have a far greater stake in protecting the local environment than do the local citizens themselves. Although full cost recovery is an important aspect of most sound infrastructure programs, this finding may argue for greater national government support for environmental infrastructure that provides substantial national benefits. In any case, it helps to explain why local officials have argued for at least 80% national funding for capital costs of public infrastructure.

4.2.2 Estimating Potential Costs Associated with Wastewater Treatment at Pattaya Beach

Although wastewater collection and treatment is only one aspect of badly needed environmental protection at Pattaya Beach it seems to be the most important for at least three reasons:

1. It probably poses the most serious health hazard and definitely receives the most adverse comment from tourists (or would be tourists);[40&41]

2. It is by far the most expensive environmental problem facing the community; and

3. More than any other problem, it requires collective action in order to be successful (i.e. one person cannot have much impact on wastewater quality and one will rarely see the effects of his/her own efforts).

Calculating Pattaya control costs based on analogous estimates at Karon Beach, Phuket Island. The following calculations are provided primarily for illustrative purposes and represent a relatively "quick and dirty" calculation based on extrapolation of more detailed estimates for Karon Beach.[42] Karon Beach is located in the South West side of Phuket Island and is one of the most rapidly growing tourist areas on Phuket. Despite its much smaller size, Karon was selected for this purpose because of the similar topography, availability of data and presumed reliability of the analysis. The purpose of these calculations is to develop a ball park estimate of potential wastewater treatment costs in Pattaya.

After extensive evaluation, a central wastewater treatment system was designed for Karon Beach consisting of: (1) a sewerage system for collection and transport of wastewater to the central treatment plant and (2) the wastewater treatment system itself. Like Pattaya, land prices at Karon are very expensive and thus precluded the use of large, land-intensive settling and treatment ponds. The system selected is referred to as Extended Aeration Activated Sludge. It was chosen because it was expected to be the lowest cost system that also met necessary constraints relating to odor control and ease of operation.

Karon Beach, like Pattaya, is a popular resort area in Thailand but is much smaller and less densely developed. The low density of Karon would tend to increase the length and cost of sewer lines per volume of wastewater handled, but the low density may also decrease land acquisition and construction costs per unit length. As Pattaya generates roughly 12 times as much wastewater as Karon it appears that there would be some economies of scale in constructing the larger system. On balance, use of the cost estimates derived from the Karon Beach calculations should tend to overestimate the per unit cost of collecting and treating wastewater at Pattaya.

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[40] *Bangkok Post* and *The Nation* newspapers, September 1990 - February 1991.

[41] Interviews with Tourist Authority of Thailand and representatives of Office of National Environmental Board, 20 November 1990.

[42] USAID, University of Rhode Island, Office of National Environmental Board, Unisearch-Chulalongkorn University, *Final Report: Water Quality Management of Karon Basin*, Phuket, 1989.

	Karon Beach	Pattaya Beach
Number of rooms	1,519	18,097
Water use	2,628,000 m^3/yr	31,309,358 m^3/yr
Capital cost	$2,569,600	$30,613,595
Operation and maintenance	$318,000/yr	$3,788,575/yr

Based on a 20 year life and 10% interest rate the capital cost can be converted to an annualized cost of $3,595,861. The total annual expense for full recovery of capital and operation and maintenance in Pattaya would then be $7,384,436 ($3,595,861 + $3,788,575).

The total annual cost of the most expensive part of an environmental clean up program for Pattaya would, therefore, be less than half the estimated local annual income benefit ($19,000,000). Pattaya could still add another $2.5 million per year to improve trash collection and still spend less than 10% of the estimated national income benefit of $100,000,000 per year.

Even if one assumes only 10% average profit and neglects all other possible benefits associated with environmental protection at this leading tourist resort, the national profits protected alone would at least equal the costs.

5 POTENTIAL FOR COST RECOVERY

The cost for wastewater treatment for Pattaya translates to roughly 25 cents per cubic meter. For means of comparison, the current charge for water in Bangkok is about 16 cents per cubic meter although the true estimated cost is over 20 cents. In Pattaya municipal water also sells for about 16 cents but there is a chronic shortage and water vendors charge about twice that amount.

5.1 Possible Mechanisms

While local interviews revealed a strong preference (almost insistence) on national funding for wastewater treatment, there remain several plausible options for full cost recovery at the local level:

1. Recover full costs through a uniform surcharge of 25 cents per cubic meter added on to the current water bill. While such a mechanism would provide maximum incentive for water conservation, to shift from the current charge of 16 cents to 41 cents per cubic meter (16 for drinking water plus 25 for wastewater) would probably be politically untenable.

2. Apply an environmental surcharge on all restaurant and hotel fees. A 2% environmental protection fee on tourists (so as to protect the environment for tourists) would provide roughly $10 million dollars per year in Pattaya alone (2% of $499,538,000). Such a fee would amount to only $1.20 per day per tourist at the 1989 level (2% of $60/day). While such a fee appears quite small, the tourist industry is likely to scream that they can't possibly afford to accept such a burden particularly if revenues are expected to decline.[43] This argument will be particularly shrill given the recent declines in tourism due to the Middle East Crisis.

3. Establish differential water and sewerage rates for different users with cross subsidies between resorts and private residential users. This third approach reduces the local residential surcharge to a more tolerable level yet still maintains the principle that beneficiaries should pay. Hotels would still presumably pass most of their costs on to their customers but the hotels would now have an additional incentive to conserve and recycle water.

Despite the seeming feasibility of options (2) and (3) above, the major differences between local and national income benefits derived from tourism in Pattaya combined with the long Thai history of local reliance on national funding for local infrastructure makes a serious argument for some form of cost sharing. Internationally the most common practice is for local communities to pay the operating and maintenance costs on the theory that locals have more control over these recurrent marginal expenses. With regard to capital costs, however, many countries (the U.S. and Japan included) provide for the national government to pay the largest share.

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[43]According to the *Bangkok Post* (9/28/90), Pattaya sought to establish a 32 cent waste-water fee per day per hotel room in 1988 but it was rejected by the hotel owners.

The earlier calculations estimated that Pattaya would retain only $19 million as its share of the additional $75 million (499 × 0.15) in tourism revenues resulting from environmental improvements. The nation of Thailand, as a consequence of its lower "leakage" and higher "multiplier," would receive nearly $100 million (1.3 × 75). This means that Thailand receives roughly five times as much national income benefit from investments in tourism related environmental infrastructure in Pattaya than does Pattaya itself. This fact alone furnishes a plausible rationale for having the national government cover 80% of the capital cost.[44]

Persuasive as this argument may be, the concept of having the national government subsidize local ones still has at least four serious flaws.

1. In a country like Thailand where almost no one has wastewater treatment it raises serious equity problems to have the national government subsidize what is undoubtedly regarded as a luxury for the benefit of the wealthy tourists and the relatively high-income Thais.

2. Even if the argument can be justified for tourist areas, once that precedent is well established it would be almost impossible politically to change course when an otherwise equally deserving but nontourist area applied for central government assistance.

3. Large national subsidies would immediately contradict the hard won and recently adopted principle of "polluter pays."[45]

4. There simply is not enough money in the national treasury to cover the capital cost of all infrastructure requested.

5.2 Factors Impacting Willingness to Invest in Environmental Infrastructure

Thai communities vary substantially in their efforts to protect and enhance their environmental resources. While no comprehensive examination was made of all factors, some of the factors appear particularly significant.

5.2.1 Tourism

There are currently only two municipal wastewater treatment plants in Thailand and both of these are in tourist areas. In addition to these facilities, all hotels of greater than 40 rooms are required to install and operate wastewater treatment plants. While this latter requirement is poorly

[44]This same cost sharing formula of 80% national and 20% local is precisely the one that the World bank has proposed for infrastructure capital expense associated with its Thailand Regional Cities Program.

[45]This concept of "polluter pays" was the central theme of the recent TDRI national conference on the environment and the policy has been firmly endorsed for the next five-year plan.

enforced, particularly with regard to the requirement for continuous operation, interviewees[46] generally felt that the requirement for compliance was better among tourist-oriented hotels than other establishments. The two locations with some centralized wastewater treatment facilities are Pattaya Beach on the inner Gulf of Thailand and Patong Beach on Phuket Island. While both communities have taken some steps to address their pollution problems, Patong Beach, the area with fewer difficulties, appears to be more committed to resolving its problems. While both facilities were constructed with funds from the central government, only Patong beach has established a system for recovery of operating costs. These areas have major environmental problems but are by no means the most polluted areas of Thailand. Tourism clearly plays a role in the willingness to invest in environmental infrastructure and thus implies some recognition of the potential impact of environmental degradation on the economic resource base.

5.2.2 Topography of Resort Area

Out of five major population concentrations on Phuket Island, only Patong beach has established a wastewater treatment program and only Patong seems to have effectively mobilized the community for a systematic clean-up campaign. One major factor in this decision was quite likely the shape of Patong beach itself. Unlike most other beaches on the island, Patong is a deep "U - shaped" cove hemmed in by hills on three sides and with comparatively limited cross beach wave action. This means that once trash and wastewater enters the cove, it will remain there for a relatively long time. It also means that only limited amounts of waste from other parts of the island end up on Patong so that it practicable to clean up this one area even if other areas become polluted. While the scope of the study did not provide for analyzing this issue in detail, the impact of natural topography in Phuket was so significant that it appears that this factor may be significant at other beach resort locations as well.

5.2.3 Experience with a Previous Collective Action

The residents of Patong Beach have a more critical need to collectively address water pollution problems because of their special topographical situation. It is not apparent, however, that their solid waste problems were any more critical than those of other tourist communities like Hua Hinh and Cha Am. Nevertheless, their success in collective wastewater treatment seems to have provided a spinoff in terms of a better-than-average effort on trash collection.

5.2.4 Density

Population density, among resort areas, is obviously a factor in creating potential pollution problems and consequently in creating willingness and capacity to overcome them. Where resorts are widely dispersed and particularly where the density is reduced by individual cabanas, the need for wastewater treatment is reduced as well. Unfortunately, the need for trash collection is not necessarily reduced through dispersal and the costs tend to increase with distance.

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[46]See Appendix B.

5.2.5 Access and Proximity to Capital City

Pattaya has one major locational advantage over all other beach resorts; it is the closest resort to Bangkok. This allows the residents to degrade the resource base there to a greater extent than would be possible in other locations and yet still keep the tourists coming. Phuket, by contrast, would be lost without its beaches. Pattaya, due to its proximity to Bangkok, could probably continue to survive. This difference in priorities is readily evident from interviews, proportional environmental efforts and even promotional brochures. Phuket brochures glory in their beaches. Pattaya brochures, even for new "top of the line" hotels, glory in their nightclubs, restaurants, saunas, and game rooms and devote less than 5% of their space to saying: "by the way, we also have a beach."

The Tourist Authority of Thailand also recognizes this issue and is making a proportionately greater effort toward preserving the environment in the outlying areas of Phuket and Koh Samui. Hua Hinh, both by geography and level of environmental interest, falls somewhere in between. Because it is further from Bangkok, it is still not as built up and it benefits from the Pattaya "spillover" but, in part because its position is relatively secure, tourist professionals indicate that it will be difficult to generate significant willingness to invest in environmental infrastructure.

5.2.6 Private Sector

The business sector in the Patong section of Phuket has played a substantial role both in promoting the initial wastewater treatment plant and more recently in expanding its operation. While the capital cost for the original plant was paid by the central government, operating costs have been paid by the users. Members of the local business organization also indicated that they feel rapid expansion of the facility is so important that they will pay part of the capital cost as well. In Pattaya, by contrast, business involvement has been more limited, no user fees are collected, and no offer to pay any share of capital costs seems forthcoming.

5.2.7 Nongovernmental Organizations

Nongovernmental organizations (NGOs) do appear to be playing a significant role in some tourist communities. Universities are actively involved in environmental research in Chiang Mai, Rayong, Koh Samui, and Surathani and this helps stimulate greater interest among the general populace. In addition, high school and university student groups in Phuket take an active part in clean-up and wildlife (turtles and shorebirds) protection efforts. While some such efforts may be operating in Pattaya, they were far less evident.

5.2.8 Governmental Leadership

Leadership, particularly by the provincial governor, appears to be a significant but nondominant factor. The governor in Chiang Mai has an outstanding reputation and has been a key factor in stimulating interest in preservation and better trash collection and disposal. In Phuket, the business sector assumed the dominant role. In Koh Samui, the Tourist Authority of Thailand and the Provincial Governor have played the major roles. In Pattaya, no one sector appears to be ready to accept responsibility.

5.2.9 Price Incentives

One significant environmental success at Pattaya is primarily due to the shortage of water and consequent high price. Many hotels privately admit that the primary motivator for installing and operating wastewater treatment is to provide recycled water for irrigation of hotel gardens. This incentive, of course, is most effective when the cost of water is greater than the cost of wastewater treatment.

Price incentives have an effect on trash collection, as well. Trash collection services in Thailand also typically cover half their costs from scavenging and selling recycled materials.

5.2.10 Subsidies

Subsidies, or partial payment for trash collection, have a mixed record in Thailand. Obviously, in some areas they provide for collection where it would not otherwise occur but in other areas the impact is detrimental. In Koh Samui, for example, the central government pays the capital cost for a limited supply of provincial garbage trucks. This central government capital subsidy, together with a local provincial subsidy, revenues from scavenging, and small user fees are sufficient to provide for collection of roughly 60% of the trash on the island. Unfortunately, while the subsidies contributed are not sufficient for complete collection, they are high enough to prevent effective competition from the private sector and as a consequence substantial amounts of trash go uncollected. Furthermore, the subsidy, when administered in this fashion, tends to primarily benefit the higher income sector. This occurs because both scavenging revenues and quasi-voluntary fees are higher for this sector.

6 CONCLUSIONS AND RECOMMENDATIONS

The real risk in Thailand's Environmental Policy is not that the Thais may fail to adequately protect Pattaya but rather that they may allow the current "Pattaya Policy" of environmental neglect to become a model for other resort areas as well. While because of its special situation the risk to Pattaya may be limited, the risk to Thailand is enormous. Tourism is a critical force in the Thai economy and other tourist resort areas will not be able to so easily survive the inevitable impacts of environmental degradation.

All other tourist resorts in Thailand (except those in Bangkok and Pattaya) are far more dependent on their natural resource base. Most have only limited night life, and none can compete in terms of ease of access. The popularity (and revenues) of these resorts has grown in large part because of their beautiful beaches and clean water. Failure to protect these assets will result in serious environmental and financial loss.

While the rate of tourism growth in Thailand has been dramatic, the threat to Thailand's environment is generally not the growth in tourism per se but the failure to match that growth with comparable growth in investment in urban environmental infrastructure.

Even in Pattaya, probably the one Thai resort where the economy is least dependent on environmental quality, the return on investments in environmental infrastructure will be very substantial. Investments of as little as $10 million annually in protecting Pattaya's environment could be responsible for preserving more than $40 million annually in foreign exchange and $100 million annually in National Income. Because other tourist areas are more likely to be dependent on their natural environment than is Pattaya, the rate of return on environmental investments there should be even higher.

Given the strong arguments on both sides of the infrastructure funding issue, the most feasible solution may be to offer a central government rebate to the local governments. This rebate would consist of part of the central government's share of business taxes on hotels and restaurants, and would be available to local governments provided that they establish and implement programs for investing these revenues in environmental infrastructure. Such rebates could be provided as matching funds to encourage local initiative and assure that the fee programs were actually implemented as planned.

Effective protection of the growing Thai economy will require carefully planned investments in the protection of the Thai environment.

APPENDIX A

Response to Interview Questions

1. **Is environment a significant factor influencing the tourist industry in Thailand?**

   All respondents felt that environment was a significant factor.

2. **How significant is environmental degradation in deterring potential tourists? How does it compare to AIDs, to crime, to traffic congestion?**

   Most respondents were uncomfortable with this question as they were with other attempts to quantify the relative importance of environment. Generally they thought that crime was a comparatively small problem and that traffic was normally only a problem in Bangkok. As to whether AIDs or environment was the bigger problem, most felt that this would depend on the individual.

3. **How does environment compare with other factors as an attraction for tourists? How does it compare with culture? with transport facilities? with quality of hotels? with price?**

   Again, respondents were reluctant to make these kinds of comparisons. Interestingly, non-tourist-industry people tended to think Thai culture was the most important, while those most closely associated with the tourist industry emphasized transport access and cost of accommodations.

4. **How significant is pollution to the tourist industry? Can you quantify the impact?**

   Nearly all respondents were uncomfortable with the question. About half said that it could not be answered numerically. Others felt that it depended on the location. Koh Samui, for example was felt to be heavily dependent on environmental quality because that was practically all there was. Pattaya, by contrast was so close to Bangkok and had so many other attractions that it could survive even with substantial environmental degradation.

5. **How significant is the impact on Pattaya? Would its rate of revenue growth be higher if the environment were better protected? Would the rate of growth be higher if the environmental quality were comparable to that found on the better beaches of Phuket and Koh Samui? How much higher?**

All respondents felt environmental quality was significant even for Pattaya and felt that its revenue growth rate would be higher if water quality was protected and the beaches were kept clean. One third still declined to answer quantitatively but the other estimates ranged from 10% to 35% with the most common estimate being 15%.

6. **How significant would the impact be at Phuket if its environmental quality deteriorated to that now found in Pattaya?**

Although several respondents stressed that tourism was an evolutionary process with new groups of tourists replacing previous ones as the attractions changed, all respondents still felt that environmental quality was very important to Phuket's future. Most also felt that it was far more significant for Phuket than for Pattaya. Half gave a quantifiable estimate with a range of 20% to 40% with the most common estimate at 30%.

7. **Among what groups is tourism being most heavily impacted by environmental degradation? What tourists are most sensitive?**

All respondents agreed that Farangs (those of European descent) were most sensitive to pollution. Interestingly, the tour operators felt the Americans were the most sensitive whereas the Tourist Authority felt that the Germans were the most sensitive. All respondents agreed that the tourists from Hong Kong and Taiwan were the least concerned about pollution problems. Both of these responses appeared to contradict our observations about the growing percentages of German and American Tourists at Pattaya and the growing percentages of Taiwan and Hong Tourists at Phuket.

8. **What can be done to better protect the environment?**
Who should pay for improved pollution control?

Most felt that the central government should contribute more to control pollution and they also hoped that international donors would help pay for controls. All respondents felt that private companies should comply with pollution control requirements but generally felt that the government was not capable of enforcing the regulations.

Only one respondent suggested that local governments should do more and that the cost should be at least partly derived from user fees.

In almost every situation, most respondents felt that their current taxes plus government surpluses should be adequate to pay for the necessary services.

In no circumstance did the respondents, themselves, voluntarily suggest putting a tax on the tourists but when the question was asked directly, many thought it would be a good idea.

9. **Would it help to place a tax on tourists and specifically earmark the proceeds for environmental protection in the tourist areas?**

Roughly half the respondents felt a tourist tax would be a good idea and that it would help rather than hurt the tourist industry.
The other half feared that the industry would be hurt and that as tourism had been such a great source of growth for the country it was not appropriate to tax it.

Those opposed to a tourist tax generally felt that the problems could be solved if the central government simply assigned a larger share of business taxes already collected in tourist areas back to those areas for use on environmental infrastructure.

APPENDIX B

List of Persons Consulted

Vichok Angmanee	Planning Officer, Tourist Authority of Thailand
Pairat Benchai	Assistant Managing Director, See Tour International Tourist Agency
Bundit Kaeoluan	Project Coordinator, Coastal Resources Management Project
Phanu Kritiporn	Industrial Environmental Specialist, Thai Development Research Institute
T. Kumpol	President, Thai Hotel Association, Member, Pattaya City Council
Banasopit Mekvichai	Urban Environmental Specialist, Thai Development Research Institute
Thainee Ponpipong	Assistant Director of Solid Waste, Office of National Environmental Board
Chamlong Ratanapant	Director of Phuket Office, Tourist Authority of Thailand
Kasem Srinian	AID Project Management Specialist, Natural Resources and Environment
Chookiat Srivatjanapong	Assistant Manager, Asia Hotel
Apichai Sunchindah	AID Project Management Specialist, Natural Resources and Environment
Adisak Thongkhaimuk	Director of Solid Waste Branch, Office of National Environmental Board