

El Nido Revisited: Ecotourism, Logging and Fisheries

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ABSTRACT

Logging in tropical countries has had serious environmental consequences that have received much publicity, especially with respect to land-based impacts. This study deals with the effects of logging on the marine environment, particularly the impact of siltation on fisheries and tourism. The case study centres on the coastal town of El Nido, located on the Philippine island of Palawan. Marine activities include traditional fisheries and dive-related tourism. The first stage of the study was made in 1986, and it found that forest logging on land surrounding a large bay could severely limit the viability of these other two industries and restrict their future income-earning. A cost-benefit analysis predicted that over a 10-year time horizon, logging would generate gross revenues of US\$ 8.6 million, much less than the predicted revenue foregone from the fisheries and tourism industries due to logging impacts (US\$ 6.2 million and 13.9 million respectively). The study concluded that logging would produce a net negative cash flow if the external effects on the fishing and tourism industries were included. Hence, it was recommended that the viability of logging be carefully re-examined. This did happen, and logging was banned by the national government in Palawan, and the bay was declared a Marine Reserve. A resurvey of El Nido in 1996 revealed that the predictions about tourism growth were correct, if an underestimate. Preservation of the unique forest ecosystem had allowed ecotourism to flourish. The hillsides and corals themselves had recovered from the effects of logging, but increased fishing pressures due a variety of causes had resulted in overfishing and severely reduced populations of most high-value species of fish and shellfish.

INTRODUCTION

Sediment production is a natural process. Long before humans existed on earth, wind and rain were washing soil into rivers and streams. Unfortunately, most human endeavours, which come under the term 'development', tend to increase erosion rates. Farming, building or road construction and deforestation all increase the rate of soil erosion and sediment input into streams. Historically, the economic impacts of accelerated soil erosion and sedimentation have been recognised and evaluated in two main areas. First, economic losses may be incurred when accelerated erosion results in valuable, nutrient-rich topsoil being washed away from farmland, lowering agricultural productivity. Second, high levels of sediment inputs to rivers have been recognised for the economic losses caused when hydroelectric and agricultural dams become choked with silt, reducing power production, economic life span and at worst, rendering dams useless (Goodland & Ledec 1986).

Although both economists and ecologists realise that nearly all rivers eventually empty into the ocean, until very recently, few attempts had been made to determine the ecological and economic implications of increasing amounts of sediment being washed into coastal areas. The main problem, of course, has been that both natural scientists and economists tend to specialise and focus on one idea at a time. Foresters, soil scientists and agricul-

turists who regularly handle soil erosion problems rarely speak with marine biologists. In the same way, when economists evaluate forestry or agricultural development projects, they often confine their analyses to the immediate project area. If downstream effects were considered at all, they were usually treated as externalities, and did not enter into the actual cost-benefit analysis.

In the 1980s, advances in ecological theory and economic analysis methodology rendered these past practices obsolete. From the ecological side, it is now recognised that the links among adjacent ecosystems are often vital to normal ecosystem function. An obvious example is the dependence of estuarine ecosystems on nutrient inputs from the terrestrial ecosystem.

On the economics side, innovative methods have been devised to value such resources as clean air, a beautiful view in a park or even an endangered species (Dixon & Hufschmidt 1986; Constanza 1991). Given these advances, from a purely economic, dollars-and-cents perspective, it is no longer acceptable to ignore the predictable economic impacts of environmental degradation associated with development projects. And the most successful approach to analysing alternative development options is an integrated ecological and economic approach. That is, the economic analysis will include dollar values for environmental impacts including all affected ecosystems and ecosystem links. In this way, the economic analysis can play a key role in assisting decision-makers by providing information about the benefits and costs of each alternative in development projects. Properly done, the analysis will include both direct costs and benefits associated with each alternative as well as the value of indirect costs or benefits (Dixon et al. 1988; Hufschmidt et al. 1981).

This approach was used to study upland logging activities and its consequences for fisheries and tourism in Bacuit Bay, a coastal area off the island of Palawan, the Philippines. Here each of the three main economic activities — logging, fishing and tourism — are described and their interactions are analysed both in ecological and economic terms. From an economic perspective, the question is: in 1986 what was the net benefit of contin-

ued logging of the Bacuit Bay drainage basin considering predicted future losses from the fisheries and tourism sectors due to increasing sedimentation pollution of the bay?

To analyse this question in a systematic way, the study site is described first, and then the ecological effects of sedimentation are assessed and discussed. This is followed by two sections on the economic aspects of logging and sedimentation, one more general and one specifically with the economic calculations. Finally, policy recommendations and conclusions are given and an update of the conditions as of 1996 is given.

STUDY SITE

Palawan is a narrow island, 425 km long and 12,000 km² in area, located in the south-west Philippines. Until the mid-sixties, 92% of Palawan was forested (Pido 1986). Rapid deforestation had left perhaps 50% of the island in forest by 1986. Northern Palawan is still relatively inaccessible and has been the least affected by development. A high percentage of the Philippine fish catch is taken from the waters surrounding Palawan. The fisheries industry is comprised of both artisanal and commercial sectors.

The study site, Bacuit Bay, (El Nido), located near the Northwest tip of Palawan, proved to be an ideal location to examine the effects of sediment pollution on marine resources (figure 1). Bacuit Bay covers about 120 km² and along with its outer shelf includes 14 islands, each surrounded by fringing reefs teeming with fish. In 1985, a logging company began operations in the watershed surrounding Bacuit Bay, causing a rapid increase in soil erosion and sediment input to the bay. The purpose of the study was to document the source of sediment as well as follow it down the main river, into the bay and to monitor the possible deleterious effects on coral reefs and associated fisheries.

From a coastal development perspective, the Bacuit Bay case is especially interesting because, besides the obvious conflict for resources between the fisheries and logging industries, Bacuit Bay is also the site of a rapidly

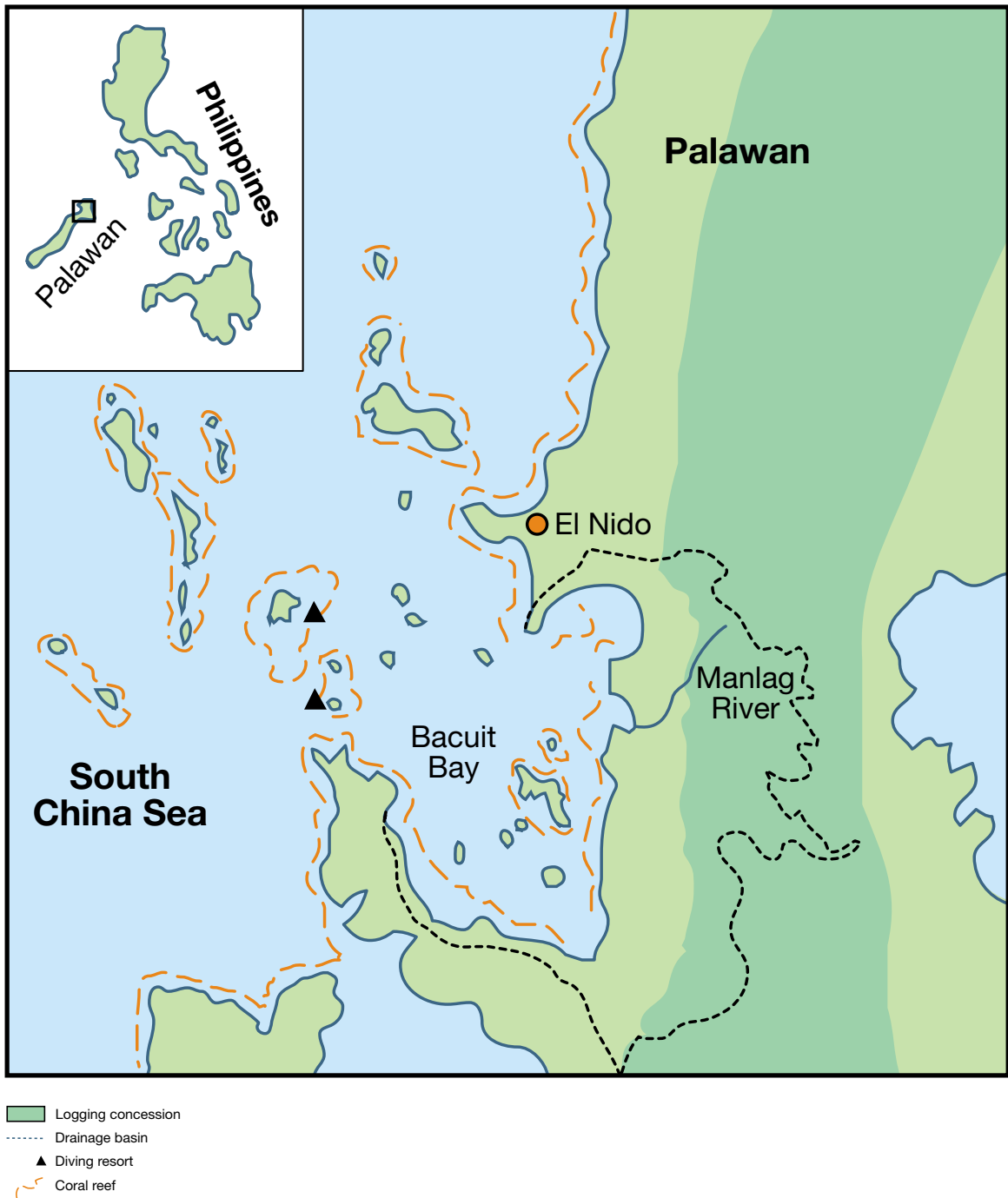


Figure 1. Bacuit Bay and the surrounding drainage basin. The Manlag River is the major river draining the logged portion of the basin.

expanding tourist industry based on foreign and Filipino SCUBA divers. By 1986, there were two major international scuba diving resorts within the bay. They are relatively high priced and market valuable products, clear water and beautiful coral reefs. Logging operations, thus, conflict with both the fisheries and tourism industries in El Nido via sediment pollution of the bay.

ECOLOGICAL EFFECTS OF SEDIMENTATION

Agricultural land makes up only 5.5% of the 78 km² drainage basin, and is located on relatively flat ground. Observations indicated that practically all sedimentation in Bacuit Bay during the time of the study was coming from logging. After cutting about 6% of the 42 km² forest in the drainage basin in 1985, logging operations were halted. The result is that the sediment output measured during the 1986 study period is a conservative estimate of what active operations would have produced.

During 1986, an experiment was conducted to compare the rate of erosion from a logging road, a cut forest and an uncut forest. The experiment involved collecting the runoff and sediment from a measured area of slope. The three experimental plots were located within a few

dozen meters of each other. The erosion rate measured from the cut forest plot was over 4 times the virgin forest erosion rate, and the road surface erosion rate was 240 times that of the virgin forest. It was estimated that although roads comprise only about 25% of the cut forest area, they produced 85% of the total erosion. These results were consistent with previous work on erosion from logging concessions in the tropics (O'Loughlin 1985).

Sediment output from the drainage basin was measured by setting up a gauging station on the main river draining the basin and measuring daily discharge and sediment load. Periodic sampling of an adjacent 'control' river passing through all land use types except logging revealed about a 100-fold difference in suspended sediment load. In order to measure the actual sediment deposition in the bay, a sediment trap network was set up at eight coral reef stations around the bay. To measure the effects of sediment deposition on the living corals, the percentage coral cover, species richness and diversity, and fish diversity and biomass were surveyed in replicate at the eight stations at the beginning and end of 1986. As shown in figure 2, coral cover, species number, species diversity and average colony size were

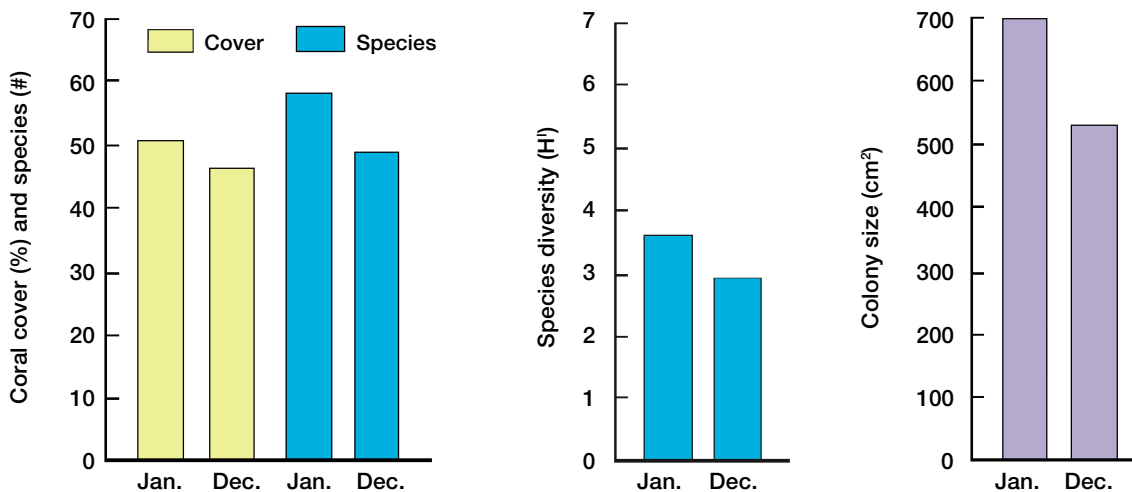


Figure 2. Percent live coral cover, number of coral species, species diversity and mean colony size per transect (8 stations), January and December 1986.

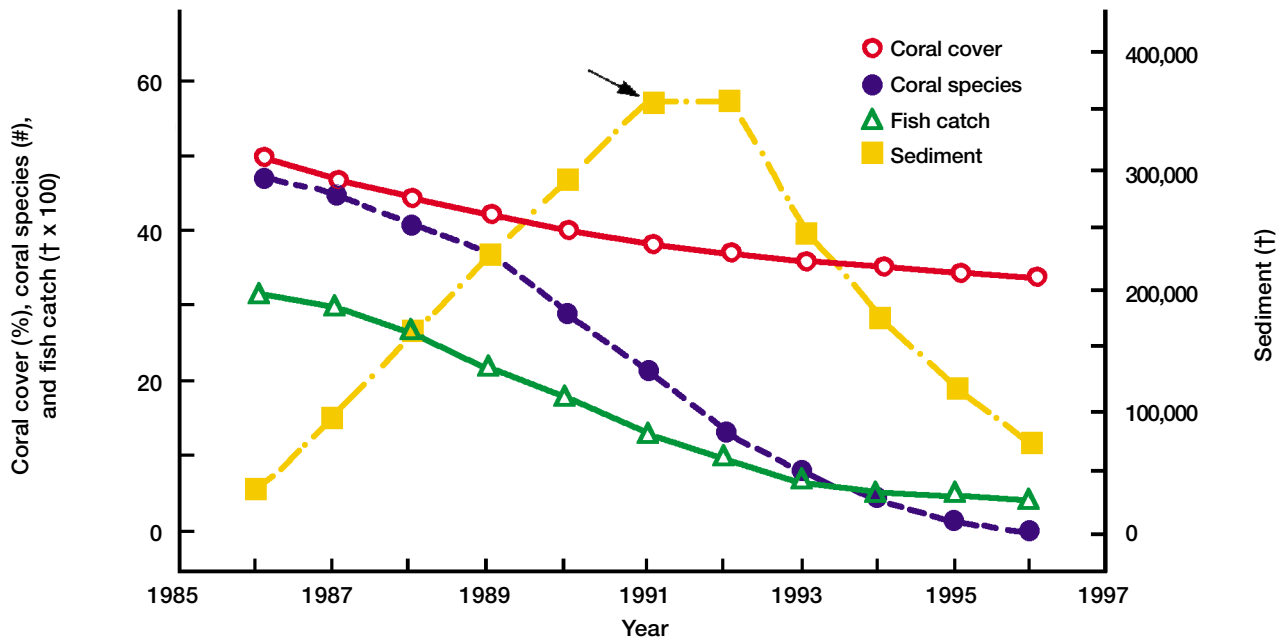


Figure 3. Predicted changes over 10 years in coral species numbers, percent live coral cover, fish catch due to increased sediment input and deposition in Bacuit Bay as a result of logging.

all reduced at the end of 1986, with the worst effects recorded at the sites closest to the river mouth.

While fish can swim to avoid stressful conditions, most reef corals are attached to the substrate and cannot escape. However, a wide variety of reef and nonreef fish are directly and indirectly dependent upon the living coral reef for their livelihood (Sano et al. 1987; McClanahan 1995). The main deleterious effect of sediment pollution on Bacuit Bay fisheries is expected to occur indirectly due to habitat and food loss as the corals are killed. In order to predict future fisheries losses due to coral mortality, the positive correlation between coral cover and diversity, and fish biomass in Bacuit Bay was used. The original analysis was based on a plan to log the remaining forest within five years. Luckily, this plan was never realised, but the analysis is still instructive regarding how to use this type of data to construct a simple ecological economic model. It is also useful for providing an illustration of how assumptions about the value of various economic sectors need to be investigated carefully before development decisions are made.

The erosion experiment showed that logging causes accelerated erosion, mainly due to road building that leads to a high sediment output from the watershed and increased sediment deposition on the bay coral reefs. This deposition kills some corals and is predicted to reduce fish biomass at a defined rate (figure 3). The assumptions underlying this graph are discussed in Hodgson & Dixon (1988).

ECONOMIC ASPECTS OF LOGGING AND SEDIMENTATION

In order to estimate the full range of economic benefits and costs associated with the use of any coastal resource, it is necessary for the economist to work with natural and social scientists. Together they can explore potential effects of a planned resource use with respect to links among ecosystems and their effect on people living in the area. For this case study, the three resource-based industries operating in the same area are logging, tour-

ism and fisheries. Logging activities in Bacuit Bay watershed were damaging the marine environment due to sediment pollution. Logging-induced soil erosion and sedimentation of Bacuit Bay resulted in smothered coral reefs, reduced fish catch and decreased attractiveness of the site for SCUBA divers. The logging company benefited from harvesting trees in this portion of its concession but the external costs created by the resulting erosion were borne by the fishing and tourism sectors. The policy question, therefore, was whether or not the benefits from logging would be greater than the anticipated losses from the fishing and tourism sectors.

The economic question is how to value the benefits and costs associated with each option: continued logging to the detriment of fishing and tourism, or reducing logging. To simplify the analysis, two options are considered: a logging ban and a continuation of logging. (The third alternative of continued logging but with strict erosion prevention measures was not considered because of the difficulty and cost of implementing such an approach.) The logging ban would impose costs on the logging concession owner but would allow the continued existence and growth of the other two industries. (The El Nido area is only a small portion of the entire logging concession.) Concession logging in this area would result in decreased fish catch and would probably end the scuba-based tourism development.

A traditional cost-benefit analysis would require information on the revenues and expenditures over time for each industry. These data were not available. Therefore, the authors analysed the two options based on gross revenues. Their examination of the three industries indicated that the import component of each industry was comparable even though the export share varied widely (Hodgson and Dixon 1988). Nevertheless, gross revenues are a first approximation of the generation of social benefits. This study illustrates how a fairly simple analytical approach can yield useful policy insights.

In order to compare the benefits generated by each industry under the two development options, the present value of gross revenues over a 10-year period is calculated, from 1987 to 1996. A 10-year period is cho-

sen to show the development of obvious trends in the system while limiting magnification of potential errors. Constant 1986 prices and two discount rates, 10% and 15%, are used. These rates reflect the range of rates used when analysing private projects.

The three use sectors are evaluated in turn. For each sector, the present values of gross revenues are calculated based on the assumptions cited. These discounted benefit figures are then compared for option 1 (the proposed logging ban) and option 2 (no change in present logging plans).

Tourism

In 1986, two tourist resorts were operating in El Nido, plus assorted smallscale lodging houses and tourism enterprises. The resorts are considered separately; estimates of gross revenue are based on information on mean length of stay, mean occupancy rate and advertised daily rates. In addition, resort 1 has a one-time, lump sum fee of \$250 per person. All other tourism revenue is lumped into the 'other' category.

Gross revenue from each category of the tourism industry from 1987 to 1996, and present value of the gross revenue based on a 10% discount rate, are shown in table 1. For option 2, tourism revenue is reduced by 10% per year between 1988 and 1991 due to degradation of seawater quality and marine life on which the diving resorts depend. Beginning in 1992, yearly tourism revenue is reduced to the 1992 value of the 'other' category since the diving resorts are predicted to go out of business by that time. This latter prediction is considered realistic because the diving resorts in this remote location are marketing a single, costly product: pristine coral reefs and clear water for an international clientele. If the quality of this single product is dramatically lowered, tourist divers will choose alternative well-known destinations. From the tourism sector, the 1987 to 1996 gross revenue from option 1 (\$47.4 million), is \$39 million more than the gross revenue under option 2. The present value at 10% discount rate over the 10-year period from option 1 (\$25.5 million) is \$19 million more than the present value under option 2.

Table 1. Tourism gross revenue and its present value using a 10% discount rate (x \$1,000).

Category	Gross Revenue Option 1 ^b	Gross Revenue Option 2 ^c	Present Value 10% ^a Option 1	Present Value 10% ^a Option 2
<i>Resort 1</i>				
1987–1991	8,897	6,510	6,745	5,038
1992–1996	29,656	0	13,961	0
Subtotal	38,553	6,510	20,706	5,038
<i>Resort 2</i>				
1987–1991	1,834	1,306	1,388	1,010
1992–1996	5,931	0	2,792	0
Subtotal	7,765	1,306	4,180	1,010
<i>Other</i>				
1987–1991	276	202	208	157
1992–1996	821	160	387	75
Subtotal	1,097	362	595	232
Total	47,415	8,178	25,481	6,280

^aSee Hodgson and Dixon (1988) for idem with 15% discount rate.

^bLogging ban. ^cContinued logging.

Marine fisheries

The fishing industry was analysed in a similar manner. Under option 1, the 10-year predicted fish catch and revenue is based on the 1986 catch. Various adjustments are made for location of catch, fleet composition and the inclusion of purse seine tuna catch. It may not be appropriate to include the value of the purse seine revenue in the total. The primary catch of purse seiners is tuna, which have generally been considered pelagic species. The extent to which tuna are biologically dependent upon coastal ecosystems such as Bacuit Bay has not been demonstrated. However, available evidence indicates a close association between tuna and inshore (reef and bay) food species, at least during part of their life cycle (Brock 1985). If this fishery is included, the 1986 total catch is nearly 5,000 t with a gross revenue of about \$4.6 million per year.

Predicted fisheries gross revenue and the present value of the gross revenue (10% and 15% discount rates) under options 1 and 2 for 1987 to 1996 are listed in table 2 (next page). For option 2, the reduction in fish catch is based on a linear equation obtained from multi-

ple regression analysis of coral cover and species diversity on fish biomass. The sizeable reduction in fish catch predicted to result from continued logging under option 2 is reflected in the gross revenue both with and without the tuna catch from the purse seiners.

Logging industry

Annual production and gross revenue estimates for 1987 to 1991 were calculated using prices and estimated production data, including wastage estimates. Under option 1, the logging ban would reduce gross revenue from logging the Bacuit Bay drainage basin to zero. Under option 2, total gross revenue is determined based on the annual data. Note that the logging company's plans would harvest all commercial timber within a five-year period. The gross revenue and its present value using both 10% and 15% discount rates for the logging sector are shown in table 3 (next page). Given a timber rotation of 85 years and replanting, any future logging benefits would only occur long after the 10-year economic time horizon considered here.

Table 2. Fisheries gross revenue and its present value using 10% and 15% discount rates, 1987–1996 (x \$1,000).

	Gross Revenue	Present Value 10%	Present value 15%
<i>Purse seine included</i>			
Option 1	46,070	28,308	23,122
Option 2	21,471	15,125	13,083
<i>Purse seine excluded</i>			
Option 1	28,070	17,248	14,088
Option 2	12,844	9,108	7,895

Table 3. Gross revenue and its present value (x 51,000) at 10% and 15% discount rates for logging industry production from Bacuit Bay drainage basin, 1987–1996.

	Gross Revenue	Present Value 10%	Present Value 15%
Option 1	0	0	0
Option 2	12,885	9,769	8,639

Note: production ends in 1991 as the area will be completely logged by then.

SUMMARY OF ECONOMIC ANALYSIS

The gross revenue and its present value are estimated for each of the three sectors under options 1 and 2 for the period 1987 to 1996. Present values are calculated using both 10% and 15% discount rates. A summary of the results from all three sectors is presented in table 4. The results are striking. The gross revenue under option 1 is more than double that under option 2. Since option 1 will prevent further logging in Bacuit Bay drainage basin, the gross revenue from logging under option 1 is 0. Fisheries and tourism, however, generate large and continuing benefits. Benefits from tourism are expected to grow over time as demand and market increase, while benefits from fisheries will remain constant. In contrast, option 2, which allows continued logging, generates smaller and decreasing benefits. After five years, the logs will be depleted, as well as significant part of the tourism and fisheries sectors. The modest logging revenue gener-

ated under option 2 is more than offset by the decreased income from tourism and fisheries.

The present value of gross revenue under option 1, calculated using a 10% discount rate, is almost double that under option 2. Since all logging production occurs during the first five years, the effect of the 15% discount rate on the gross revenue generated from this industry is relatively slight. In comparison, most of the tourism revenue is predicted to accrue during the post-five-year tourism expansion period. Therefore, tourism revenue is reduced proportionately more than the logging revenue. Even at the 15% discount rate, total present value of gross revenue under option 1 is still 1.5 times larger than that under option 2.

EL NIDO REVISITED — TEN YEARS LATER

Major changes had occurred over the ten year period that demonstrate the importance of socio-economic as well as biophysical factors in determining the quality of the environment. The changes to be discussed here include:

- A new legal framework (parks, logging, fisheries, environment) and improved law enforcement;
- Commitment of government and industry to ecotourism, and growth of this sector;
- Population growth and transient migration;
- Improved transportation links;
- Increased market prices and other external factors leading to increased fishing pressure.

Table 4. Tourism, fisheries and logging industries: ten-year sum of gross revenue, present value of gross revenue (x \$1,000) using 10% and 15% discount rates

	Option 1	Option 2	Option 1-2
<i>Gross revenue</i>			
Tourism	\$ 47,415	\$ 8,178	\$ 39,237
Fisheries	28,070	12,844	15,226
(with tuna)	(46,070)	(21,471)	(24,599)
Logging	0	12,884	-12,884
Total	\$ 75,485	\$ 33,906	\$ 41,579
<i>Present value (10%)</i>			
Tourism	\$ 25,481	\$ 6,216	\$ 19,265
Fisheries	17,248	9,108	8,140
(with tuna)	(28,308)	(15,125)	(13,183)
Logging	0	9,769	-9,769
Total	\$ 42,729	\$ 25,093	\$ 17,636
<i>Present value (15%)</i>			
Tourism	\$ 19,511	\$ 5,591	\$ 13,920
Fisheries	14,088	7,895	6,193
(with tuna)	(28,308)	(13,083)	(10,039)
Logging	0	8,639	-8,639
Total	\$ 33,599	\$ 22,125	\$ 11,474

^aTuna revenues (in parentheses) are not used to calculate the totals.

A. New legal framework and improved law enforcement

The single most important change was that commercial logging, which had been temporarily stopped in 1986 in the El Nido area, was banned completely in Palawan within four years of the publication of the 1988 study. This ban has stood and was reaffirmed by the government as recently as 1999. The logging ban came about due to a combination of factors. In the Philippines, the negative environmental effects of forest logging have always had a high profile with the public and government. The media often link deadly floods with forest logging. Therefore, certain sectors were already receptive to a logging ban. The drafting of new legislation allowed this to move forward.

In the early 1980s, the European-funded Palawan Integrated Area Development Project had undertaken

an environmental review of the province and made recommendations that eventually were heard at both international and national levels. As a result, by 1990 the entire province of Palawan had been declared a UNESCO Biosphere Reserve. While this does not provide any particular protection, this action served notice that Palawan is a special environment containing unique species that were not only locally important, but of international significance. This action was followed by two pieces of legislation that allowed strong conservation measures to be implemented.

In 1992, the “Strategic Environmental Plan (SEP) for Palawan Act” (Republic Act No. 7611) was ratified. This legislation is very specific in granting environmental protection, and established a new Palawan Council for Sustainable Development that was given enforcement powers. Under Sec. 7, it called for the “establishment of

an 'Environmentally Critical Areas Network' (ECAN). ECAN would establish a graded system of protection and development control over the whole of Palawan, including its tribal lands, forests, mines, agricultural areas, settlement areas, small islands, mangroves, coral reefs, seagrass beds and the surrounding sea." The goal of the ECAN was to ensure forest conservation and protection through the imposition of a total commercial logging ban in all areas of maximum protection and in such other restricted use zones as the Palawan Council for Sustainable Development may provide. Besides, the ECAN aimed to protect the watersheds, tribal people, biodiversity including rare and endangered species and their habitats among other things.

At the same time and also at the national level, the National Integrated Protected Areas System Act of 1992 (Republic Act No.7586 or NIPAS) was already under discussion at the highest levels. Several reports had confirmed the rapid rate of loss of primary forest throughout the country and the need to conserve what was left.

While some illegal commercial and local logging continued, the ban has been reasonably successful in the area around Bacuit Bay, and the government should be applauded for taking such a strong stand on enforcement. As a result, by 1996 many logging roads built prior to 1986 had become revegetated, and erosion and sedimentation appeared to have decreased dramatically. By maintaining the logging ban, the area around El Nido also retained a relatively natural state. Without the forest habitat, wild animals and birds, now a major attraction for tourists, would have disappeared. Ecotourism was the hoped for new economic engine in Palawan in the 1990s. With provisions for protection of the terrestrial environment in place, some attention was also needed for the marine environment.

In 1978, President, Ferdinand Marcos, issued Presidential Proclamation No. 1801, establishing a portion of Bacuit Bay as a Marine Reserve Tourist Zone. In 1980, the Ministry of Natural Resources created the Pawikan Task Force (Special Order No. 201) that involved a ban on the harvest of all salt-water turtles and their eggs. Shortly thereafter, a portion of Bacuit Bay

was accorded some protection when it was declared a Marine Turtle Protection Area. This designation was used to good effect by the Ten Knots resort. The management used this as a basis for patrolling the area and in some cases apprehending illegal destructive fishermen and trawlers operating inside the bay. In 1991, the Department of Natural Resources (DENR) issued Administrative Order No. 14, "Establishing The El Nido Marine Reserves" which banned much fishing activity in the area. The following year, this regulation was subsequently amended (DENR Administrative Order No. 04, January 31, 1992) and weakened slightly based on the recommendations of the nearby mayors, who felt it unfairly excluded residents from their traditional anchovy fishing grounds.

As recently as 1999, another presidential proclamation (No. 32) was issued declaring the area to be the "El Nido Managed Resources Protected Area". The authority of the DENR to enforce these regulations has been challenged in the Supreme Court by local governments backed by business interests. The DENR lost in 1999 and is now appealing the decision that it is the local government units (Mayors) which have the jurisdiction.

B. Palawan as ecotourism destination

Another major change in Palawan is that the tourism authorities and resorts realised the potential for marketing the region as an ecotourism destination. In the 1980s, the government viewed Palawan as a remote wild land — not suitable for most tourists except perhaps adventurous foreign scuba divers. Widespread cerebral malaria was considered a major constraint to tourism marketing. The newly developing resorts, however, realised that preservation of the environment was crucial to their long-term success and began buying up key stretches of coastline and even hinterlands. But it was not until the mid-1990s, that the resorts actually began to target the ecotourism market.

The Ten Knots corporation can be credited with leading the charge into ecotourism. Publicity materials for the company include a statement regarding its environmental programs, which include the "tagging of

hawksbill turtles and endangered green sea turtles, and enforcement and surveillance against illegal fishing, forest resource and extraction, and pollution of sea water by commercial ships". The company has also been supporting environmental education among the villages in El Nido. In 1996, the company received the prestigious Kalakbay Award for Outstanding Contribution in the Promotion and Development of Philippine Tourism, in the area of Ecotourism. The company was lauded for its environment and community related projects, such as the Environment Education campaign, installation of mooring buoys at dive sites, and an annual beach clean-up project.

The company mission statement reflects this commitment to environmental protection. "Ten Knots today aims to continue the mission of attaining sustainable development where tourism, community and ecology are in harmony with each other. In partnership with other sectors, the company will contribute to the organisation of a comprehensive master plan for El Nido, which will serve as the blueprint for the development of the area. Prior to the preparation of the master plan, Ten Knots will conduct an environmental baseline study of the area in order to establish the current state of the resources in El Nido, and to have a better understanding of the capacity of the environment for future development."

The marketing approach has now expanded away from the previous 'diver only' strategy to encompass a variety of interactions with nature e.g., "A short hike in the Lagen (island) forest will take you through a canopy of giant trees and lead you to a private cove. You can then kayak to the bat caves and behold the unique sight of bats hanging upside down right above you. Take a pre-dawn mangrove tour and see wild ducks or egrets fly from their nests in the early morning mist."

As predicted in 1988, preservation of the natural environment has allowed El Nido/Bacuit Bay to remain attractive to both domestic and international tourists. Tourism growth has occurred in all sectors of the industry and this growth surpassed our predictions. Major new upmarket resorts have been built on Lagen Island

Origin of Tourists in El Nido (%)

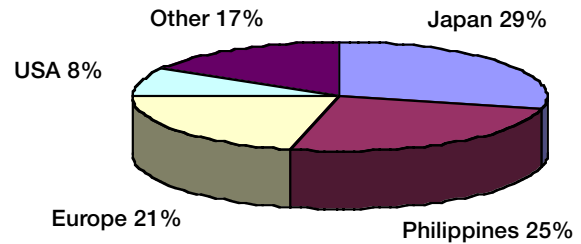


Figure 4. Distribution of Tourists by Origin (1996 figures).

and Malapacao adding about 70 new rooms, and a religious site was established on one of the outer islands of the bay. In 1995, there were a total of 17,888 arrivals in El Nido of which 87% were destined for the major resorts. Assuming a five-day stay at US\$200/day, the gross annual revenue from these resorts is estimated to be about US\$15 million.

Dozens of new guesthouses, shops and restaurants have been opened in the town of El Nido itself. This change is reflected in the fact that in 1986 there were frequently no tourists staying in the town, whereas on a busy day, the three guesthouses accommodated perhaps 20 low-budget tourists. By 1996, there were 18 guesthouses in and around the town with a total number of 80 rooms/cottages with a capacity of 190 beds. Of the total visitors, 25% were from the domestic market (figure 4). While peak season is 2nd quarter, it only accounts for 30% of the annual number of visitors, which are spread almost evenly among the rest of the year. Using a very conservative estimate of US\$ 20 expenditure per day per person for food and housing, and assuming a five day stay, the 2325 visitors to guesthouses were estimated to account for a minimum of US\$ 230,000 pa by 1996. This does not include purchases or rental of boats for island tours and diving, which could easily double this estimate. When combined with the much larger resort income, what is clear is that the 1986 predictions of tourism growth were far

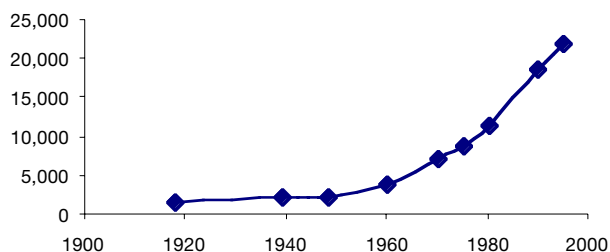


Figure 5. Population Growth in El Nido from 1918–1995.

too low. Thus the banning of logging in this area has allowed for an explosive growth in tourism that appears to be benefiting many families in El Nido whose wage earners are employed.

C. Population growth and transient migration

Population growth has been exponential (figure 5). The annual birth rate doubled from about 550 new babies in 1990 to over 1000 in 1995. An unknown percentage of the population growth in El Nido is due to migration from other areas of the Philippines. It is not possible to calculate this fraction because it is obvious from inspection of the mortality figures that few people bother to report deaths to the government, whereas there is an incentive to report births. The population figures do not take account of transient migrant workers that may form a significant portion of the total population at any one time.

The growth of the population at this rapid rate has had a number of consequences on the environment. The ‘squatter’ population has grown rapidly and many small huts have been built along the waterfront in El Nido town. New dwellings have been built directly on the beach, detracting from the stunning white sand beaches, with towering karst cliffs in the background. Beach access has been blocked in many areas where houses have been built without any space in between. While the resorts have invested in state of the art sewage treatment systems, the town’s raw sewage flows in and out with the tide, polluting the nearby beaches. While wet garbage is recycled via pigs, solid wastes are dumped on the beach and allowed to wash into the sea. A major challenge is

for El Nido is to gain control over their environmental protection systems so that the increasing pollution does not threaten the tourism value.

D. Improved transportation links

Transportation has improved somewhat over the ten-year period. One potential major change was the construction of a road in the early 1990s connecting El Nido to points east and south. This non-surfaced road allowed El Nido residents access to emergency medical care and other government and business services not available in the town. But it created the negative impact of increased sedimentation around Bacuit Bay from road cuts, and opened the way for transporting seafood and other products to the capitol, Puerto Princessa, in the south. These threats to the environment were reduced when the road was washed out in a number of locations after a series of storms, and it was not in service in 1996. When this road is completed with a hard surface, it will have a major impact on the marine environment in El Nido, by speeding up the delivery of fresh fish to Puerto Princessa.

Options for transport by ship were little changed over the ten-year period and delivery time was about the same — a one-day trip to Manila. The air transport options were improved. The airport was extended and gravelled, allowing slightly larger aircraft to land. This economy of scale reduced the cost of a round trip flight by \$50 to about US\$200. The options for cargo shipments by air were also improved and rate reduced.

E. Increased market prices and other external factors

Over the ten-year period, one of the most dramatic changes was the increased market prices of seafood products. Two of the most desirable fish species serve as examples. Both iced grouper (lapu-lapu) and skip jack (tanguig) increased from P5 to P65 per kilo over the ten-year period. This increase is probably due to several factors. A new ice plant provided a reliable ice supply in El Nido. This in turn allowed the fish to be preserved sufficiently for shipment. At the same time, the supply

of these fish from other parts of the Philippines has dropped dramatically due to severe overfishing. It is also likely that some of these fish were channelled to supply international markets, and thus the price increases reflect those markets rather than just national demand. Certainly this is true for lobster, which were going for about P20/kilo in 1986 and were P350/kilo by 1996. Some seafood items have become so scarce that their prices have skyrocketed. The major local buyer indicated that both edible sea cucumbers (P850/kg dried) and *Trochus* (P80/kg) had all but disappeared. This left the two remaining marine export items as squid (100 tonnes fresh worth P5 million and 50 tonnes dry worth P1.2 million per year) and anchovies (5 tonnes dry/year worth P225,000) and 8250 gallons of salted anchovies also worth P225,000.

The impacts of overfishing in other parts of the Philippines, especially the Visayan Islands where human population growth rates and fishing pressure are some of the highest in the country, had reduced fish populations to such low levels that it was difficult for fishermen to feed their families. Not surprisingly, interviews with fishermen in 1996 indicated that the majority of transient and newly relocated fishermen were from the Visayas. They were very candid about why they had moved and what they believed the prospects were for Palawan and Bacuit Bay fisheries. Unfortunately, these predictions were already apparent.

CONCLUSIONS

Policy implications of the Economic Analysis

The El Nido case illustrates how three legitimate resource users in a coastal environment are linked via the coastal ecosystem. Resource management decisions by one industry (in this case, logging) can have serious ecological and economic impacts on the other industries. Logging creates a classic economic externality. Its actions have a negative impact on the fishing and tourism sectors and yet the latter groups have no direct effect on the logging operation.

In situations like this, coastal resource managers must identify the ecological-social-economic interactions and their economic consequences. The economic analysis, done with some fairly simple assumptions and readily available data, provided useful predictions about the likely economic impacts of the two main options: continued logging or a logging ban.

The analysis showed that the 'cost' of continued logging in terms of lost fisheries and tourism revenue was very large, and this helped to convince the government to ban further logging in Bacuit Bay watershed in 1988. At the time, it was predicted that normal market forces would allow logging to continue and that fishing and tourism would suffer. On the other hand, it was predicted that if logging was stopped in El Nido, a modest financial cost to the logging concession holder would result in major present and future benefits from fishing and tourism development. Because of the pattern of employment and distribution of profits, the logging ban also was seen to have favourable equity implications.

Too many people, too few fish

By 1996, the coral reefs of Bacuit Bay, El Nido had recovered nicely from the sedimentation damage suffered due to logging in 1985. The tourism industry has flourished. The large resorts are models for ecotourism, and have contributed greatly both directly and indirectly to marine conservation in the area. By contrast, the typical haphazard, uncontrolled growth of small businesses and guesthouses, while offering an alternative livelihood to residents, has reached the stage where it threatens the 'golden goose' of ecotourism.

Human population growth due to a high birth rate, immigration and economic factors have led to problems with El Nido fisheries. Populations of high value marine organisms have been decimated by large numbers of artisanal fishers. Previously common organisms such as giant clams (*Tridacna*) are now rare, and of small sizes only, while lobster, *Trochus*, green snails and edible holothurians are simply gone. Where previously there were large specimens of grouper, sweetlips, parrotfish, bump-head wrasse etc, there are now a small number of small-

sized animals — even at the most remote dive spots on the farthest islands and at depths of 20 m. The exception is the well-protected fish feeding stations directly in front of the resorts.

A large number of non-governmental organisations have opened project offices in El Nido, and one Dutch aid project alone was reported to be worth US\$5 million. It is not immediately obvious how these NGOs and projects have improved the environment. The government has a marine management plan, but it is clear that what is called traditional artisanal fishing is in fact commercial fishing to supply the 15–20 tonnes per month of iced fish exported to Puerto Princessa, Manila and overseas.

Savvy foreign scuba divers are already aware that the El Nido reefs have been fished out of exciting large fish. But divers still come to see other underwater attractions; the corals, drop-offs and small reef fish. The government faces a difficult dilemma. Exclude more people from fishing by enforcing a complete fishing ban on a larger area, or face the gradual degradation of the Bacuit Bay reefs to a state similar to that now found in the Central Philippines — few fish larger than 10 cm.

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