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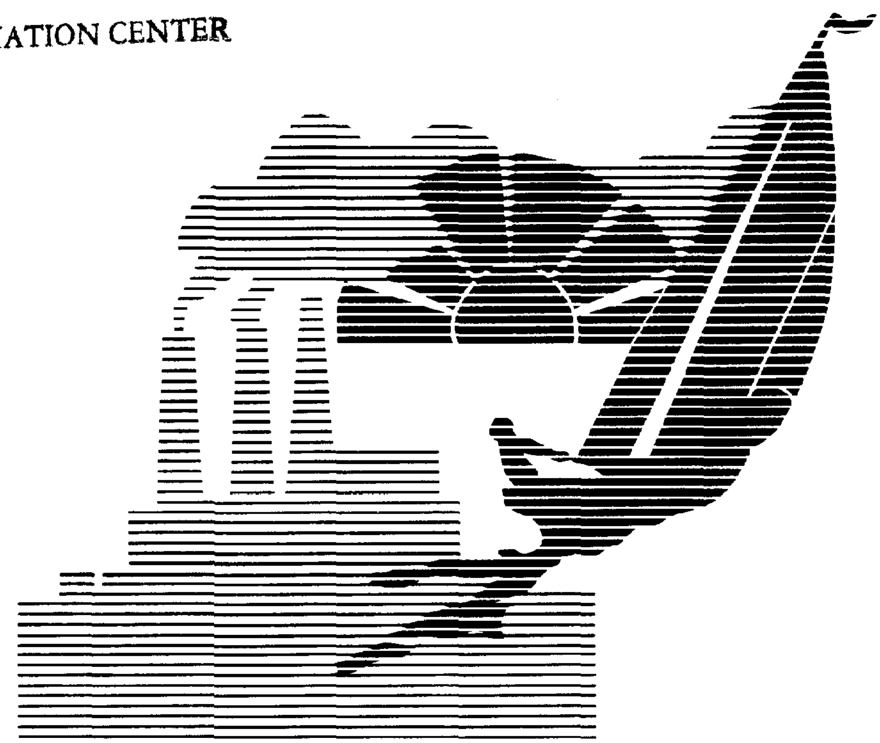
Impacts of Coastal Energy Development on New Jersey's Shorefront Recreational Resources

Dept of Environmental Protection



New Jersey Department of Environmental Protection · Division of Coastal Resources

Rogers, Golden & Halpern · March 1984

Summary Report of the Impacts of Coastal Energy Development on New Jersey's Shorefront Recreational Resources

The New Jersey Department of Environmental Protection · Division of Coastal Resources

Rogers, Golden & Halpern 1427 Vine St. Philadelphia, PA 19102 • March 1984

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TABLE OF CONTENTS

1. INTRODUCTION

Tourism, particularly along New Jersey's shorefront, is a major contributor to the state's economy. This study examines the impacts of energy activity on this important resource. First, it describes the extent to which energy activity and development cause tourists to seek out alternate vacation spots; and second, it provides a way of calculating the net economic effect of lost revenue due to a tourism decline versus the economic benefits that an energy facility can bring to a municipality.

The New Jersey shorefront area extending from Sandy Hook to Cape May Point is a unique environmental resource. Its proximity to major population centers and its appealing aesthetic and physical attributes create an excellent setting for recreational activities. Because the region supports a flourishing tourism industry, its contribution to the State's overall economic and social well being is significant. The economic value of the shore is dependent upon maintaining its natural resources.

Many of the attributes that make the shore desirable for recreational activities also make it desirable for energy development. These attributes include access to navigable waterways, proximity to offshore oil and gas exploration and production activities, availability of sufficient surface water supplies, and access to wharves or piers. Industrial development of this nature could certainly entail positive economic and social gains. However, the direct environmental effects that accompany the construction and operation of such facilities can diminish the quantity or quality of recreational resources.

A decline in the perceived quality of a shorefront recreational resource will cause tourists to change the patterns of their recreational activities. They may choose to enjoy their recreational activities elsewhere along the Jersey shore or even decide to abandon the shore altogether. When this occurs, the direct expenditures from those tourists on locally provided recreational goods and services will obviously be lost.

The study's findings support the long-observed fact that coastal tourism is a vital part of the New Jersey economy:

- Non-business travellers spent $5 billion in the coastal region in 1982.

- $850 million was spent at hotels, motels, and campgrounds.

- Another $850 million was spent on food and drink.

- A total economic output of $7 billion was generated as a result of these expenditures.

- Casinos generated in 1982:

  $1.5 billion from gambling

  $250 million from eating and drinking at the nine operating casinos

  $109 million from room revenues (included in the $850 million total)

- The total value added to the New Jersey economy as a result of the above expenditures was approximately $4.032 billion in 1982. As a comparison, the total value added by the manufacturing sector in New Jersey during 1982 was estimated at $33.6 billion.

- 225,000 person years of employment are supported annually by tourism expenditures, which is approximately 6.7 percent of New Jersey's resident employment.

Shore tourism amounted to 77 million person-days* distributed as follows:

Seasonal home	40.6 million person-days
Hotel or motel	16.1 million person-days
Day party	10.4 million person-days (31.3 million person-trips, 60 percent of which (23 million) were to Atlantic City)
Friend or relative	5.6 million person-days
Campground	4.3 million person-days

*NOTE: Person-day is defined as one night at the shore by an overnight visitor, or 24 hours of attendance by persons on a day trip. Person-trip is defined as one trip by a person to the shore longer than 10 miles one-way and lasting up to 8 hours in duration (i.e., 3 person trips equal one person-day).

Using these statistics, and others, in a linkage of data bases, the study has provided New Jersey with a model of coastal tourism response to energy facility development. In the sections that follow, the objectives, assumptions, and methodology of the study are presented, and the Coastal Tourism Response Model is described. Conclusions about the social and economic character of New Jersey's shorefront, the importance of tourism, the environmental impacts of energy facilities as conflicting uses, and social and economic impacts are presented. The case studies of the model are then described, with conclusions and recommendations for further work. The summary concludes with a set of coastal policy guidelines and a glossary.

2. STUDY OBJECTIVES

The Division of Coastal Resources will use the results of this study to consider the potential economic losses produced by energy facility development and to formulate policies concerning the location of energy facilities within New Jersey's coastal areas. In this process, the potential impacts on shorefront recreational resource quality and tourism are balanced against the positive economic impacts that accompany energy facility development. The recommended policies will be used to guide the siting of energy facilities in locations where their potential effects on natural resources and tourism can be minimized.

The four main objectives of the study were to:

- describe the economic, social, demographic, and land use characteristics of the New Jersey shore;
- model the economic, social, fiscal, and demographic impact sequences of energy facility development in coastal areas;
- link the impacts of energy facility development and their accompanying direct environmental effects with the resulting economic losses in tourism; and
- estimate the size and economic importance of New Jersey's shorefront recreational economy.

3. ASSUMPTIONS AND METHODOLOGY

The responses of shorefront visitors to energy facility-related environmental impacts vary according to the type of accommodation used, the activity sought, and the energy activity to be sited. Based on this assumption, four distinct groups of recreational activities were identified: shorefront recreation, bay-water recreation, entertainment, and visiting friends. Combining these activity groups with the five accommodation types (seasonal home, hotel or motel, campground, friend or relative, day party) produced twenty distinct visitor types. (Note: Assumptions concerning the Coastal Tourism Response Model (CTRM) are contained in the discussion of the model in section 4.)

The study area encompasses 87 municipalities in Monmouth, Ocean, Atlantic, and Cape May Counties and is shown in Figure 1 (in center fold). It was defined on the basis of a municipality's dependence on the shorefront economy, and the presence of or proximity to shorefront recreational resources. Thus, all municipalities that had frontage on the ocean or back bays were included. In addition, those inland municipalities that were determined to be dependent upon, or oriented toward, the shorefront recreational economy were also included. This orientation was determined through a variety of factors, including economic processes (i.e., worker commuting patterns to shorefront areas), presence of recreational resources or facilities (i.e., campgrounds), economic structure (i.e., high proportion of retail and service establishments providing recreational goods and services), and seasonality (i.e., high number of seasonal accommodations).

Shorefront municipalities along the New Jersey coast vary greatly in their economic and social characteristics. These characteristics determine the type and magnitude of the socioeconomic impacts stemming from the diversion of tourists due to energy facility development. This reflects the fact that shorefront municipalities differ widely according to the types of recreational activities available, the visitor types those activities attract, and the municipality's dependence on tourism. For example, day travelers comprise a larger proportion of the visitors to Monmouth County municipalities, while tourism to Cape May's barrier island communities consists primarily of overnight visits. Not surprisingly, Cape May municipalities are much more dependent economically on tourism than are municipalities in Monmouth County.

In order to analyze the diversity of the shore communities, the study created a data base consisting of 49 variables for each municipality located within the four coastal counties studied. Six distinct tourism regions were defined on the basis of seasonality indices, intensity of development, land use patterns, and local dependence on tourism. These six subregions are: non-seasonal suburban, north shore non-seasonal/rural, north shore seasonal, resort gambling, south shore non-seasonal/rural, and south shore seasonal. Figure 1 shows the boundaries of the six tourism regions.

A number of key assumptions were made during the formulation of the model. These are presented below.

These assumptions indicate clearly that the major focus of the CTRM is on the characteristics of both the affected tourists (e.g., their accommodation and activity), and the nature of the affected community (i.e., its economic dependency on tourism). This is essentially a perceptual issue: how do tourists in different locations respond to the same environmental impacts that change the quality of recreational resources? Orienting the CTRM in this fashion makes the model consistent with the locational focus of New Jersey's Coastal Resource and Development Policies.

- The key issue in linking tourist responses to facility-induced changes in recreational resource quality is the perception of these changes by the affected tourists.

- Energy facilities will be sited at locations that do not require extraordinary or unique engineering measures to overcome site deficiencies. (This assumption applies to the capital cost and labor force estimates within the CTRM for each facility prototype.)

- Following from this assumption, facility-specific environmental impacts will be the same throughout the study area. Thus, the primary determinants of tourism losses are the types of recreational activities and shorefront visitors affected by a change in recreational resource quality.

The study clearly confirms the importance to New Jersey's shorefront economy of seasonal homes, which includes owner-occupied second homes, and homes held for seasonal rent. Table 1 indicates the total number of person days by each of the five accommodation types for all 87 municipalities located within the study area. The column after municipality indicates whether it is a borough (B), township (T), city (C) or a village (V). The column labeled "tourism region" indicates the type of region where each municipality is located. The following classification applies to tourism regions:

1. Non-seasonal suburban
2. North shore non-seasonal/rural
3. North shore seasonal
4. Resort gambling
5. South shore non-seasonal/rural
6. South shore seasonal

The significance of the loss of tourism expenditures was found to vary depending upon the geographic level analyzed. Clearly, an individual municipality would suffer a precipitous loss in visitation and expenditures due to an oil spill on its beach. However, at the county or State level, this loss would be minimal if bathers simply visited other beaches along the Jersey shore. A net loss to the state's economy would occur if shorefront visitors decided to transfer their recreational activities to Delaware beaches.

Factors affecting how shorefront visitors responded to energy facility-related declines in resource quality included the following: the type of accommodation being used by the shorefront visitor; the type of recreational activities being consumed; and the characteristics of the direct environmental effect (i.e., severity, duration, season of occurrence, one-time versus permanent, etc.). Of course, those on day trips are less committed to any one location and will be more likely to switch the site of their

Table 1. Inventory of Visitors in Shorefront Municipalities

Map Number	Municipality	County	Tourism Region	Seasonal Home	Hotel Motel	Campground	Friend Relative	Day Party
1	ATLANTIC HIGHLANDS	B MONMOUTH	1	9,240	20,127	0	37,034	4,706
2	HIGHLANDS	B MONMOUTH	1	102,480	20,127	0	38,807	11,439
3	MIDDLETOWN	T MONMOUTH	1	109,200	40,254	0	468,151	43,769
4	SEA BRIGHT	B MONMOUTH	1	62,160	20,193	0	13,557	6,797
5	FAIR HAVEN	B MONMOUTH	1	3,360	0	0	42,488	3,249
6	RUMSON	B MONMOUTH	1	16,380	0	0	57,032	5,203
7	RED BANK	B MONMOUTH	1	15,540	20,127	0	90,011	8,907
8	LITTLE SILVER	B MONMOUTH	1	5,460	0	0	41,508	3,329
9	MONMOUTH BEACH	B MONMOUTH	1	88,620	4,791	0	24,824	8,379
10	OCEANPORT	B MONMOUTH	1	10,500	0	0	44,051	3,866
11	LONG BRANCH	C MONMOUTH	1	214,200	80,517	0	223,093	36,697
12	DEAL	B MONMOUTH	1	84,840	4,219	0	14,604	7,346
13	ALLENHURST	B MONMOUTH	1	24,780	6,302	0	6,823	2,686
14	LOCH ARBOUR	V MONMOUTH	1	14,700	825	0	2,761	1,296
15	ASBURY PARK	C MONMOUTH	1	136,920	462,975	0	127,299	51,535
16	NEPTUNE	T MONMOUTH	1	310,380	240,962	0	212,222	54,113
17	BRADLEY BEACH	B MONMOUTH	1	339,360	40,254	0	35,702	29,433
18	NEPTUNE CITY	B MONMOUTH	1	8,400	20,127	0	39,473	4,819
19	AVON-BY-THE-SEA	B MONMOUTH	1	126,000	4,464	0	17,484	10,485
20	BELMAR	B MONMOUTH	1	415,800	80,517	0	50,658	38,763
21	SOUTH BELMAR	B MONMOUTH	1	119,280	3,095	0	11,716	9,503
22	WALL	T MONMOUTH	1	87,360	111,704	0	141,791	24,156
23	SPRING LAKE HEIGHTS	B MONMOUTH	1	92,400	40,254	0	40,580	12,277
24	SPRING LAKE	B MONMOUTH	1	132,720	240,065	0	31,535	28,654
25	SEA GIRT	B MONMOUTH	1	86,100	6,424	0	19,826	7,962
26	MANASQUAN	B MONMOUTH	1	376,740	60,390	0	40,056	33,818
27	BRIELLE	B MONMOUTH	1	66,360	20,127	0	30,435	8,286
28	POINT PLEASANT BEACH	B OCEAN	1	357,840	224,436	0	40,513	44,136
29	POINT PLEASANT	B OCEAN	1	202,440	26,729	0	132,775	25,651
30	BAY HEAD	B OCEAN	3	165,900	18,297	0	10,025	13,764
31	BRICK	T OCEAN	2	956,760	316,164	0	401,229	118,645
32	MANTOLOKING	B OCEAN	3	101,640	2,625	0	3,240	7,619
33	DOVER	T OCEAN	2	2,341,720	283,650	93,881	482,224	130,761
34	LAVALLETTE	B OCEAN	3	821,940	25,149	0	15,502	61,131
35	ISLAND HEIGHTS	B OCEAN	2	48,720	8,200	0	11,783	4,869
36	SEASIDE HEIGHTS	B OCEAN	3	760,620	82,684	0	13,482	262,319
37	SOUTH TOMS RIVER	B OCEAN	2	3,780	0	0	29,582	2,364
38	PINE BEACH	B OCEAN	2	40,740	5,941	0	13,437	4,261
39	BEACHWOOD	B OCEAN	2	43,260	16,028	0	57,511	8,277
40	OCEAN GATE	B OCEAN	3	176,400	2,308	0	10,362	13,399
41	SEASIDE PARK	B OCEAN	3	719,040	51,907	0	13,429	55,588
42	BERKELEY	T OCEAN	2	708,540	72,304	35,046	173,206	70,096
43	LACEY	T OCEAN	2	521,220	52,040	0	105,946	48,135
44	OCEAN	T OCEAN	2	282,660	21,978	20,815	27,914	25,043
45	BARNEGAT	T OCEAN	2	142,800	22,097	10,620	65,105	17,053
46	BARNEGAT LIGHT	B OCEAN	3	319,200	13,072	0	4,631	23,876
47	STAFFORD	T OCEAN	2	1,044,540	57,413	0	77,696	83,600
48	BASS RIVER	T BURLINGTON	2	32,760	1	189,036	10,055	16,431
49	HARVEY CEDARS	B OCEAN	3	399,420	6,311	0	2,716	28,946
50	SURF CITY	B OCEAN	3	650,580	25,901	0	11,754	48,774
51	SHIP BOTTOM	B OCEAN	3	459,900	36,395	0	10,676	35,929
52	EAGLESWOOD	T OCEAN	2	1,795,080	4,246	38,232	7,549	60,719
53	LONG BEACH	T OCEAN	3	2,463,300	76,481	0	26,096	181,841
54	LITTLE EGG HARBOR	T OCEAN	2	621,600	24,557	44,604	63,466	53,451
55	TUCKERTON	B OCEAN	2	244,860	14,920	36,745	18,494	22,325
56	BEACH HAVEN	B OCEAN	3	635,040	47,819	0	12,823	49,302
57	PORT REPUBLIC	C ATLANTIC	5	5,880	397	79,013	6,262	6,488
58	GALLOWAY	T ATLANTIC	5	71,820	18,580	189,036	91,096	26,259
59	ABSECON	C ATLANTIC	5	14,700	27,028	21,240	51,316	8,099
60	BRIGANTINE	C ATLANTIC	6	855,960	146,911	0	62,232	75,483
61	EGG HARBOR	T ATLANTIC	5	227,220	70,786	149,530	145,000	41,992
62	PLEASANTVILLE	C ATLANTIC	5	139,020	37,501	77,526	100,515	25,127
63	ATLANTIC CITY	C ATLANTIC	4	1,035,300	6,570,000	0	300,751	6,285,521
64	NORTHFIELD	C ATLANTIC	5	10,500	5,884	12,744	58,319	6,197
65	VENTNOR CITY	C ATLANTIC	5	769,020	67,521	0	87,564	65,490
66	LINWOOD	C ATLANTIC	5	11,340	0	0	45,967	4,061
67	MARGATE CITY	C ATLANTIC	5	717,360	135,043	0	68,673	65,276
68	SOMERS POINT	C ATLANTIC	5	194,040	30,320	0	77,285	21,377
69	LONGPORT	B ATLANTIC	6	338,940	2,647	0	9,344	24,870
70	ESTELL MANOR	C ATLANTIC	5	6,720	548	78,163	6,344	6,504
71	CORBIN CITY	C ATLANTIC	5	8,820	369	0	1,900	786
72	OCEAN CITY	C CAPE MAY	6	4,166,820	606,595	0	104,360	345,683
73	UPPER	T CAPE MAY	5	262,920	145,578	349,398	50,224	57,271
74	WOODBINE	B CAPE MAY	5	15,540	0	0	21,016	2,591
75	DENNIS	T CAPE MAY	5	31,500	36,295	605,765	29,844	49,849
76	SEA ISLE CITY	C CAPE MAY	6	1,438,920	154,768	0	19,781	114,345
77	AVALON	B CAPE MAY	6	1,291,500	252,106	0	16,175	110,540
78	MIDDLE	T CAPE MAY	5	511,560	394,394	872,114	85,088	132,040
79	STONE HARBOR	B CAPE MAY	6	966,420	200,255	0	8,881	83,310
80	NORTH WILDWOOD	C CAPE MAY	6	1,651,440	1,009,729	0	35,268	191,094
81	WEST WILDWOOD	B CAPE MAY	5	238,140	5,018	0	2,693	17,423
82	WILDWOOD	C CAPE MAY	6	1,619,520	1,027,980	0	36,757	190,230
83	WILDWOOD CREST	B CAPE MAY	6	1,135,680	1,341,052	0	31,041	177,723
84	LOWER	T CAPE MAY	5	1,462,020	49,818	842,803	127,972	175,940
85	WEST CAPE MAY	B CAPE MAY	5	149,100	9,363	43,542	8,162	14,894
86	CAPE MAY	C CAPE MAY	6	575,820	687,182	482,148	36,308	126,250
87	CAPE MAY POINT	B CAPE MAY	6	139,440	1,350	0	1,908	10,113
TOTALS BY ACCOMMODATION				40,684,560	16,123,509	4,272,001	5,484,787	10,442,607

recreational activities to another location than are persons owning second homes. Similarly, there would be much less diversion of shorefront visitors from a municipality being affected by a short-term environmental impact (e.g., turbidity from periodic maintenance dredging) than there would be from permanent change (e.g., turbidity due to the frequent passage of coal colliers traveling to and from an operating coal terminal).

The study divided the response of shorefront visitors to an actual or perceived decline in the quality of a recreational resource (for example, fewer fish being caught, dirty water, oil on the beach, noise, odor, etc.) into several possibilities. These involved the tourists leaving the area and participating in the same recreational activity at another location on the Jersey shore; continuing to visit the same area and accepting the decline in resource quality; switching to other recreational activities; and switching the location of recreational activities outside of New Jersey.

The study also estimated the response patterns of different types of visitors to the direct environmental effects accompanying energy facility development in all six subregions. These estimates were the outcome of a "delphi" session that employed a series of hypothetical scenarios. Each scenario described in detail the type, magnitude, and duration of a loss in recreational resources due to facility-generated direct environmental effects. The context for each scenario was set by specifying the community (i.e., by subregion type), accommodation type, and principal recreational activity. The scenarios covered the full range of possible combinations. The participants in the study's "delphi" session, all providers of tourism-related services, were assumed to be capable of making reasonable estimates of tourist responses to environmental impacts on the basis of the role and experience of each as providers of recreational goods and services along the New Jersey shore.

A diverse group was asked in the session to estimate how different visitor types would respond to changes in the quality or quantity of recreational resources produced by each of the energy facility scenarios. The participants were asked to estimate the percentage of the different visitor types that would change their pattern of recreational activity for each scenario.

The results of the session indicated that owners of seasonal homes were less likely to change the location of their recreational activities than were other visitor types. It also found that the types of environmental effects that are most likely to have significant adverse impacts on tourism are temporary losses of recreation resources due to pollution (i.e., oil spills), lowering of aesthetic qualities (i.e., noise, odor) and decreases in visual quality. As expected, visitors engaged in shorefront or bay-water recreational activities were estimated to change the location of their recreational activities. In general, the session revealed that aesthetic and visual impacts will produce more diversion of all types of visitors from municipalities located in the shorefront seasonal communities than from any of the year-round communities.

The response coefficients gained in the session were then incorporated into the model to project the probable tourism losses produced by a number of scenarios. The loss of visitor types was then combined with data on the expenditure patterns of all visitor types. The result is an estimate of the total economic impact accompanying the diversion of tourists from an area due to a facility-related direct environmental change or a perception of change.

Adverse economic impacts resulting from the diversion of tourist-related expenditures were balanced against the positive economic impacts accompaning energy facility development to derive a net estimate of economic impacts. The construction of an energy facility results in an increase in employment for local construction workers, as well as increased sales for local establishments that supply raw materials, equipment, and services required by the facility. The multiplier spending effects that accompany these local purchases and the expenditures of locally hired workers will create additional amounts of local employment and income. While the construction of an energy facility usually results in the creation of a large number of temporary jobs (less than 5 years in duration), the actual operation of an energy facility provides a smaller number of permanent jobs. The specialized and technical nature of both the construction and operation phases requires workers who are paid substantially higher wages than the service and retail employment opportunities found in the tourist sector. Thus, an energy facility-related job will have a larger beneficial impact on the local economy than one in the tourist industry. Finally, an energy facility will often result in a substantial increase in the local real property tax base.

In some instances, the net statewide losses in tourism expenditures due to the environmental effects of energy facility development are more than offset by the positive economic impacts of increases in the state's employment and the purchases of materials, equipment, and services from New Jersey establishments. Conversely, a capital-intensive energy processing facility requiring few workers and few materials and services from establishments in its highly desirable waterfront location was found to result in tourism losses that more than offset the positive economic benefits accompanying the facility's construction and operation.

4. COASTAL TOURISM RESPONSE MODEL DESCRIPTION

The Coastal Tourism Response Model (CTRM) is designed to simultaneously estimate two major types of impacts of energy facility construction and operation in coastal areas: first, the economic, fiscal, and social impacts produced by a facility's development; and second, the magnitude and economic effects of tourism losses produced by the facility's direct environmental effects. The model estimates both groups at the local, regional, and statewide levels, and then combines them for an overall set of net economic impacts.

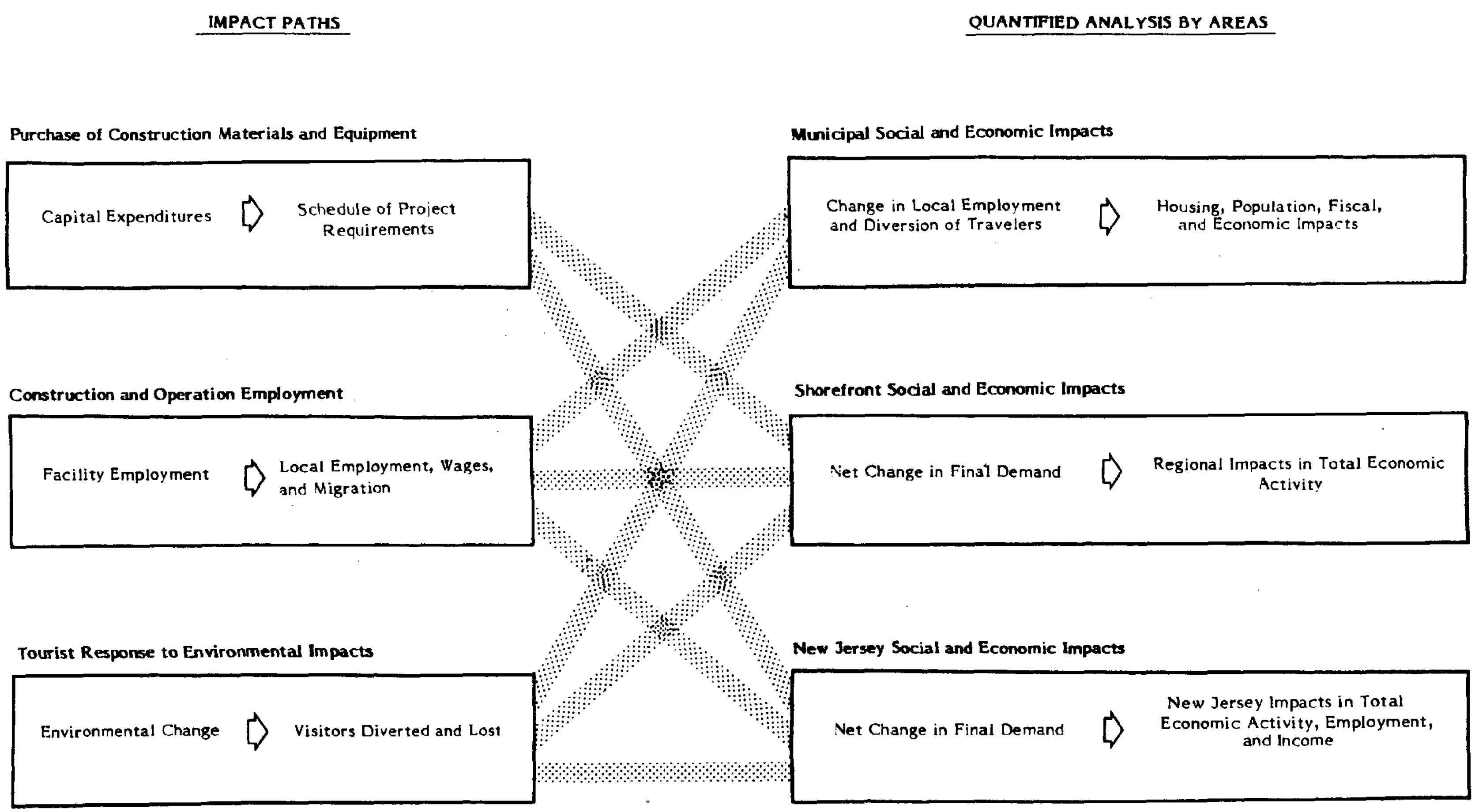
The model is structured to analyze proposed projects by using either actual plans or, in the absence of facility-specific data, prototype descriptions. The evaluation can be targeted to specific impacts, such as the effect of a coal-fired plant on the number of migrants brought to the facility site area, or it can be focused on broader policy issues, such as the impact of energy development on bay-related recreational use. To initiate any type of analysis, the model user manually enters facility-specific data into the system and triggers the desired set of analyses through selective use of a linked series of computer programs.

The CTRM draws on a vast array of information as it makes its calculations and projections. In all, there are ten separate data bases supplying social, economic, physical, fiscal, and facility information. One file in particular, the New Jersey Shorefront Municipality Data Base, contains over 49 separate items of information for 127 municipalities and was assembled from published data specifically for this study.

The other data bases, assembled from some of the best and most recent research available, include economic multipliers, current tourist visitation by municipality, construction and operating labor force, requirements by facility, and current wages. For instance, the Economic Multipliers for New Jersey, the product of the Regional Science Research Institute, are usually precise estimates of economic activity generated by a given stimulus. Current data on tourist activity in New Jersey was derived from a variety of sources and adapted for use in this study, including the U.S. Travel Data Center's Travel Economic Impact Model. Perhaps most unique to the model are the visitor response coefficients which were estimated in the delphi session described above. The utility of these data bases is not diminished over time, as they can be updated or replaced as new information becomes available.

As displayed in figure 2, the CTRM is broken down into three impact paths and three geographical area analyses. The impact paths, in addition to producing useful intermediate tables, provide information to initiate the three area analyses. The calculation procedures of all six model components are summarized as follows.

Figure 2. Coastal Tourism Response Model: Computer-Assisted Model Components



Impact Path 1, Purchase of Construction Materials and Equipment

In the first impact path, the total capital expenditure required to erect the facility is parceled out in the construction period, according to the portion of construction completed in each yearly interval. That way, the years in which the greatest amount of construction activity takes place receive the greatest share of the impact of those expenditures.

Impact Path 2, Construction and Operation Employment

In the second impact path, the construction period labor force is allocated to each construction year in a similar fashion. In addition, the labor force required for annual operation of the facility is shown. Then, a commuting zone is defined and the area's labor supply is assessed in order to make an estimate of the number of local residents employed by the facility. An estimate is also made of the number of migrants drawn to the area. Demographic data incorporated into the model are used to survey the housing market in each municipality and, relating this information to migration, to forecast unsupplied housing demand. Finally, the total income of local residents and migrants in the commuting zone is determined. All of these measures of change associated with facility employment are reported by municipality for each year of the analysis.

Impact Path 3, Tourist Response to Environmental Impacts

While Impact Paths 1 and 2 capture the positive economic aspects of energy facility development (the stimuli of purchases and employment), Impact Path 3 assesses the negative economic aspect of energy facility development (loss of tourism). First, the potential environmental impacts of each of the energy facilities, direct and indirect, are itemized in the facility impact assessment matrices. Next, the environmental change schedules translate these direct effects into the probability of losses in the six classes of perceived losses in recreational resources. Then, the tourism trade within each affected municipality is considered, using data compiled for all 87 municipalities in the study area. Drawing on the tourist response coefficients, estimates are made of the number of travelers diverted from each municipality or lost from the shorefront study area entirely, for each year of the eleven-year analysis period. By structuring the analysis around twenty visitor-group types, six kinds of losses in quality of recreational resources, and six tourism subregions, the model yields detailed estimates of tourism loss for each affected municipality.

Municipal Area Analysis

First, a fiscal impact analysis is undertaken to evaluate the demands placed by migrants on locally provided services. In this analysis, which uses the number of migrants calculated in Impact Path 2, increased revenue from migrants is compared to increased expenditures for locally provided services. Next, an opportunity cost analysis is performed to determine the value of seasonal home rent and use foregone by the owner as a result of the environmental impact. This analysis uses the report from Impact Path 3 which presents the number of travelers typically accommodated in seasonal homes now diverted from the municipality. Finally, an analysis of tourist expenditure assigns a dollar value to the loss in visitor-days, presenting lost trade by type of establishment for each municipality experiencing significant environmental change.

Regional Area Analysis

The CTRM also considers the shorefront study area as an economic entity, separately measuring regional economic impacts. The economic impacts experienced at this level are similar to those at the state level, except that the shorefront captures a smaller share of New Jersey's economic activity. Analysis at the regional level is useful to determine what impacts will cause tourists to leave the entire region, as opposed to an individual municipality.

The analysis begins by structuring the economic changes implied by each impact path into change in purchases experienced by individual sectors of the regional economy. The regional portion of purchases are allocated across the 56 economic sectors which are used to describe the economy in the Regional Industrial Multiplier System (RIMS). Facility capital expenditures determined in Impact Path 1 are proportionally allocated to economic sectors to describe purchases of materials and equipment made within the region by type of supplier. Wages of facility employees determined in Impact Path 2 are allocated to economic sectors according to a typical profile of household purchases. The loss of expenditures suffered by establishments in the tourism industry is calculated from the loss of visitors reported in Impact Path 3, and then allocated as negative values to economic sectors which contain those establishments.

The final step in the regional area analysis takes the net change arrived at by summing the two positive effects and one negative effect above, and proportionately increases it by a multiplier for each sector to account for indirect and induced economic activity generated by this direct change. The resulting dollar values represent the total change in regional economic output.

Statewide Analysis

This component of the model forecasts six impacts that New Jersey will experience as a result of coastal energy facility development. The six are the changes in gross economic output, employment, wages, value added, and state and local tax receipts. Analysis at this level is important both because information reported at the state level results in more precise forecasting and because the major policies are debated and determined at the state level.

The measures of social and economic impact are calculated by using economic multipliers that have been determined by application of the New Jersey Input-Output Model. The Regional Science Research Institute conducted 29 separate analyses using their model of economic transactions in New Jersey to provide multipliers for these measures of impact associated with facility construction and operation. It also conducted an analysis to provide multipliers for eleven categories of traveler expenditures. When applied to capital expenditures, the income of facility employees, and each of the travel expenditure categories, total change in economic activity can be calculated and interpreted in terms of each of the six impact measures.

Table 2 presents a listing of the quantifiable socioeconomic, fiscal, and demographic impacts that are estimated by the CTRM.

The following existing data bases and economic models were incorporated into the CTRM.

- o Information of tourist expenditures, by accommodation type, and the number of overnight travelers was contributed by the United States Travel Data Center's Travel Economic Impact Model (TEIM).

- o The magnitude and sectoral composition of the multiplied statewide economic impacts of energy facility spending and tourist expenditures were estimated by the Regional Science Research Institute's Input/Output Model for New Jersey. This model has been adapted by the New Jersey Office of Economic Policy in cooperation with the Bureau of Economic Research at Rutgers University.

- o Information on the capital cost, labor force requirements, duration of construction periods, and timing of construction labor force loadings came from the Energy Facility Development Potential Study.

- o Data on the distribution of shorefront visitors by accommodation type, and activity and length of stay were obtained from the statewide survey of New Jerseyans Vacations conducted by the Eagleton Institute at Rutgers University.

- o The model's approach to estimating municipal-level demographic, fiscal, housing, employment, and income effects was based on the Maryland Major Facilities Study's RIFLE (Regional Impact of Facility Location on the Economy) and on case studies of electric power plant impacts published by the Electric Power Research Institute.

- o The model's estimation of the study area's indirect employment and income effects accompanying energy facility development and tourism diversion used the RIMS 1 (Regional Income Multiplier System) input/output coefficients produced by the United States Department of Commerce and the United States Water Resources Council.

Table 2. Quantitative Outputs of the CTRM

Impact Path 2

Directly employed migrants brought to region, by municipality and year (in person-years)

Project employment zone, by municipality

Directly employed previous residents, by municipality and year (in person-years)

Unsupplied family housing demand, by municipality and year (in dwelling units)

Facility employee income, by municipality and year (in thousand of dollars)

Schedule of environmental changes for each affected municipality, by category and year

Impact Path 3

Tourism diverted from each municipality, by group type and year (in person-days)

Tourism lost from shorefront study area by each municipality, by group type and year (in person-days)

Total tourism lost from shorefront study area from all municipalities, by group type and year (in person-days)

Municipal Area Analysis

Fiscal impact from migration, by municipality and year (in thousands of dollars)

Value lost by seasonal home owners for each municipality, by year (in thousands of dollars)

Tourism industry final demand loss for each municipality, by type of visitor expenditure and year (in thousands of dollars)

Regional Area Analysis

Regional expenditures for materials and equipment, by WRC economic sector and year (in thousands of dollars)

Tourism industry final demand loss, by WRC economic sector and year (in thousands of dollars)

Final demand change for shorefront study area, by sector and year (in thousands of dollars)

Economic activity change for shorefront study area, by sector and year (in thousands of dollars)

Statewide Analysis

Tourism industry final demand loss, by type of visitor expenditure and year (in thousands of dollars)

New Jersey social and economic impacts, by year

The numbers of visitors to the shore are not strictly comparable to any other sets of numbers. This is because they are estimated only for the 87 municipalities that comprise the study area. This involves only part of four of the counties (Monmouth, Ocean, Atlantic and Burlington). It is important to note that these estimates use as primary data sources the two most important and recent sources of tourism data in the state. These are the statewide number of long distance visitors from the U.S. Travel Data Center (which participated in this study), and Eagleton Institute's Survey of New Jerseyans Vacations. The major advantage of these visitor counts is that they are based on a "top-down" approach. This apportions the most accurate study area control totals among the various municipalities using a single methodology. Thus, the various municipal estimates can be meaningfully compared.

The information contained in the municipal data base came from a variety of published sources. The primary criterion used in selecting the sources was that the data had been collected using the same methodology over the entire study area. Data sources included the 1980 Censuses of Population and Housing, the 1977 Economic Censuses of Retail and Service Industries, annual fiscal data compiled by the New Jersey Division of Taxation, and employment data from the New Jersey Department of Labor and Industry.

In order to use the model, the following information is required:

- facility type
- municipality where the facility is located
- name of all municipalities located within a 30 minute commuting distance of the facility (shown in table T101 of the Technical Report).

The use of the model with this information requires the use a number of previously specified data sets already contained within the model. The information is suitable for most applications that analyze the impact of a typical facility at a suitable site; 1982 data will suffice. However, these data sets, listed below, can and should be updated to accommodate recent information (i.e., changing wage costs), new technology (i.e., labor requirements for facility construction and operation) or individual site types (i.e., consideration of environmental impacts associated with site-specific characteristics):

- facility size
- facility capital cost in current dollars
- facility construction phase labor requirements by year and by type (i.e., manual versus non-manual)
- wage rates in current dollars
- facility operating labor force requirements
- facility-specific changes in the probability of a change in the perceived quality of a recreational resource.

As an example, the model contains an environmental change schedule for each of the fifteen energy facility types. This schedule lists the probability that a facility's development will result in a change in the perceived quality of a recreation resource. It assumes a typical facility located in a favorable location with no unique site characteristics that requires extraordinary remedial measures. However, the model user is able to change a schedule if it is known that a particular development scenario will result in impacts on recreational resources not generally associated with that facility's development.

The CTRM produces a number of interim and final outputs, all of which are provided in tabular form. Some of them are listed below.

- Number of directly employed study area residents, by municipality.
- Number of migrants drawn into the study area, by municipality.
- Fiscal impacts at the municipal level.
- Tourism diverted from affected municipalities, itemized according to the 20 combinations of visitor types and activities.
- Loss in direct tourism expenditures, by municipality.
- Direct study area expenditures for materials, equipment, and services generated by energy facility construction and operation.
- Net statewide economic impacts from energy facility development and accompanying tourism diversion.

The model was tested using five case studies of hypothetical energy facility development scenarios. The four municipalities used in the case studies were chosen on the basis of feasible locations for the two facility types. (These selections do not imply that these facilities are actually being considered for location in these municipalities.) The first two case studies analyzed two different facilities in the same location: a 600 megawatt coal-fired power plant and a support base in Lacey Township, Ocean County. The other three case studies hypothetically sited these two facilities in other locations: support bases in Manasquan, Monmouth County, and in Ocean City, Cape May County, and a coal-fired power plant in Middle Township, Cape May County.

The impacts estimated by the CTRM varied widely among the five case studies. The support base would have less of an adverse effect on tourism in Manasquan than in Ocean City. The net statewide economic impacts on employment and value added from both tourism losses and support base development would be positive in both Manasquan and Lacey Township, while they would be negative in Ocean City. Losses in tourism establishment receipts from support base development would be approximately five times higher in Ocean City than in Manasquan, and three times higher in Ocean City than in Lacey Township.

The adverse impact on tourism from the development of a coal-fired power plant would be larger in Middle Township than in Lacey Township. In particular, about four times more visitor expenditures would be diverted from Middle Township than from Lacey Township. The location of a support base in Ocean City would result in a larger absolute loss in local recreational establishment receipts than would the coal-fired power plant in either of the other two locations.

Finally, the CTRM contains a number of appendices which provide supporting information on the components of the model. These include descriptions of the 15 energy facilities considered by the model, facility impact assessment matrices and environmental change schedules, the "delphi" questionnaire, and the tourism response coefficients. In addition, there are sections presenting the attitudes of shore municipalities toward development and preservation, the methodology used for defining the regional subtypes, and municipal data bases.

5. SOCIAL AND ECONOMIC CHARACTER OF NEW JERSEY'S SHOREFRONT

The New Jersey shorefront is an area consisting of groups of municipalities with widely diverse social and economic characterisitics. These are manifestations of the wide array of recreational resources and tourist facilities that are found along the New Jersey shorefront. The differences in the types and composition of these recreational activities are the result of a number of factors. Some of these include ecological and physiographic features (i.e., barrier islands and headlands), proximity to major metropolitan areas, and other non-recreational uses of an area (i.e., agricultural or industrial suitability).

Therefore, one important part of the study was to assemble a comprehensive data base containing social, economic, fiscal, and demographic information on the 87 municipalities included in the study area. This data base consists of 49 separate municipal-level data items. This data base, along with considerations of the ecological, physiographic, and natural resource characteristics of the shorefront communities, was then used to define functional subregions within the study area on the following basis:

- the economic dependence on and social orientation (i.e., seasonality of employment and population changes) to the coastal recreation economy;

- the predominant types of recreational services offered by a subregion, and the types of recreation users visiting it;

- the magnitude and composition of the socioeconomic and environmental impacts that would accompany the construction and operation of an energy facility.

The six clearly distinct tourism regions were delineated using the following four elements in the municipal data base:

- year-round population density per acre
- proportion of housing stock held for seasonal use
- residential land value per acre
- median home value.

Together, these data indicate the intensity of the development, the seasonality of a community, and the economic value of existing development. A brief description of the distinguishing features of each of the subregion types is presented below. Figure 1 indicates the municipalities that fall within each subregion type.

Non-Seasonal Suburban. This subregion is comprised of 29 municipalities in Monmouth and Ocean Counties within commuting distance of the New York metropolitan area. The subregion includes the shorefront municipalities located along the headland section of Monmouth and Ocean Counties, and municipalities located in the interior of Monmouth County. There is a mix of affluent, residential communities (i.e., Deal) and declining and fiscally stressed urban areas (i.e., Asbury Park and Long Branch). These shorefront communities, while containing recreational facilities, have a low proportion of their housing stock reserved for seasonal use. Their urbanized character is evidenced by their high population densities, high median home value, and high residential home value per acre. Their recreational facilities are primarily oriented toward daytrippers.

North Shore Non-Seasonal/Rural. This region is comprised of 15 municipalities, all but one located in Ocean County. Communities in this subregion are located along the western shores of the region's back bays. Most of these communities have no ocean or backbay shorefront and are located further to the west in the interior of the two counties. The year-round municipalities have little dependence on tourism (e.g., low proportion of seasonal housing), are not as densely developed as the commuter suburbs, and have less commutation to the New York area. The rural communities have a substantial portion of seasonal housing, but also have a low intensity of development and a low population density.

North Shore Seasonal. Twelve municipalities in Ocean County comprise this subregion. They are the shorefront communities extending south from Bay Head, including the communities on Long Beach Island. These communities are densely developed and economically highly dependent on tourism. They have a high proportion of seasonal homes and exhibit significant seasonal fluctuations in population, employment, and public service demands. Their recreational facilities and activities are more oriented to overnight tourists than the shorefront municipalities of Monmouth County. However, Seaside Heights does attract a substantial number of daytrippers.

Resort Gambling. This subregion includes only Atlantic City, due to the unique nature of its major attraction -- legalized gambling. It is a highly urbanized area undergoing rapid and signficant changes in development patterns due to the casino-related industry. Development densities are increasing, while the year-round population will begin to increase following a long, slow decline. It is increasingly becoming a year-round tourist center, with the former seasonal fluctuations in population and employment becoming stable year-round. Atlantic City's non-casino-related recreational and tourist attractions are patronized primarily by daytrippers and by overnight visitors whose primary purpose for visiting is to patronize casinos.

South Shore Non-Seasonal/Rural. This subregion consists of 18 municipalities located in Atlantic and Cape May Counties. These communities are located on the western shores of the bays and in the interior portions of the two counties. The two exceptions are Absecon Island's Ventnor and Margate, both of which have less than 30 percent of their housing stock classified as seasonal, while they also have high residential property values. The mainland rural communities have low densities of development and are sparsely populated. They do not exhibit high seasonal fluctuations in population or employment due to tourist-related activities. The inland communities do provide land-intensive recreational and tourist facilities such as campgrounds. While the two barrier island communities do provide a number of recreational facilities, they are in effect suburbs of Atlantic City, and will become more so over time. Their seasonal fluctuations of employment and population will decrease as they become more linked to the year-round pattern of activities occurring in Atlantic City.

South Shore Seasonal. Twelve ocean shorefront and barrier island communities in Cape May County comprise this subregion. These communities are highly dependent upon tourism and recreational activities, as evidenced by their high proportion of seasonal homes. They exhibit high seasonal flucuations in employment, economic activity, and population. They are heavily developed communities with high residential values per acre and high home values. These communities are patronized primarily by weekend and long term (i.e., weekly and monthly) overnight visitors.

6. IMPORTANCE OF TOURISM

New Jersey's oceanfront recreational resources and facilities constitute a vital part of the State's economy. The expenditures for recreational goods and services by non-business tourists visiting the New Jersey shore produce additional economic benefits by way of the multiplier effect that generates additional rounds of employment and income throughout the State's economy.

The first step in assessing the economic importance of coastal tourism to the state's economy was to determine the composition and number of the different types of visitors to the New Jersey shore. The expenditure patterns and the accompanying economic impacts vary significantly depending upon the type of visitor (e.g., overnight versus daytripper) and the types of activities they seek. A number of data sources were consulted, including survey data from the Eagleton Institute, the United States Travel Data Center, the 1980 Census of Population, and other published statistics. Concurrently, this study also estimated the total number of units of the four basic types of housing accommodations used by overnight tourists. These accommodation types are seasonal homes, hotels and motels, campgrounds, and the homes of friends or relatives.

The magnitude of New Jersey's shorefront tourist industry is seen in the fact that during 1982, non-business, recreational travelers to the New Jersey shore totaled 77 million person-days. (A person-day is defined as one person spending 24 hours at the shore.) This total includes 66.6 million person-days by overnight visitors and 10.4 million person-days by day-trip travelers. However, day-trippers do not spend 24 hours at the shore. Assuming that the average daytripper spends 8 hours at the shore, there were a total of 31.2 million day-party person-trips (which do not include an overnight stay). Included within this figure are 19.9 million day party person-trips made by persons visiting Atlantic City.

The number of person days by accommodation type for overnight visitors is presented below.

Seasonal home	40.7 million person-days
Hotels and motel	16.1 million person-days
Campground	4.3 million person-days
Home of friend or relative	5.5 million person-days
Total	66.6 million person-days

These figures indicate the importance of seasonal homes in providing overnight accommodations for visitors to the New Jersey shore. A review of the 1980 Census of Housing indicated that there were approximately 96,900 seasonal homes in the 87 municipalities that comprise the study area. The inventory of seasonal housing units showed, as expected, that the total units and their proportion of the total municipal housing stock were highest in those muncipalities contained in the northern and southern shorefront seasonal subregions.

There is an additional economic significance to this heavy reliance on seasonal homes, apart from the direct expenditures of tourists staying in these structures. The owners of these buildings purchase significant amounts of materials, supplies, and services from the local economy to maintain their property. These purchases supply an additional positive economic impact to the shorefront economy.

Table 1 presented an inventory of visitors to the 87 municipalities that comprise the study area. These figures were presented by the four accommodation types and for day parties. (The day party figures are presented in person-days; multiply by three to obtain the total number of day party person-trips into a municipality). A general pattern is noticeable in that the proportion of total person-days within a given shorefront municipality accounted for by overnight visitors becomes increasingly important as one proceeds down the coast from Monmouth County to Cape May County. In particular, the importance of seasonal homes, hotels and motels, and campgrounds to the economies of these south Jersey oceanfront municipalities becomes much more significant. The majority of the campgrounds found along the shorefront area are located in Cape May County.

The final step prior to estimating the statewide economic impact of shorefront tourism was to estimate the different expenditure patterns of visitors by the four accommodation types and for day visitors. The magnitude and composition of tourist expenditures vary according to the type of accommodation and by the type of activity tourists engage in. The per capita expenditures of overnight visitors are much higher than those for day visitors due to expenditures for lodging, entertainment, and meals. The same number of total overnight visitor person-days will have a larger economic impact on the local and state economy than will the same number of day visitors person-days. In addition, expenditures in different economic sectors have differing economic "multiplier" benefits in terms of the additional income and employment generated by these expenditures. Therefore, accurate estimates of the economic impact on local and state economies of tourist expenditures areas must take into account the types of goods and services purchased by visitors.

Total New Jersey traveler expenditure figures and average expenditure figures by visitor type were obtained from the United States Travel Data Center's Travel Economic Impact Model (TEIM). The TEIM model incorporates data from the 1981 National Travel Survey, supplemented by additional survey data obtained by the U. S. Travel Data Center. In addition, TEIM also uses information obtained from the 1977 Business Census conducted by the U. S. Department of Commerce. The TEIM model estimated that during 1981, total traveler expenditures in New Jersey (excluding business travelers) were \$3.979 billion for persons traveling more than 100 miles. Of this total, TEIM estimated that \$2.558 billion were produced by visitors to the New Jersey shore (i.e., this figure does not include the expenditures of day visitors).

Table 3 (U. S. Travel Data Center Average Expenditure Per Visitor-Day) presents the U. S. Travel Data Center's estimates on average expenditure per visitor-day by type of overnight accommodation. These expenditure figures are presented for the seven Standard Industrial Classification (SIC) codes that receive the majority of tourist's direct expenditures. Table 3 confirms the higher per capita expenditure figures for overnight visitors.

The above expenditures produced by tourists were made according to survey data based on the type of recreational goods or services purchased. These amounts were then allocated to the SIC codes noted above. Expenditure statistics, such as those collected during the economic censuses conducted every five years, are collected on the basis of receipts of business establishments. The establishments are in turn classified according their SIC code. This study compared the survey-based tourist expenditure data with the business establishment receipt data from the economic census (all comparisons were made in constant 1982 dollars). This comparison was taken to provide an independent verification of the survey-based data.

The result of this study indicated that in 1982, non-business visitors to New Jersey's shorefront area accounted for \$4.87 billion in direct expenditures for recreational goods and services. These expenditures occurred primarily in the retail and service sectors. This figure includes \$850 million at hotel and motels, over \$850 million at eating and drinking places, and \$1.5 for gambling and casino-related activities. The total value added to the New Jersey economy as a result of these expenditures was estimated to be \$4.032 billion by the Regional Science Research Institute. Value added is defined as the value contributed to a product or an industry by a region's inputs, rather than the total value of the sales of the product or industry. The major portion of value added is wages, with the remainder coming from profits, interest, rent, taxes, and other items.

The Regional Science Research Institute's Input/Output model for New Jersey estimates that 225,000 man-years of employment are generated by the direct tourist expenditures of \$4.87 billion. The tourism industry, being concentrated primarily in the retail and service sectors, is a very labor-intensive industry. This results in a large number of jobs per dollar of direct expenditure within these economic sectors. However, it should also be noted that jobs in the tourism industry are lower paying than those in other sectors (e.g., manufacturing, transportation, etc.). In addition, many of the jobs in the tourism industry last only for the

Table 3. U.S. Travel Data Center Average Expenditure per Visitor-Day

Industry category (SIC)	Type of overnight accommodation				
	Seasonal home[1]	Hotel/ motel	Campsite	Friends/ relatives	Day visitor[4]
1. Gasoline service station (554)	$ 1.42	$ 1.94	$ 1.55	$ 2.24	$ 3.65
2. Auto rental (7512)	0.00	0.38	0.00	0.00	0.00
3. Hotels, motels and motor hotels (701)[2]	0.00	17.00	0.00	0.00	0.00
4. Campgrounds and trailor parks (703)	0.00	0.00	3.52	0.00	0.00
5. Eating and drinking places (58)[5]	15.44	22.06	15.44	14.34	5.52
6. Amusement, recreation services (79)[3]	5.10	5.10	5.10	5.10	2.55
7. General retail trade (53,59)	5.10	5.10	5.10	5.10	2.55
8. Total	$27.06	$51.58	$30.71	$26.78	$14.27

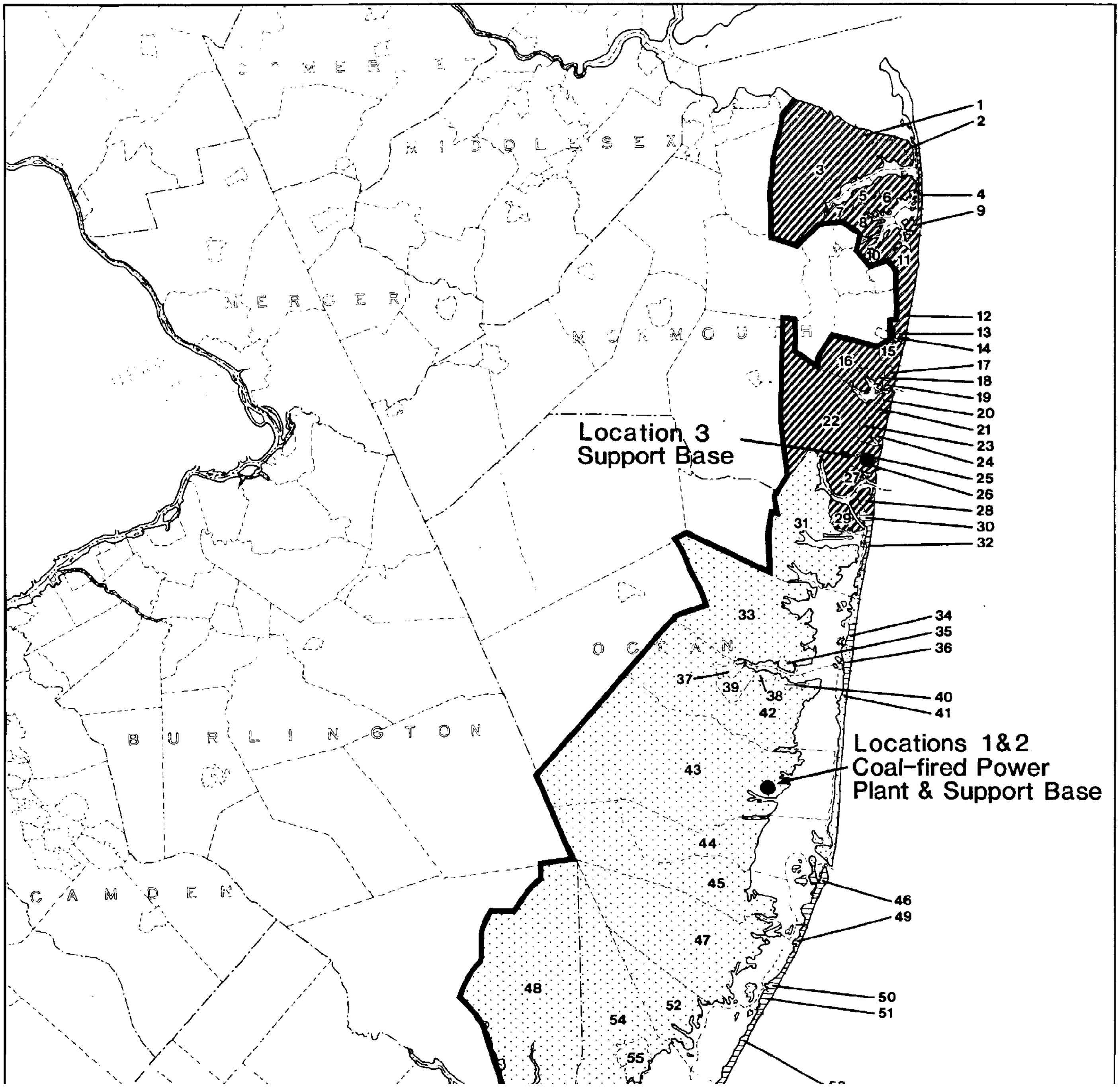
[1]Does not include payments for rented seasonal homes. These would be comparable to hotel/motel lodging expenditures multiplied by 0.5.

[2]Includes spending for lodging only in hotels and motels.

[3]Does not include visitor gaming losses.

[4]Expenditure per eight hour average length of stay.

[5]Includes spending for groceries and package liquor reported by respondents as general eating and drinking expenditures.



STUDY AREA MUNICIPALITIES

1. Atlantic Highlands Borough
2. Highlands Borough
3. Middletown Township
4. Sea Bright Borough
5. Fair Haven Borough
6. Rumson Borough
7. Red Bank Borough
8. Little Silver Borough
9. Monmouth Beach Borough
10. Oceanport Borough
11. Long Branch City
12. Deal Borough
13. Allenhurst Borough
14. Loch Arbour Village
15. Asbury Park City
16. Neptune Township
17. Bradley Beach Borough
18. Neptune City
19. Avon-by-the-Sea Borough
20. Belmar Borough
21. South Belmar Borough
22. Wall Township
23. Spring Lake Heights Borough
24. Spring Lake Borough
25. Sea Girt Borough
26. Manasquan Borough
27. Brielle Borough
28. Point Pleasant Beach Borough
29. Point Pleasant Borough
30. Bay Head Borough
31. Brick Township
32. Mantoloking Borough
33. Dover Township
34. Lavallette Borough
35. Island Heights Borough
36. Seaside Heights Borough
37. South Toms River Borough
38. Pine Beach Borough
39. Beachwood Borough
40. Ocean Gate Borough
41. Seaside Park Borough
42. Berkeley Township
43. Lacey Township
44. Ocean Township
45. Barnegat Township (Union)
46. Barnegat Light Borough
47. Stafford Township
48. Bass River Township

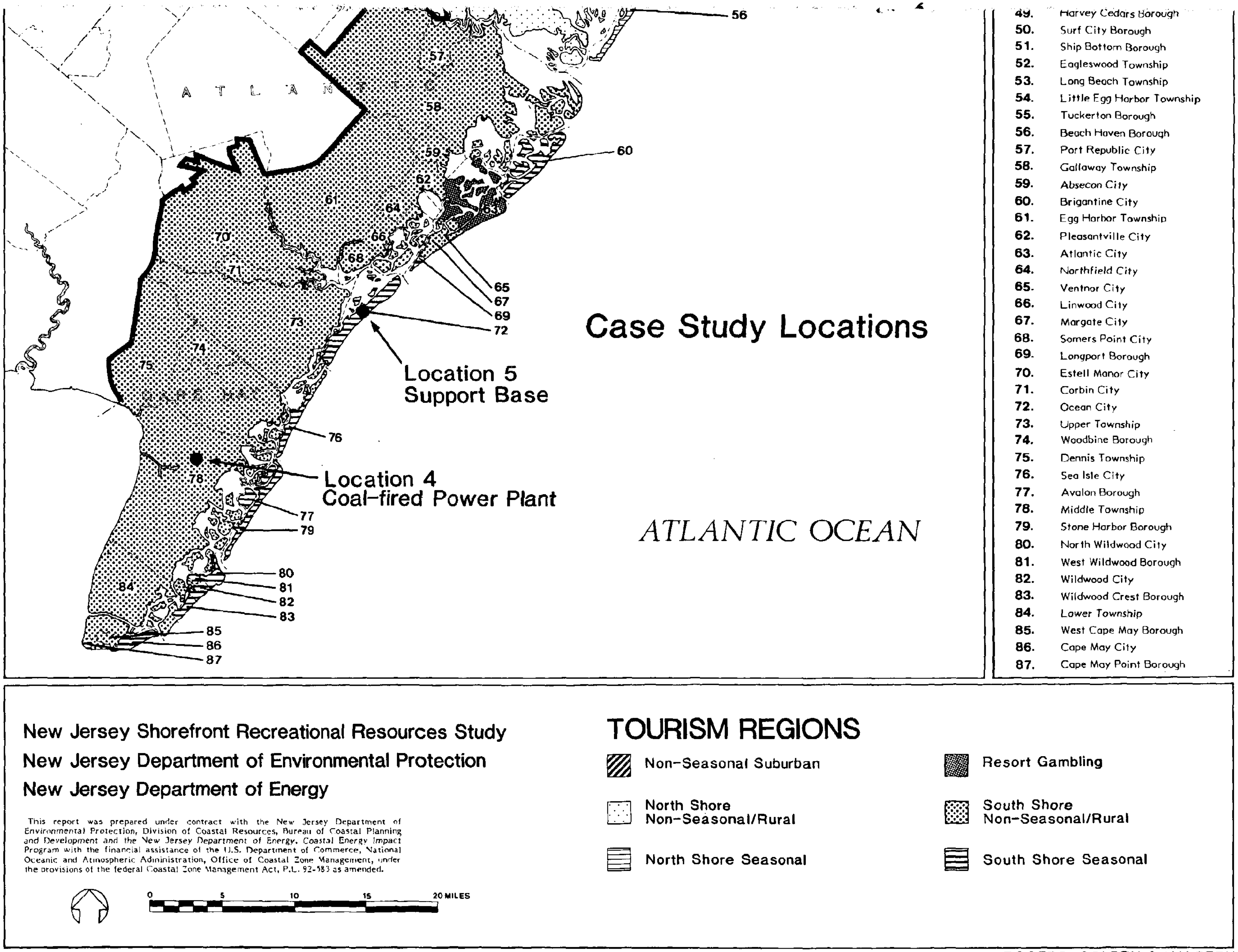


Figure 1. Map of New Jersey Coastal Municipalities

ROGERS, GOLDEN & HALPERN

duration of the summer season. Thus, 225,000 man-years of labor likely represents many more people working full time during the summer months than during the remainder of the year.

As a basis of comparison, during 1982 average resident employment in New Jersey was approximately 3.3 million persons. Thus, the total man-years of labor generated by the tourism industry was about 6.8 percent of the state's average resident employment.

7. ENVIRONMENTAL IMPACTS OF ENERGY FACILITIES AS CONFLICTING USES

The construction, operation, and possible malfunction of an energy facility produce a specific array of direct and indirect environmental impacts. These environmental effects differ according to timing (construction versus operation phases), duration (short term versus long term), and magnitude. Different environmental impacts then produce varying responses by tourists, which in turn result in different economic impacts as shorefront visitors shift their consumption patterns for recreational goods and services (i.e., decide to visit another beach). Bathers may permanently switch to another beach due to the permanent visual intrusion of a power plant's cooling tower. Conversely, increases in turbidity produced by dredging may only result in bathers staying away from an affected beachfront area for one season.

The study presents the direct environmental changes associated with the development of each of the fifteen energy facilities through a facility impact assessment matrix. Figure 3 presents the facility impact assessment matrix for a coal-fired power plant. The first step in constructing each facility's matrix was to determine the specific on-site activities that accompany the site preparation, construction, operation, and malfunction of each facility type. On-site activities include surface grading, soil compaction, liquid waste disposal, and vehicular operation. Dots were used to indicate which on-site activities occur during each of the three phases, and in the event of a plant malfunction. It was assumed that the activities accompanying each facility's development were those that would be required if the facility were developed on a typically suitable site. Thus, it was also assumed that extraordinary or unique engineering measures designed to correct for site deficiencies would not be required.

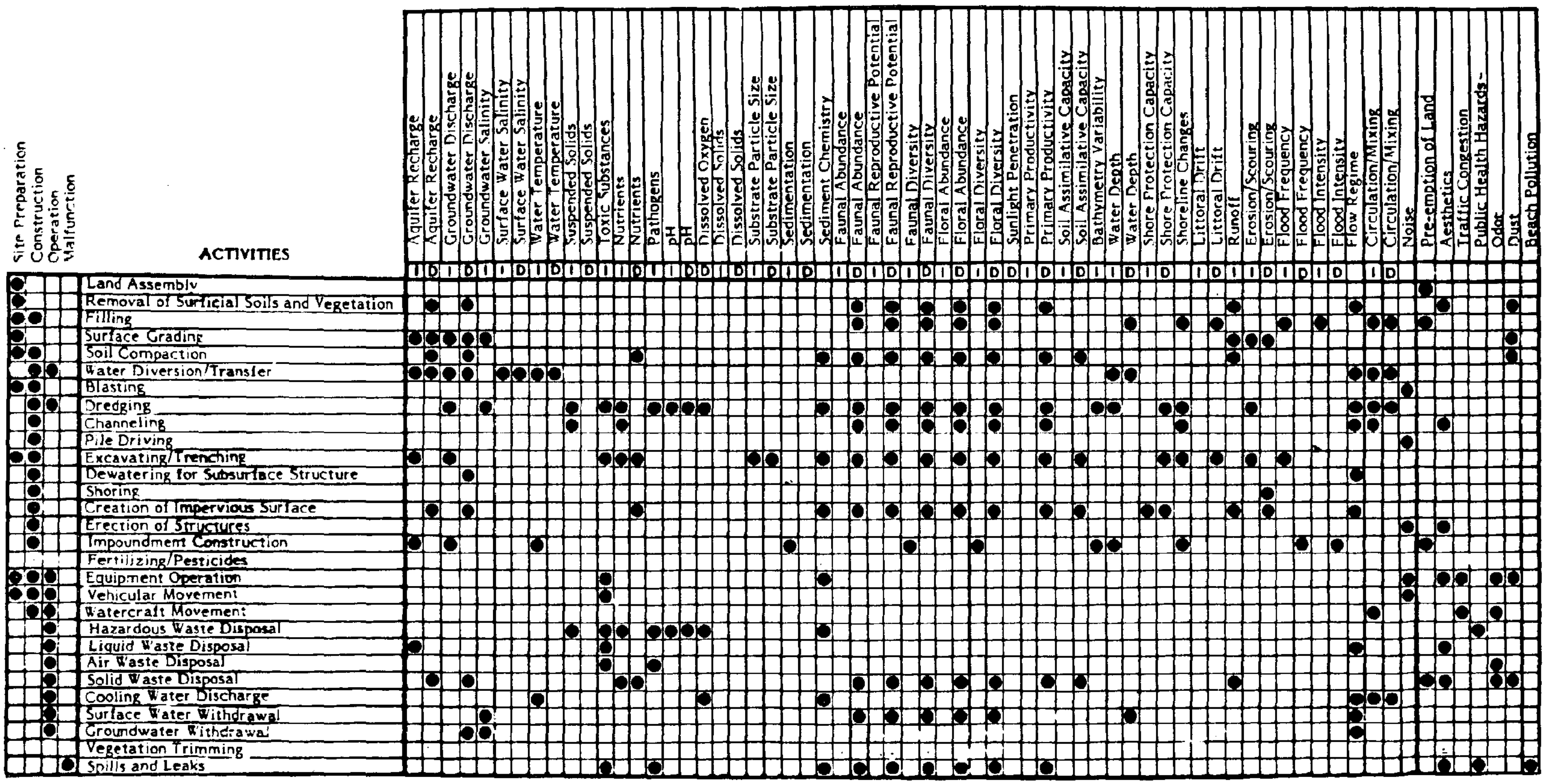
Second, the types of direct environmental changes that accompany a specific activity were determined and shown on the matrix. As an example, cooling water discharge from a power plant can result in an increase in water temperature or a decrease in dissolved oxygen concentration, and can produce a change in the

Figure 3. Facility Impact Assessment Matrix

FACILITY IMPACT ASSESSMENT MATRIX

ACTIVITIES - DIRECT CHANGE CATEGORIES

Coal-fired Power Plant



mixing pattern of the receiving body of water. A dot was placed in a cell to indicate when an activity causes a specific direct environmental change.

The categories of direct environmental changes used in the matrices were the same as those contained in the Estuarine Study (Division of Coastal Resources, 1979). This was done to ensure compatibility between the tourism study and the Division's other coastal planning tools. The indirect environmental effects associated with direct environmental effects shown in the facility impact assessment matrices are presented in the Estuarine Study. Seven additional direct change categories were added to each matrix to account for changes that were either not considered in the estuarine study (Wapora, 1980), or that can directly affect the quantity or quality of a recreational resource.

The next step in the analysis was to classify the environmental changes into types of changes in recreational resources that could be perceived by tourists and would result in changes in the amount and location of recreational resources being consumed. The emphasis here is on the level and type of environmental effects that are perceived by tourists to diminish or deplete the amount or quality of recreational resources they are currently using. A decrease in recreational resource quality can mean a direct impact, such as an oil spill on a beach, or a potential impact, such as the introduction of hazardous materials in an area where unplanned release could endanger human health.

The direct environmental changes were grouped into six main categories of perceived losses in the quality of recreational resources that can produce a tourist reaction. The six types of perceived losses in the quality of recreational resources, and the accompanying direct changes that comprise them are presented in Table 4. Threshold descriptions indicating perceivable levels and examples using specific types of energy facilities were developed for the direct changes listed under each category. As an example, a decrease in the number of previously present indigenous animal species by more than 20 percent was defined as one way of producing a loss of quality or degree of recreational opportunity.

The last step in assessing environmentally produced changes in tourism patterns due to energy facility development was to produce an environmental change schedule for each energy facility type. These schedules indicate the estimated probability of occurrence of the six categories of quality losses in recreational resource over an eleven-year period. The same type of direct environmental changes can have a different probability of occurrence for two different types of energy facilities. These probabilities must be considered when estimating the potential impacts on tourism. A period of eleven years was chosen to accommodate the construction period of longest duration--ten years for a nuclear power plant--and to allow one year for its actual operation.

Table 4. Categories of Perceived Loss of Quality in Recreational Resources

Loss of access to recreational resource
- Pre-emption of land

Loss in quality or degree of recreation opportunity
- Formal abundance
- Formal diversity
- Water depth
- Shoreline changes
- Traffic congestion

Lowering of other aesthetic qualities
- Noise
- Odor

Lowering of visual quality
- Turbidity
- Dust
- Surface coverage
- Aesthetics - minor visual intrusion on the oceanfront
- Aesthetics - minor visual intrusion not on the oceanfront
- Aesthetics - major visual intrusion on the oceanfront

Introduction of a hazard to public health, safety, or the environment
- Toxic substances
- Pathogens
- Hazardous substances

Temporary loss of access to recreational resource due to pollution
- Pre-emption by pollution

When assigning the probabilities of environmental change, it was assumed that each individual energy facility would be located in the areas where suitable sites are most commonly encountered. This assumption was necessary for the development of prototype profiles of losses in the quality or quantity of recreational resources by facility type. If a proposed facility is being considered for a site with a unique environmental condition, then particular attention should be given to deriving an appropriate environmental change schedule from information contained in the Estuarine Study.

An example of the above assumption can be found in the environmental change probabilities for a gas separation and dehydration plant. They were based on the premise that it would most likely be placed adjacent to a back bay along the mainland shorefront. It is highly unlikely that this facility would be located on any of the barrier islands. Thus, the probability of such a facility causing a lowering of visual quality due to the presence of a major visual intrusion on the oceanfront was estimated to be low.

8. SOCIAL AND ECONOMIC IMPACTS

The magnitude and composition of the direct and indirect impacts that accompany the construction and operation of a major energy facility are generated by the interactions between the energy facility, the natural environment, the local economy, the tourists, and the local social system. These subsystems are highly interrelated, and a change in one produces impacts and accompanying adaptions in the other systems. The magnitude of the change introduced by the development of an energy facility is often sufficient to produce permanent changes in all of the other subsystems. This can result in a new equilibrium among the various systems within an impacted coastal community.

The social and economic impacts consist of a mixture of quantitative and qualitative impacts. Some of the socioeconomic impacts (i.e., changes in employment and population, diversion of tourists, impact on local taxes and expenditures, etc.) can be expressed by a quantitative estimate that expresses the magnitude and composition of the impact. In addition, such quantitative estimates are also based on an accurate understanding of the factors and accompanying causal sequences that produce these impacts. Conversely, other impacts (i.e., effect on community cohesion, diversion of tourists, changes in community values and goals, etc.) are either expressed in a manner that is not quantifiable, or are the result of the complex interaction of many factors such that the causal sequence is difficult to capture within a modeling framework. The CTRM includes both types of socioeconomic impacts.

The usefulness in quantifying impacts where possible is that the ease and flexibility in analyzing different scenarios through the model are enhanced. Quantitative estimates are less likely to be given varying, subjective interpretations when it is known that they are based on theoretically sound relationships, and were generated using an accepted, accurate data base. Conversely, qualitative estimates are more desirable when a quantitative estimate is either not possible, or abstracts so far from reality that it cannot be given a meaningful interpretation. A qualitative assessment that discusses the potential composition, range, and magnitude of the socioeconomic impacts is useful for delineating the issues that have to be considered by policy makers.

Many of the impacts produced by the interaction of the various subsystems are non-quantitative in nature, or are produced by such a complex interaction of factors that they cannot be easily modeled. A tourist's response to a perceived change in the quality of a recreational resource or a community's character is difficult to accurately attribute to a precise number of factors in a consistent format (i.e., in an equation). Differences in the type of tourist (i.e., accommodation, activity), the nature of the impacted recreational resource, and the type of direct environmental effect will all change the tourist's response from one situation to another.

There are a number of the non-quantifiable socioeconomic impacts that result from the development of an energy facility and the resulting interactions that occur among the five subsystems noted above. These impacts were determined through interviews with planners in each of the four counties, and through a review of the literature of previous impact assessments in other areas. These discussions are conceptual in nature, and are intended to provide a frame of reference for the model user within which to consider the quantitative impacts estimated by the CTRM. The significant impacts of energy facilities on various community aspects are summarized below.

The close ties between the tourism sector, the environment, and other aspects in the New Jersey shore communities cause changes in one component to affect the entire community. The aspects of community concern include: employment, income, population, housing demand, property values, government service, tax revenues, public expenditure requirements, as well as quality of life, community cohesion, social fabric, and welfare of the community.

The direct changes in income, employment, and population will cause indirect impacts on social structure and public services, and will generate social problems affecting the community's welfare. All these impacts will generate some community response. Such response might be a decision for change or a gradual adaptation of the community to the new situation. The intrusion of exogenous factors compounds the problem of attributing measured effects to causes.

Building a complete profile of the community is the first step toward assessing social impacts. The municipal data base (Appendix I) presents a detailed socioeconomic profile of the municipality in the study. The second step includes an analysis of possible impacts with primary and secondary, short- and long-term implications. The third step consists of an analysis of options available for avoiding negative impacts and trade-offs, and the last step includes suggestions for mitigating the effects of unavoidable adverse impacts.

There are a variety of likely community impacts that may result from the introduction of an energy facility. The interpretation of these impacts as beneficial or adverse for the community depends upon the factors already mentioned. The siting of an energy facility, generating new jobs next to a small, exclusive summer resort, can only be viewed as detrimental by the community. The crowding, traffic congestion, and noise will be the most noticeable results. The same energy facility may be welcomed in communities with high unemployment.

While the economic impacts of the construction and operation of an energy facility are traceable, there is a great deal of uncertainty, speculation, and fear concerning the effect of mishaps at energy-related facilities. The available evidence for this sort of event are fragmented, circumstantial, and controversial. One accident that was studied extensively occurred in 1979 at the Three Mile Island nuclear power plant in Middletown, Pennsylvania. Another source of energy malfunctions are offshore oil wells. The most applicable example here is the Santa Barbara oil blowout which occurred in 1969. In both instances, there were short-term, significant declines in tourism activities (i.e., declines in retail sales, sales and occupancy taxes, bookings, etc.). In the Santa Barbara incident, the changes in the level of tourism at the county level was negligible. In the long run, after several years, tourism levels began to approach pre-accident levels in both areas.

Specifying the sequence between direct environmental effects produced by a facility's development, and a tourist's response to changes in the quality of a recreational resource was necessary in constructing the CTRM. The Division of Coastal Resources' objectives could only be met by developing an analytic tool capable of estimating different tourist responses as a function of the specific array of direct environmental effects produced by a facility, by the environmental quality of affected resources, and by the type of tourist. Therefore, a "delphi" procedure employing hypothetical development scenarios, and using the perceptions of knowledgeable providers of recreational goods and services was used to quantify these relationships.

In order to incorporate the response of tourists to a loss of recreational resources, the CTRM uses the results of the "delphi" session that brought together fifteen experts on the social and economic activity at the New Jersey shore. Together, the fifteen considered a series of complex, hypothetical situations, in which prototype energy facilities were placed in selected shorefront municipalities. The experts represented both public and private interests. Among them were a realtor, an owner of a restaurant near the shore, an electrical utility official, a New Jersey university professor of psychology who specializes in tourist behavior, members of the planning boards of both Ocean and Monmouth Counties, an official from the Atlantic County Division of Economic Development, the director of the public relations department of a shorefront municipality, and five professional planners--four from the State's Department of Environmental Protection and one from the Coastal Energy Impact Program of the Department of Energy. The meeting was formally structured to achieve a group estimation. Workshop participants responded both before and after group discussion to a lengthy questionnaire that contained a series of questions about a cross-section of the possible facility-visitor-context situations.

Four municipalities were used in the questionnaire to exemplify the local contexts for the experts. None of them has been under active consideration as a potential energy facility site; rather, they were used as prototypes in terms of landform, recreational resources and uses, level of development and municipal finances, and other social and economic factors.

In the questions, each municipality was fully described, and visitors' accommodation types and principal activities were provided. A possible environmental change or a combination of changes and the duration of the impact was postulated in each question group. The experts were then asked to make their estimates, usually as a percentage of visitors diverted.

The estimates the panel collectively produced varied markedly according the different situations given in the questionnaire. For instance, the questionnaire posed a northern shore, year-round, rural community in Ocean County that would experience a change in the visual quality of the oceanfront (i.e., two 400-foot smokestacks). For visitors to seasonal homes who were principally concerned with bay-related outdoor recreation, the experts' median estimate of people diverted away from the shore the first year was 6 percent. This estimate jumped to 30 percent when the visual quality was combined with loss of access to recreational resources and increased noise levels.

The panel was asked to consider the number of visitors who might be lost from a densely settled commuter suburb in Monmouth County. They were asked to consider visitors accommodated in seasonal homes whose principal activity was to enjoy shorefront entertainment. For an environmental change of the magnitude of a 10,000-barrel oil spill covering 2,500 acres of water, the estimators thought that 35 percent would be diverted. For the same type of visitors, the panel estimated that 20 percent of seasonal home visitors would be diverted by a major visual intrusion on the oceanfront.

A pair of estimates about a seasonal community on Cape May County's southern shore concerned visitors in two different types of accommodations. Both groups were interested in shorefront recreation, but access to these resources was pre-empted by pollution. For visitors staying in hotels, motels, or inns, the panel estimated that 75 percent would be diverted. But for visitors accommodated in a seasonal home, only 40 percent would be lost.

When incorporated into the CTRM, the individual panel estimates work together to estimate the diversion and loss of traveler activity in response to loss of recreational resources. The questionnaires produced response coefficients that were linked to the six types of losses of quality in recreational resources. These predict the loss in tourism (by accommodation and activity classes) for facility-induced environmental impacts occurring in different community types.

Finally, the CTRM produces a number of quantifiable estimates of socioeconomic impacts. As noted above, these are performed when data availability and theoretical considerations make such estimates feasible. The types of quantifiable socioeconomic estimates are explained in the following section discussing the CTRM's components in more detail.

9. CASE STUDY SUMMARY

The case studies were hypothetical situations in which prototype facilities were proposed for selected municipalities. The purpose of the case studies was to, first, test and demonstrate the various analyses carried out by the CTRM. Secondly, they indicate the range of impacts that can result when the same facilities are located in different sites or when different facilities are located in the same site. Third, and perhaps most important, these case studies test the underlying principle of the model: that tourist response is not only a necessary variable for a thorough assessment of energy facility impacts, it is a factor of paramount importance to planners and policy analysts who must weigh the pros and cons of competing activities.

Selection of the five case study locations was based on placing these facilities in the particular municipalities that are representative of locations where these facilities could feasibly be located. However, these case studies should in no way be construed as an assessment or review of actual development plans for the sites. The following cases were chosen for illustration (see map, Figure 1):

Case Study 1	Lacey Township, Ocean County Coal-fired power plant
Case Study 2	Lacey Township, Ocean County Support base
Case Study 3	Manasquan Township, Monmouth County Support base
Case Study 4	Middle Township, Cape May County Coal-fired power plant
Case Study 5	Ocean City, Cape May County Support base

The "proposed" energy facility used in case studies one and four was a 500 megawatt unit with a total capital cost of $468.8 million to be constructed over a five year period. The facility would use a closed cooling system, minimizing the need for water from the adjacent bays. Coal is anticipated to arrive at the plant site by rail, though the site's bay frontage would permit installation of large unloading equipment, should it become desirable.

The "proposed" energy facility used in case studies two, three, and five was a support base. It was assumed to have 20 berths for supply boats for use during the exploration phase of Outer Continental Shelf development. It would become a permanent base to support development and production activities once initial exploration is completed. The base would require approximately 1,400 feet of wharf along the adjacent bay. Some dredging would be required along the bayfront to accommodate supply boats. The total capital cost is expected to be $30 million over a construction period of one year.

Case Study Comparison

Tables 5a and 5b, entitled Comparison of Case Study Indicators, summarize some of the essential statistics produced by each of the five case studies. Also included are visitor expenditure and enumeration data for the selected municipalities. To simplify the analysis across the eleven years evaluated, figures are taken from the year of peak construction expenditures and the second year of facility operation.

The social and economic impacts of the facilities vary considerably depending upon the scale of the facility and the level of tourist activity at the plant location. Given certain combinations of facility purchases, facility employment, facility impact on recreational resources, and the level of tourist activity, employment losses are substantial in New Jersey and even greater in the shorefront study area. Furthermore, there are particularly severe repercussions on employment and sales in the local tourism industry establishments. The percentage and magnitude of receipts and value added lost in some economic sectors will result in hardship for many individuals. Although the net employment impact may be positive, many jobs in local tourism industry establishments will be eliminated. Some of them will be employed in nearby municipalities which absorb a percentage of the diverted tourism trade. Few of the remaining unemployed will be suited for employment in the manual construction and plant operation jobs which are created.

Additionally, the case studies demonstrated that some types of facility-related impacts are not of major concern for the New Jersey shorefront. The densely-settled shorefront, with its abundant supply of second and seasonal homes, can support the labor requirements of facility and operation with little adverse effect. Because of the proximity of the two large urban centers, New York and Philadelphia, and the generally high population density of New Jersey, relatively few families will migrate to the plant location. In general, then, there are minimal adverse impacts on municipal finances and housing demand.

The case studies also identified several factors that, though part of the calculation of lost tourism, do not cause dramatic

Table 5a. Comparison of Case Study Indicators

Measure	Unit	Case Study Number 1	2	3	4	5
Municipality Map Number		43	43	26	78	72
Annual Expenditures of all Travelers to Municipality Excluding Gambling and Home Rental	million dollars	22.9	22.9	16.7	72.4	170.9
Local Tourism Industry Final Demand Loss (T14)						
Construction Year	million dollars	7.832	5.600	4.986	32.259	44.385
Operation Year	million dollars	7.065	5.852	5.105	29.084	41.471
Proportion of Traveler Expenditures Diverted from the Municipality						
Construction Year	percent of dollars	34	24	30	45	26
Operation Year	percent of dollars	31	26	31	40	24
Major Tourism Industry Establishment Receipts for the Municipality (Eating, Lodging, Amus.)	million dollars	8.9	8.9	5.6	16.5	27.5
Local Tourism Industry Loss for Eating, Lodging and Amusement Firms (Lines 3-6 T14)						
Construction Year	million dollars	3.959	2.832	2.548	19.971	22.345
Operation Year	million dollars	3.536	2.872	2.467	13.799	20.270
Proportion of Primary Tourism Industry Receipts Diverted						
Construction Year	percent of dollars	44	32	46	121	81
Operation Year	percent of dollars	40	32	44	84	74
Value Lost by Seasonal Home Owners (T13)						
Construction Year	million dollars	1.644	1.179	0.997	1.280	10.577
Operation Year	million dollars	1.506	1.361	1.152	1.212	10.495
Employment Impact for New Jersey (T20)						
Construction Year	person-years	2720	211	214	2466	-201
Operation Year	person-years	157	183	188	-68	-188
Value Added Impact on New Jersey (T20)						
Construction Year	million dollars	76.102	6.829	6.883	71.746	-0.607
Operation Year	million dollars	10.890	6.471	6.555	7.036	-0.272
Employment Impact for New Jersey due to Tourist Response Only						
Construction Year	person-years	-74	-55	-53	-329	-467
Operation Year	person-years	-67	-60	-55	-292	-431

Table 5b. Comparison of Case Study Indicators

Measure	Unit	Case Study Number				
		1	2	3	4	5
Municipality Map Number		43	43	26	78	72
Facility Type		10	1	1	10	1
Annual Facility Capital Expenditures (T3)	million dollars	215.6	30.0	30.0	215.6	30.0
Total Annual Facility Employment (T3)						
Construction Year	person-years	1361	47	47	1361	47
Operation Year		102	100	100	102	100
Annual Tourism in Municipality	visitor-days	727341	727341	511004	1995196	5223458
Municipality Proportion of all visitor-Days in Shorefront Study Area	percent	0.94	0.94	0.66	2.59	6.78
Tourism Diverted from the Municipality (T9)						
Construction Year	visitor-days	239464	171301	150118	871297	1346324
Operation Year		217552	186117	160522	795971	1286543
Proportion of All Tourism Lost from the Municipality						
Construction Year	percent of visitor-days	32.92	23.55	29.38	43.67	25.77
Operation Year		29.91	25.59	31.41	39.89	24.63

differences among the case studies. Expenditures per person-day vary according to visitor accommodation, but differences in the profile of expenditure and the proportion of visitors in certain accommodations are relatively small. Similarly, the facilities differ in their effects on the environment. Visitor response to changes in the quantity and quality of recreational resources varies considerably between the types of resources affected (shorefront versus bay-water) and from tourism region to tourism region (northern year-round versus southern seasonal community). However, this form of variation is small relative to differences in the number of visitor person-days from municipality to municipality. A notable exception to this conclusion is the response of visitors to a temporary environmental event such as an oil spill. Depending upon the season of the occurrence, an oil spill in an area of moderate to high level of tourist activity could result in severe social and economic impact.

One key indicator recorded in the table is the number of tourists diverted from the environmentally affected municipality. The loss of expenditures associated with these tourists (i.e., tourism industry final demand loss) adversely affects the local economy. By looking at the number of tourists lost as a fraction of total annual tourism, and the change in final demand as a fraction of the total annual tourist expenditure, the severity of the impact can be gauged.

During the peak construction year of a support base in Lacey Township (case study #2), over 171,000 visitor-days, or almost 24 percent of the total tourism in the municipality, will be diverted to another location. The absence of expenditures by these tourists will result in an approximately $5.6 million loss in tourism industry final demand. Over $2.8 million of this loss takes place in establishments closely related to the tourism industry for which travelers report their expenditures for lodging, eating and drinking, and amusement. This expenditure is a considerable proportion (32 percent) of the $8.9 million in receipts reported by firms within the municipality in primary tourism industry economic sectors which include lodging, eating, drinking, and amusement. This proportion somewhat overstates the scale of impact, both because visitor expenditures for these items correspond to receipts in a broader range of economic sectors than the totaled sectors, and because travelers lodged in Lacey Township spend money in other nearby municipalities offering other recreational services. Of course, this net local impact is more adverse than the net regional and state level impacts because many of the travelers diverted from the municipality are received by other shorefront municipalities for their vacation, reducing the net loss from all municipalities.

Of the five cases shown, the absolute impact on the local tourist economy is greatest in Case #5, support base in Ocean City. While the percentage of tourists diverted from the total in this municipality may be relatively small compared to the rest of the other case studies, the sheer magnitude of the tourism economy (totaling 5.2 million visitor-days or 6.8 percent of total visitor-days at the shorefront) means that the overall impact on Ocean City will be substantial. This is true both in terms of the actual amount of tourists lost (1.3 million visitor-days in the peak construction year and 1.3 million during a typical operation year) and the effect on local economic activity ($44 million and $41 million lost during peak construction and annual operation, respectively). These figures and those for other case studies in the table indicate the correlation between large adverse impacts and those areas along the shorefront where seasonal tourism is most active.

Of the five case studies, the greatest percentage of loss to the tourism industry would occur in Case Study #4, coal-fired power plant in Middle Township. During construction, over half of tourism industry receipts would be lost in the municipality. This would most severely affect restaurants, motels, and similar tourism-dependent establishments. Middle Township incurs these relatively heavy losses because it contains a higher percentage of visitors in hotels and motels than the other municipalities. The dollar loss for the local economy associated with a visitor-day of a traveler lodged in a hotel or motel is almost twice that of a visitor-day of a seasonal home occupant ($54 as opposed to $28 in 1982).

Another useful indicator of a facility's impact is the loss or gain in the employment of residents in the state. For coal-fired power plants, 1,361 person-years of employment are directly created by the construction of the plant during the peak year and 102 person-years are generated during each year of operation. For the support base, 47 person-years are required for its construction and 100 person-years are created for annual operation. However, the net employment effect of a facility includes not only the direct, but also the indirect and induced employment generated by facility construction and operation, and the overall job losses due to the loss of tourism in the state.

As shown in Table 5a, the two coal-fired power plants result in a fairly close gain in state-wide employment during the peak construction year (2,720 person-years in Case Study #1 and 2,466 in Case Study #4). During the operation year, however, the impacts are considerably different. In Lacey Township, the operation of the plant would result in a net addition of 157 person-years of employment. In Middle Township, the operation of the same plant results in a net loss of 68 person-years of employment annually. It is noteworthy that of the two townships, Middle's tourist activity represents 2.6 percent of total shorefront tourism, while Lacey's tourist activity accounts for only .95 percent. Furthermore, local tourism amounts to about 2.0 million visitor-days in Middle compared to 730,000 visitor-days in Lacey.

Alternative use of model programs to produce separate analyses of the impact of first the facility and secondly the response of travelers to change in environmental resource sheds light on the origin of impact. Due to its greater scale, the coal-fired facility results in more employment than does the support base, generating 2,720 person-years of employment in year three due to direct purchases and employment. This pattern is fixed because change of location within the coastal area will have little impact on the make-up of suppliers or the number of non-local (i.e., out of the study area) employees hired.

The municipal location does cause change in the loss due to tourist response. Operation of a support base in Ocean City would cause a net loss of 431 person-years of employment, seven times the loss associated with location in Lacey Township. The scale of the loss associated with tourist response is offset in most of the case studies with a gain associated with facility activities. However, the gain and loss occur in largely different sectors of the economy. Social strain of unemployment will occur for some residents even though employment may gain across most sectors of the economy. The bulk of the adverse impact is on persons employed in tourism-related sectors. It is greatest in Case Study #5, first, because more visitors are located there and, secondly, because these visitors are a bit more responsive to loss in recreational resources. As evidenced in differences between Case Study #1 and Case Study #2, the extent of environmental change is also a secondary influence.

From the comparison table of the five case studies it can be seen that value added results differ according to the location of the facility. During the peak construction year of a coal-fired plant, the value added figures for the Lacey Township and Middle Township cases are fairly close at $76 million and $72 million, respectively. During the operation phase, however, Lacey Township experiences an increase of almost $11 million in value added, while the increase in Middle Township is only $6.6 million. These operation year differences are attributable to the difference in tourist activity in each municipality (greater tourism loss in Middle Township) and to the presence of more suppliers of goods and services needed by the power plant in and around Lacey Township.

Case Studies #2 and #3, Lacey Borough in Ocean County and Manasquan Borough in Monmouth County, end up with $6.8 million and $6.9 million in value added to the state economy during the construction year, respectively. During the operation year, value added amounts to $6.5 million and $6.6 million apiece. Though Lacey accounts for more of the total shorefront tourism than does Manasquan, both receive less than 1 percent of the total. In contrast, Ocean City, which accounts for 6.8 percent of the total shorefront tourism, generates an overall decrease in value added in the state. There is a $600,000 decrease during the construction year and a $270,000 loss during annual operation. Thus, the loss of tourist expenditures more than outweighs the positive economic impacts generated by the support base's need for labor and material inputs.

In addition to the five case studies, a model analysis was performed on a hypothetical oil spill creating a significant perceivable impact for June and July on the beach of Ocean City, Cape May County. These months contain 42 percent of visitor activity. This analysis considers only the loss of economic activity associated with visitor response. The results indicate that an oil spill would cause serious losses whose impact would last over time unless addressed by actions such as advertisement or lower rental rates. The analysis also points to the importance of the time when the oil spill occurs.

The occurrence would result in immediate diversion of 800,000 visitor-days from Ocean City, and a final demand loss to Ocean City's tourism sector of $28.5 million in potential receipts. Two years later, 34 percent of the visitors diverted still will not be replaced. The tourism industry final demand loss would equal $5.7 million during the year of the spill in the four county shorefront study area. The oil spill would result in the losses of 230 person-years of employment and $4.1 million of value added in the year of the impact to the State's economy. Further, the two-month event would result in a continuing impact which would decline slowly, as indicated by the loss of 68 person-years of employment two years after the oilspill.

The immediate adverse impacts to Ocean City's tourism economy would be larger due to the construction of a support base than due to the oil spill. This is because of the larger range of environmental effects that would accompany the support base's construction. In addition, the support base would have a permanent adverse impact on Ocean City's economy, while the oil spill would not (if properly counteracted through such means as publicity).

Due to the lack of offsetting facility-related employment and income benefits, the short term net economic loss to the state in terms of value added and employment would be larger for the oil spill than for the construction of the support base.

The results of the study are concentrated in four basic groups:

- A detailed description of the economic, social, and demographic character of New Jersey's shorefront municipalities.

- An estimate of the size, composition, and economic importance of New Jersey's coastal recreational industry.

- A model of the economic, social, fiscal, and demographic impacts of energy facility development on shorefront municipalities.

- A model of how energy facility environmental impacts produce economic losses in the tourism industry through perceived changes in the quality of coastal recreational resources.

These results have specific policy implications for the State of New Jersey in terms of better understanding and minimizing the inevitable conflicts between energy facility development in coastal areas and the shorefront recreational economy.

Within the New Jersey Department of Environmental Protection, the Division of Coastal Resources (DEP/DCR) will use the results of the study to incorporate socioeconomic factors into coastal permit decisionmaking. DCR will use the study's results to develop guidelines in reviewing applications for the development of energy facilities in coastal areas. Such actions are made through the provisions of the New Jersey Coastal Management Program as approved by the National Oceanic and Atmospheric Administration -- Office of Ocean and Coastal Resource Management (NOAA--OCRM) and as specified in Section 306 of the Federal Coastal Zone Management Act.

The results of the study will also be incorporated into joint decisionmaking on coastal energy facility applications by the New Jersey Department of Environmental Protection, Division of Coastal Resources and the New Jersey Department of Energy (NJDOE).

The model's outputs can also be used to compare how the same facility will impact tourism in different shorefront municipalities. The DCR could use these results to determine those areas where a specific facility type should be encouraged to locate, and where development of that facility type should be discouraged. The model can also be used to compare the impacts of different energy facilities in the same location. Thus, certain facilities could be deemed acceptable for development in certain special and general land areas. The policies developed as a result of these analyses would be added to the DCR's Coastal Resource and Development Policies.

One example of the application of the model's output would be to compare the total tourism losses by visitor type estimated by the model for several different coastal municipalities. The concerns here would be the composition of the losses (i.e., proportion of overnight visitors versus day trippers) and the proportion of the affected municipality's visitation that is diverted. The model's outputs estimating the net combined statewide economic impacts of energy facility development and tourism diversion would be compared for alternative sites. This would help resolve the question of whether the facility-related impacts less than, or more than, compensate for the losses in tourism. Finally, the municipal level impacts would allow users to identify those municipalities that might be more severely impacted through fiscal effects or inmigration.

10. CONCLUSION AND RECOMMENDATIONS FOR FURTHER RESEARCH

Analysis conducted as part of this study verified that the tourism sector is a very important part of New Jersey's economy. During 1982, tourist visitors to New Jersey's four oceanfront counties totaled 77 million person-days. Approximately $5 billion was spent in the four county study area during 1982. These expenditures produced approximately 225,000 person-years of employment for New Jersey residents during this period. Clearly, the importance of the tourism economy necessitates that potentially adverse impacts on this sector must be taken into account when considering the development of energy facilities in coastal areas of the state.

The ocean shore is simultaneously an important economic resource and an important natural resource. The environmental resources and locational attributes of the shorefront area that make it attractive for recreational activities also make it attractive for energy development. Thus, the Coastal Tourism Response Model is based on the causal sequence that links facility related environmental impacts with changes in the quantity and quality of recreational resources. Changes in resource quality are then linked to changes in the behavior of tourists. Finally, the economic impacts accompanying the loss of tourism are combined with positive economic impacts that accompany the construction and operation of an energy facility.

Results of the model indicated clearly that the responsiveness of tourists to facility-related environmental change are dependent upon their accommodation type, the activities they are engaged in, and on the type of energy facility. The key variable is at what point a direct environmental effect results in a perceivable change in a recreational resource such that tourists respond by changing the location of their recreational activities. Persons owning seasonal homes are the least "footloose" and least able to change the location of their recreational activities away from an impacted resource. Conversely, day trippers are the most mobile, and the group most likely to change the location of the recreational activities away from an impacted resource.

The magnitude of the losses in tourism and tourist expenditures was found to vary widely according to the level of analysis. Losses are most significant at the municipal level as diverted tourists take their expenditures into neighboring communities. At the state level, the net losses in tourism are much smaller due to the relatively small proportion of diverted tourists who choose locations out of New Jersey.

The construction of the municipal data base led to the classification of six distinct tourism regions. The six regions vary according to their economic and social dependence upon tourism and on the intensity of their land use patterns. This classification verified that the southern communities located along New Jersey's ocean shorefront are substantially more dependent upon tourism than are the more northerly communities. Similarly, barrier island communities are more dependent upon tourism than are back bay or inland communities.

The results of the case studies indicate that the net regional and statewide economic impacts accompanying the construction and operation of an energy facility are likely to be positive for most of the energy facilities considered in this study. Those facilities that do not significantly change the quality or quantity of recreational resources will produce economic benefits in the form of income and employment that more than outweigh the adverse economic impacts produced by the diversion of tourists. However, the construction of electric power plants and other large-scale facilities (i.e., coal handling terminals, tank farms) can produce negative net economic effects at the local level during the construction and operation phases. The magnitude of this net loss would increase when the facilities were located in communities highly dependent upon tourism.

Further research is needed to advance understanding of social and economic impacts of coastal development. Several areas of study have pointed to areas for further research. Most of this need follows from the importance of the response of travelers to loss of recreational resources in total impacts of coastal development. Other areas which would benefit from future research have emerged from sensitivity analysis of the CTRM and case study application of it.

Both the study estimate of the total value of the New Jersey shorefront tourism economy and the CTRM estimate of loss from tourist response to a loss of recreational resources are highly dependent upon the estimate of annual visitor days of traveler activity, categorized by visitor accommodation. Information from both the Travel Economic Impact Model and published Eagleton Poll reports contributed to the estimate of traveler activity. Additional research should be undertaken to refine the number of visitor days, particularly the number of daytrippers. A questionnaire distributed to visitors at various locations along the shorefront would provide further definition.

Study work confirmed that the estimate of traveler activity should be based upon random-selection surveys of potential visitor populations. Potential visitor population should include New Jersey, Pennsylvania, and New York. New definitions of travelers and their accommodations should be developed for such research. The current definitions of both travelers (especially as described by distance) and concepts such as the seasonal home or vacation home or cottage are not well-suited for tourism at the New Jersey shorefront, within the highly developed context of the Eastern seaboard. Other problems identified include the large biases inherent in surveys of visitors and in use of reported receipts. Much of the information available in published surveys of tourists and in published business receipts proved an inappropriate base for estimation of traveler activity, largely because the information was not collected with the goal of estimating shorefront traveler activity.

Traveler expenditures per visitor day can be estimated with acceptable accuracy based upon information available in the TEIM and several sectors reported in the Business Census. Expenditure information should not be population survey-collected because respondents lack understanding of definitions required to properly classify their response. It is likely that many expenditures are not recalled by respondents and that error can be introduced by allocation of total reported expenditure in a sector to visitor-day units.

At the beginning of the study, concern was focused on the accuracy of the response coefficients, the numbers estimating the diversion and loss of visitors in response to environmental change. Considerable study effort was directed toward understanding the structure of tourist response to stratify the coefficients. Additional studies on how tourists perceive environmental impacts and the thresholds at which they begin to change the location of their recreational activities would be very useful. Sensitivity analysis of the model suggests that it is not as sensitive to considerable disagreement between experts or error in the panel's approximation of the answers of all experts as it is to changes in the estimate of the number of visitors. Further studies could repeat the expert panel to broaden and update the estimates of tourist response to environmental changes.

The estimates of total social and economic impact are very sensitive to accuracy of economic multipliers. The study has benefited from use of a highly sectorized input-output model which carefully accounts importation. The wealth of information on the structure of the New Jersey economy contained in the model was necessary to maintain accuracy of the estimate of lost expenditures. No further study is required in the area of multipliers.

The most important area of future study related to the model is directed toward extension of the model into analysis of impacts from developments that are not energy facilities. Application of the model format to residential and commercial development will require study of two major areas. First, the description of recreational resource loss within CTRM is adapted to the relatively large environmental changes associated with energy facility development. The environmental impacts of a shopping center or apartment building differ both in quality and quantity. Further study should look at these other ranges of environmental impact and determine whether the existing expert panel's estimates can be adapted to this range. The second major area of study to expand model applications is derivation of additional multipliers for these developments from the New Jersey input-output model.

11. COASTAL POLICY GUIDELINES

Decisions concerning the location of energy facilities within New Jersey's coastal zone are made by applying the DCR's Coastal Resource and Development Policies, N.J.A.C 7:7E-1.1 et seq. This is a three step process comprised of a set of location, use and resource policies.

The Location Policies classify all land and water locations along the shore into general areas (e.g., land or water areas) and some general areas into special areas. These latter locations are naturally valuable, important or sensitive locations that require special consideration in the coastal planning process. The development of energy facilities is most acceptable in the general land areas.

The acceptability of a given location within the general land area as a site for an energy facility is defined on the basis of that site's acceptable development intensity. Three factors determine a location's acceptable development intensity: coastal growth rating, environmental sensitivity and development potential. The development potential of a general land area location is determined on a case-by-case basis.

The existing energy Use Policies are presented for 16 different energy facilities. Each facility's use policy specifies where it can be acceptably located, and where its location is discouraged. The accompanying rationale section explains why an energy facility should or should not be sited in a particular general and area location.

Finally, the Resource Policies present standards in terms of impacts on natural and man-made resources which must be adhered to by proposed coastal projects. It should be noted that a broadly defined category of recreational resources or the shorefront economy is not included as a part of these Resource Policies. However, several components of recreational resources are included as Resource Policies. These are scenic resources and design, public access to the shorefront, as well as a number of natural recreational resources (e.g., marine fish and fisheries, water quality, important wildlife habitat, etc.).

A substantive amendment to New Jersey's Coastal Resource and Development Policies should be approved to incorporate the results of CTRM analysis. Adoption of an amendment would recognize recreational resources as an aspect of the environmental resources of New Jersey's coastal zone and the importance of the linkage between environmental resources and economic activity caused by tourist perception of recreational resources. Adoption of an amendment also would enhance the capabilities of the Department of Environmental Protection to review a more comprehensive scope of energy facility impacts during their review of permit applications under the Coastal Area Facility Review Act (CAFRA), N.J.S.A. 12:19-1 et seq., Wetlands Act, N.J.S.A. 13:9A-1 et seq., and Waterfront Development Permit Program, N.J.S.A. 12:5-3. Through use of CTRM as an objective tool for evaluation, the Department could increase the predictability of coastal decision-making. CTRM provides measures of impact which could be compared to standards set by policy.

A substantive amendment to New Jersey's Coastal Resource Development Policies incorporating the results of CTRM analysis should both explain model structure and set thresholds for acceptability of adverse impact. The following text is a recommendation for portions of that amendment. It should be placed in Section 7:7E-8 as resource policy 27.

Social and Economic Effect Policies for Coastal Energy Facilities

Purpose

Coastal energy facilities provide social and economic benefits to New Jersey and the nation by contributing to provision of energy, by purchasing materials and equipment, and by employment for facility construction and operation. However, energy facilities also can impact the environment. Certain facility related environmental changes are perceived by travelers as reduced recreational resources. When travelers respond to loss of recreational resources by leaving the New Jersey shorefront for alternative recreational opportunities, their expenditures are lost from the New Jersey economy. Coastal Resource and Development Policies are intended to assure that the net employment and economic impact for New Jersey of coastal energy facility development will not be negative and that energy facilities will be located such that impacts on the local tourism industry will not be excessive.

Measurement of Social and Economic Effects of Coastal Energy Facilities

Social and economic impacts of proposed coastal energy facility developments will be estimated by application of the Coastal Tourism Response Model (CTRM). CTRM is a linked series of computer programs. The model is maintained by the New Jersey Department of Environmental

Protection, Division of Coastal Resources. The model is intended to assist in determination of whether or not the positive economic and social effects of facility construction and operation outweigh the losses that could result from environmental changes due to the proposed facility, and the consequent effects on tourism industry.

Policy For Social and Economic Impacts of Coastal Energy Facilities

Coastal energy facility construction and operation shall not directly or indirectly result in net loss of employment or value added to New Jersey for any single year.

Coastal energy facility construction and operation which results in loss of 200 or more person-years of employment in jobs in New Jersey directly or indirectly related to New Jersey's coastal tourism industry in any single year is prohibited.

These measures of impact and others shall be estimated by application of CTRM. Evaluation of social and economic effects of proposed energy facilities will include consideration of the broader range of impacts reported by CTRM as well as those specified here. A finding of acceptable social and economic impact under these policies is <u>not</u> intended to override use policies in Section 7:7E-7.4.

GLOSSARY

Day-trip - A day-trip is considered a journey taken by persons traveling ten miles or more, one way, to participate in shorefront recreational activities. Because a day traveler typically stays much less than 24 hours, three day-trips are considered to equal one person-day of traveler attendance.

Eleven-year analysis period - This is an arbitrary analysis period chosen for the purposes of this study. The eleven years allow for the completion of the facility with the longest construction period (nuclear power plant) plus one year of operation; all other facilities have a construction period of five years or less, with the remainder of the analysis period representing the facility operation phase.

Final demand - Final demand refers to the ultimate destination of goods and services, which is really the initializing or direct effect on the economy (i.e., the construction and operation of an energy facility).

Gross economic output - The sum of the direct changes in the economy (such as the purchase of materials for construction of a plant) plus the indirect effects (such as the purchase of labor and materials by the suppliers) plus the induced effects (purchases by households which supply the labor to the directly and indirectly affected firms). This indicates the overall change in economic activity, though it double-counts many inputs.

Indirect economic effects - Indirect economic effects consist of the labor, services, materials, and other items purchased by the firms supplying material, equipment and services to the companies that construct and operate the facility. These secondary firms in turn make purchases from their own suppliers, who in turn make purchases of their own. The spin-off demand for goods and services, stimulated by the original transaction, affects a wide range of related sectors in the economy and is measured as indirect effects.

Induced economic effects - Induced economic effects consist of the increased purchases by households of goods and services due to the additional employment and wages paid by both directly and indirectly affected businesses. The induced purchases themselves have further effects on the economy.

Leakage	- Expenditures (or losses of expenditures) that occur out of the geographical areas under consideration are referred to as leakages; they minimize the input of changes in economic activity.
Migrants	- Migrants are individuals drawn to the 30-minute commuting zone around a facility site by the prospect of employment at the facility. Based on actual case studies, it is assumed that migrants will only go to municipalities with populations of 15,000 or more.
Multipliers	- Economic multipliers are coefficients or factors by which a direct effect on the economy is literally multiplied to account for indirect and induced effects on the economy. Two types are used in this study: RIMS, in the regional area analysis; and RSRI multipliers, in the state area analysis.
Person-day	- A term used interchangeably with visitor-day; it represents one night at the shorefront for one overnight traveler, or 24 hours of attendance by a person on a day trip. Because a day traveler typically stays much less than 24 hours, three day-trips are considered equal to one person-day of traveler attendance.
Previous residents	- People who currently reside in the study area or within the 30-minute commuting zone around a facility site. They will be a source of construction and operation labor, differentiated from the group of people who will migrate to the study area because of the new employment opportunities created by the construction and operation of a facility.
RIMS	- The Regional Industrial Multiplier System. This system identifies 56 economic sectors and provides multipliers for each of the sectors, for regions throughout the nation. It was developed by the Bureau of Economic Analysis for the Water Resource Council for use in the Council's resource utilization analyses. A majority of the study area is included in the RIMS Philadelphia-New Jersey economic region; the multipliers of this region were modified for the four-county shorefront area for the purposes of this study.
Travel expenditure	- This is said to occur when a traveler exchanges money for an activity considered to be part of his trip. The recipients of these expenditures are generally the retail establishments that provide goods and services to the traveler whose destination is within the study area.

Unsupplied housing demand - When the number equal to .5 percent of specific, occupied housing units (single person or family) is greater than the number of units required for migrants, then housing supply is sufficient. Unsupplied housing demand is the number of units migrants require above the figure equalling .5% of the occupied housing units.

Value added - Value added is a basic measure of gross production of a region's economy in which the value contributed to the materials at each stage of production, rather than the total dollar value of the industry's sales, is considered. The major portion of value added is wages; the leftover portion consists of profits, interest, rent, taxes and similar items.

WRC sectors - The series of 56 economic sectors are used by the Water Resource Council to describe the total economy. It is part of the RIMS used by the Council to perform economic impact analysis.