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Foreword

The Southern California Beach Valuation Project is a multi-agency partnership that was initiated in 1998 by the National Oceanic and Atmospheric Administration (NOAA). In the early 1990s, NOAA's Coastal and Ocean Resource Economics Program had estimated single-site travel cost models for 10 California beach sites as well as 40 others nationally using the Public Area Recreation Visitors Survey (PARVS). The results from these efforts were being used in damage assessment cases due to oil spills and sewage spills by California State agencies. Two major deficiencies were noted for single-site travel cost models for these types of applications; 1) the models don't account for substitution to other sites and 2) the models can't include the evaluation of changes in water quality or other beach attributes.

In 1998, NOAA started the process of forming a partnership to develop a state-of-the-art model to address the two above deficiencies. Two elements of NOAA's National Ocean Service joined the partnership; the Coastal and Ocean Resource Economics Program and the Damage Assessment Center. From the State of California, three agencies joined the effort; the State Water Resources Control Board, the California Department of Fish and Game's Office of Spill Prevention and Response, and the Southern California Coastal Water Research Program. The Santa Monica Bay Restoration Foundation also joined the partnership. These organizations were the original project partners. Later in the process, the U.S. Department of Interior's Minerals Management Service joined the partnership.

The project not only involved multiple funding partners, the Research Team also came from multiple organizations. Many researchers have contributed to the effort since the projects inception, including many students at the universities. The overall project Principal Investigator was Professor Michael Hanemann of the University of California – Berkeley. Dr. Linwood Pendleton was the Co-Principal Investigator and during the project went from the University of Southern California to the University of Wyoming and is now at the University of California – Los Angeles. Dr. Craig Mohn was hired under a Post Doctoral Fellowship at the University of California – Berkeley to lead the estimation and implementation of the Southern California Beach Valuation Model. Dr. David Layton, originally at the University of California – Davis, now at the University of Washington was also brought on to help design a contingent valuation/behavior element and do preliminary analysis of the project survey data (see Recruitment report on our web site). As noted above, there were many other researchers involved at different stages of the project. Also, each of the agencies has economists and other social scientists that provided internal peer review as well as doing some of the analyses (this report). Outside paid peer reviewers were also used through every stage of the project.

The surveys were conducted by Chico State University's Survey Research Center. The surveys were complex. A panel approach was used, which was not common for studies in outdoor recreation. Panel members were recruited through a telephone survey of the general population, and then interviewed every two months on the details of each trip they took to Southern California beaches over the previous two-month period. Even though a computer-aided telephone instrument (CATI) software system was used, the many complex types of trips taken pushed the technology beyond its limits. Trips were categorized as single-day, single-site trips; single-day, multiple-site trips; multiple-day, single-site trips; and multiple-day, multi-site trips. The original software could not handle all these complexities and some portions of the early surveys had to be coded by hand. Later in the project, upgraded software allowed for programming the complexities of all trip types. These complexities led to delays in processing the data and final delivery to the research team for analysis. The Research Team and the Survey Research Center spent a great deal of time on quality analysis/quality control (QA/QC) on the survey data. Again, this delayed analysis of the data.

The delays have been worth the effort. We believe we now have a state-of-the-art model based on high quality data. On our web site (see link below), you can find reports detailing how the survey was conducted (the Production Report); an analysis of who are the beach users in southern California (the Recruitment Report); a report summarizing the estimated model, including brief literature reviews of modeling issues and research judgments made on these issues in the estimated model; a report on demonstrating the use of the model for estimating welfare (consumer's surplus or the net value people receive from a good or service over and above what they actually pay for the good or service—often referred to as net economic user value or nonmarket economic use value because it is a value that doesn't show up in our normal economic accounts) gains/losses for five policy/management scenarios involving water quality changes and beach closures; economic impact of beach use on the local economies and the changes in economic impact of beach use on the local economies for the same five policy/management scenarios in the welfare report (Economic Impact Report); and finally the user manual for the electronic model, which is distributed on CD-ROM.

This report adds to the collection of above reports by adding an additional policy/management scenario, which is to increase water quality at Long Beach to the water quality at Huntington City Beach. Both estimates of non market economic values (consumer's surplus) and market economic values or the economic impacts of beach recreation on the local economies are provided for this policy/management scenario. Market economic impacts include expenditures by beach users and the associated impacts on sales/output, value added, income and employment in a local area, including multiplier impacts. Definitions of these concepts are provided in this report.

We are currently working on a summary report, which will include summaries for the entire project without technical details on how things were estimated. This report will be posted on our web site. All project data and documentation will be available on CD-

ROM. The data from this project is extremely rich and much of the data has not been analyzed, so there are many opportunities for further research. We will make the data available in a variety of data formats.

All project reports are available on our web site in portable document format (pdf) using the following link:

http://marineeconomics.noaa.gov/SCBeach/laobeach1.html

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Executive Summary

This report presents the results from a request to run the Southern California Beach Valuation Model for a scenario in which the water quality at Long Beach is changed to the water quality conditions at Huntington City Beach. Both the annual changes in economic value and economic impacts on the local economy are estimated and presented here.

Estimates of annual changes in beach visitation for day use and changes in the economic value (welfare or consumer's surplus) associated with the changes in day use were obtained using the Southern California Beach Valuation Model (SCBVM). Economic impacts on the local economy were estimated using expenditure profiles obtained from the Southern California Beach Valuation Project surveys of people that live in the four-county study area of Los Angeles, Orange, Riverside and San Bernardino counties. The local economy was also defined as the same four-county area. Impacts by county cannot be reliably estimated due to limitations in the survey data and the fact that the four-county study area is highly interconnected in the production of goods and services. The IMPLAN input-output model is used to estimate economic impact.

Estimates of changes in economic value and economic impact for day use were extrapolated to all beach use by all users (e.g. day and multiple day users from the four county study area and multiple day users from the rest of California, the rest of the U.S. and international visitors). Extrapolation factors were derived from a state-wide beach study by King and Symes (2003). All dollar amounts presented in this report are in constant 2006 dollars.

Results

Annual Changes in Use. The SCBVM predicts that changing the water quality at Long Beach from a Heal the Bay baseline 2000 annual average score of 2.8545 to the baseline score for Huntington City Beach of 3.915 will result in an annual increase in day use from residents of the four-county study area to Long Beach in the amount of 5,633 person-days of use. Multiple-day use is estimated to add an additional 1,353 person-days of use resulting in an estimated annual increase of 6,986 person-days of total beach use at Long Beach (Table E1).

Annual Changes in Economic Value. The SCBVM predicts an annual increase in economic value (welfare or consumer's surplus) of almost $603 thousand for day use from the four-county study area. Multiple-day users from all areas are estimated to receive and additional $321.3 thousand in economic value with a total annual increase in economic value for all beach users of $924 thousand (Table E1).

Total Benefits of Water Quality Change. The annual changes in economic value can be capitalized or converted to the net present value of the annual flow of changes in economic value over different time periods with a few assumptions. Assuming the annual increase in value remains constant in real terms (net of inflation) and using and

interest or discount rate of three (3) percent in real terms, we estimate the total benefits of the water quality change for three time periods (e.g. 10, 20 and 30 years).

For the change in all beach use, we estimate the benefits of the water quality change at Long Beach to be worth $8.8 million over ten years, $14.9 million over 20 years, and $19.3 million over 30 years (Table E1). These values represent the benefits that would be entered into a benefit-cost analysis of the investments (costs) required to bring the water quality at Long Beach up to the water quality at Huntington City Beach.

Economic Impacts on the Local Economy. Economic impacts on the local economy are measured in terms of changes in annual spending by beach users and the secondary impacts, including multiplier impacts, on output/sales, value added, income and employment. Employment is measured in number of full and part-time jobs.

We estimate that for all beach use in the four-county economy, spending will increase annually by about $204.5 thousand. This spending will generate an annual increase of $328 thousand in output/sales; $208.5 thousand in value added; $131.8 thousand in income; and about five (5) full and part-time jobs (Table E1).

Definitions of economic value and economic impact are included in the main body of this report, which also provides more detail on the values derived using the SCBVM and how we extrapolated to the changes associated with the changes in total beach use.

Table E1. Changes in Economic Value and Economic Impact Due to Changes in Water Quality at Long Beach - All Beach Use

Measurement[1]	Day Use	Multiple Day Use	All Beach Use
Person-days	5,633	1,353	6,986
Economic Value	$602,781	$321,305	$924,086
Capitalized Value			
10 years @ 3%	$5,744,625	$3,062,102	$8,806,727
20 years @ 3%	$9,720,403	$5,181,341	$14,901,744
30 years @ 3%	$12,567,317	$6,698,854	$19,266,171
Economic Impact			
Spending	$133,410	$71,112	$204,522
Output/Sales	$213,895	$114,067	$328,062
Value Added	$135,976	$72,480	$208,456
Income	$85,982	$45,832	$131,814
Employment	3.1	1.8	4.8

1. 2006 $ and number of full and part-time jobs.

Background

Two previous reports provided estimates for five policy/management scenarios run through the Southern California Beach Valuation Model. The welfare estimates (consumer's surplus) were published in Hanemann et al (2005a) and the economic impact estimates were published in Wiley et al (2006).

This report includes the results for running the scenario of increasing the water quality at Long Beach to the water quality conditions at Huntington City Beach. This involved changing the water quality from the Heal the Bay baseline value of 2.8545 for Long Beach to the baseline value of 3.915 for Huntington City Beach.

Unlike previous efforts, in this report we combine the reporting of both the change in welfare (economic value – consumer's surplus) and the change in economic impact on the local economy (expenditures, output/sales, value added, income, and employment). Here we also repeat the definitions of each of the measurements and the proper use of each measurement.

Economic Impact versus Economic Welfare. It is important to understand the difference between what is meant by "economic impact" versus "economic welfare" because each has its own uses. Economic welfare includes what economists call consumer's surplus (CS). CS is the amount of value a consumer of a good or service receives over and above what he or she has to pay for a good or service. It represents the net result of both demand and supply factors. The demand-side represents what people are willing and able to pay for a good or service and the supply-side represents what producers of a good or service are willing to sell it for, i.e., what consumers have to pay to obtain it from producers.

CS is a *net value* and is often referred to as "net economic use value", or "non market economic use value". Recent terminology has also extended the qualifiers with the term "non market direct economic use value". The added term of "direct" is included to distinguish this portion of value from non use or "passive economic use value". Non use or "passive economic use values" include such values as existence value and bequest value. Existence value being the willingness to pay a given amount just to know something exists in a certain condition, without directly using it. Bequest value is the willingness to pay to ensure something is available for future generations in a certain condition. The term "passive use" has become more popular than "non use" because people have to know about something in order to have economic values for it. People learn about natural resources through books, magazines, newspapers, television shows, etc. (the passive use).

The "non market" descriptor is important because unlike "economic impact" measurements, CS (direct use or passive use) doesn't appear in our standard economic accounts (e.g. Gross National Product, Gross Domestic Product, Income, Employment).

CS, whether direct use or passive use, is the appropriate economic measurement to use in a benefit-cost analysis of public investments and in damage assessment cases in establishing a claim against a responsible party.

Economic impact (EI) is measured by actual expenditures that people make while undertaking an activity, and the secondary effects on sales/output, value added, income, employment and tax revenues. These are the measurements that are in our standard economic accounts.

EI can be broken down into direct, indirect and induced effects (see definition box). The indirect and induced effects make up the "multiplier process". When a local economy experiences a change in an activity that results in a change in demand for a good or service, residents of that economy are impacted by more than just the dollar amount of goods and services purchased by those who engage in that activity. The reason for this is that the businesses serving those who participate in that activity must adjust to the change in the amount of labor and other inputs to the production of their good or service. For example, the changes made by the businesses that experience a decrease in sales due to decreases in water quality or beach closures will cause a "ripple effect" on the other businesses that supply them, and those businesses, in turn, affect others down the supply chain. In addition, workers and owners receive income and they spend it on housing, food, transportation, entertainment, etc. The initial spending is called the "direct effect", and the subsequent ripples are the "indirect" and "induced" effects. The indirect and induced effects are also called the multiplier impacts.

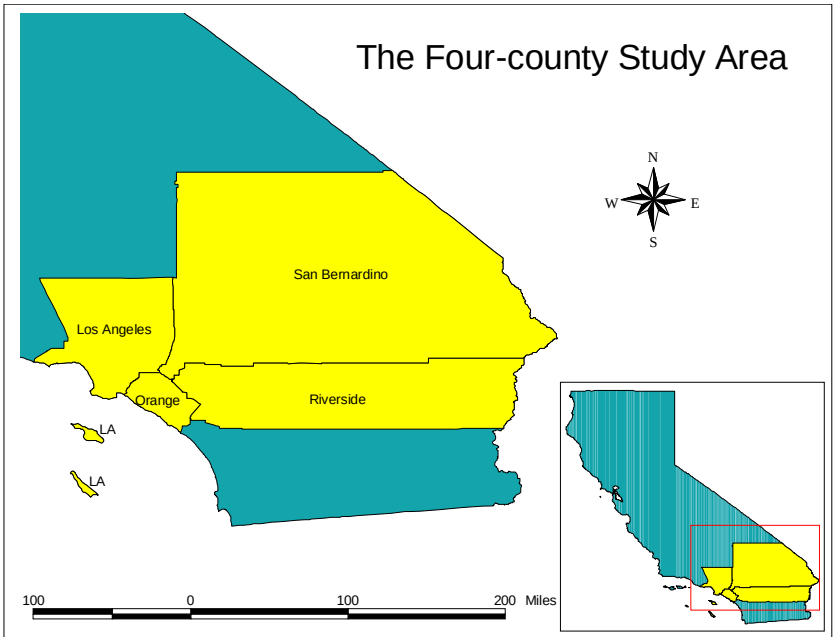
EI is always defined for particular geographic areas depending on the desired scope of the analysis. EI can be done for a particular county, group of counties, an entire State, a region or the Nation. The scope of the analysis determines how much of the "multiplier process" is captured.

- **Direct Effects:** The amount of the change in purchase of inputs used to manufacture or produce the final goods and services purchased by visitors
- **Indirect Effects:** The value of the inputs used by firms that produce the goods and services for those firms first impacted by the closure or change in water quality
- **Induced Effects:** Resultant effects of the direct and indirect effects. Induced effects are related to persons and firms that receive added income as a result of local spending by employees of the firms that are impacted by the direct and indirect effects.
- **Total Effect:** The sum of direct, indirect and induced effects.
- **Output multiplier:** The total output effect divided by the direct output effect. Typically, the output multiplier is between 1.5 and 2.

EI is generally not appropriate to include in calculating benefits or costs in a benefit-cost analysis of a public investment, and is never included in damage assessment cases brought by the government acting as a trustee for the public. The reason is that EI is not a *net value*. If people do not spend their money on one thing in a certain place, they will spend it on something else in another place. Different people in different places might be impacted by changes in water quality and/or beach closures in Los Angeles and Orange counties, but on net, across all people, businesses and places, there is no net value change as measured by EI. However, it will still be important to those who

are affected. If you are one of those whose livelihood is affected (positively or negatively) by a change in water quality and/or a beach closure, it will matter to you. Given this, we decided that EI was important to present.

Study Area. For the economic impact analysis conducted here, the study area has three definitions. The first definition is what beaches would be the focus of the study. The partner/funding agencies decided the focus would be limited to the beaches in Los Angeles and Orange counties. The second definition is what population of beach users the study would include. The Research Team decided that the four-county area of Los Angeles, Orange, Riverside and San Bernardino counties (hereafter referred to as the four-county area or study area) would cost-effectively capture the overwhelming majority of users and use. The third definition of the study area is a more complex issue, since it involves issues of knowing where beach users made their beach use related expenditures (i.e. in which county they made each expenditure) and how interconnected are the different county economies. This latter issue is important because it defines how much of the "multiplier process" is captured, which will determine estimates of EI.



The IMPLAN input-output model is used here to estimate EI (MIG, 1999). IMPLAN is short for IMpact PLANning. IMPLAN is an off-the-shelf product that includes specifications of all the interrelationships between households, businesses, and government entities in the production process. It can take two to three years to build an input-output model from scratch. It can take less than one hour to build an IMPLAN model, once the study area is defined.

So the first step in building an IMPLAN model is to define the study area. A key assumption of the IMPLAN model is that all the people in the study area both live and work in the study area, and therefore spend a good portion of their incomes within the

study area. This is a key assumption and can affect greatly the estimates of EI because of the impact on the "multiplier process".

We used the Census of Inter-county Commuters (Bureau of the Census, 2000) to make our judgments on the "best" study area or local economy for developing estimates of EI. Single county or count-by-county analysis would not be reliable because of the extensive interconnections between counties in terms of where people work and live. Our task was to minimize the amount of people that work in the study area, but live outside the study area, since these people are likely to spend most of the income they receive in the area where they live. We also wanted to define the study area as narrowly as possible to estimate EI on the local area economy.

The "Census of Inter-county Commuters" shows the matrix of where people both live and work (Table 1). About 98,000 people work in the four-county study area, but live in Ventura and San Diego counties. These people are taking their incomes outside the study area. About 65,000 people work in Ventura and San Diego counties, but live in the four-county study area. These people bring their incomes into the study area. On net, 33,000 people or 0.6% of the total four-county study area employment is taking their income out of the four-study area. Generally, this would imply our multipliers for the four-county study area would be overstated because the IMPLAN model assumes all the workers in the four-study area live and work in the four-county study area. However, as we shall see below, the people that live in the four-county study area that work in counties outside the study area make more than those that live outside the four-county study area and work inside the four-county study area. The result is a net decrease in income to the four-county study area of only 0.67% (see Table 2, Adjustment to Income by Place of Residence by the Bureau of Economic Analysis). We think this small amount means that our definition of the study area in the IMPLAN model will yield reasonably good estimates of EI.

Table 1. Inter-County Commuting Patterns[1]

County	Los Angeles		Orange		Riverside		San Bernardino		Total Study Area	
Residents that work in the County(ies)	3,576		1,091		417		457		5,541	
Residents that commute to work outside the county(ies)[2]	264		217		170		198		91	
Breakdown of top five destination counties:										
	Orange	160	Los Angeles	185	San Bernardino	60	Los Angeles	111	Ventura	33
	San Bernardino	41	Riverside	11	Orange	52	Riverside	52	San Diego	32
	Ventura	32	San Bernardino	9	Los Angeles	37	Orange	29	Kern	8
	Riverside	9	San Diego	7	San Diego	19	San Diego	2	Santa Barbara	2
	Kern	6	Ventura	1	Imperial	0.4	Kern	1	San Francisco	2
Non-residents that work inside the county(ies)[3]	440		260		82		120		145	
Breakdown of top five source counties:										
	Orange	185	Los Angeles	160	San Bernardino	52	Riverside	60	Ventura	70
	San Bernardino	111	Riverside	52	Orange	11	Los Angeles	41	San Diego	28
	Ventura	69	San Bernardino	29	Los Angeles	9	Orange	9	Kern	9
	Riverside	37	San Diego	12	San Diego	6	San Diego	2	Santa Barbara	2
	San Diego	8	Ventura	1	Imperial	1	Mohave Co., AZ	1	Clark Co., NV	2

1. Estimates are expressed in thousands of persons. Unless ohterwise noted, counties are in California.

2. For Total Study Area, the estimate is the residents of any of the four counties who work outside of the four counties.

3. For Total Study Area, the estimates are the number of persons residing outside the four counties who work anywhere inside the four counties

Source: United States Census Bureau (2000)

Residents of the Economic Impact Study Area and the Multiplier Process. In regional economic impact analysis, it is customary to not include the spending by residents of the economic impact study area. The reason is that multiplier impacts are derived from "basic" or "export" industries, which attract "new" dollars into the economy. Spending by residents is considered "local spending" from income generated by the "new" dollars

injected into the economy from "export" industries. Resident spending is part of the multiplier process derived from "new" dollars to the "export" industries. So here, beach expenditures would be considered local spending and are part of the multiplier process from "export" industries. It would be double-counting to count the spending impact by residents on beach activities, with additional multiplier impacts. Given our definition of the study area (where people live) and the economic impact area are the same, it is generally thought that we should only include direct impacts.

But there are several reasons why the customary approach is not used here. One reason for defining the study area as the four-county area is that the survey did not breakdown expenditures by county of where the expenditure was made. So if a survey respondent lived in Riverside County and visited a beach in Los Angeles County, we don't know how much was spent in Riverside County in preparation for the beach visit versus how much was spent in Los Angeles County. All we know is that the spending was likely in one or both counties. We know that all the spending took place in the four-county study area. An economic impact analysis that looked at the economic impact area as defined as Los Angeles County would consider spending on beach activities in Los Angeles County as "new" dollars coming into the county and thus beach spending would have multiplier impacts within Los Angeles County.

Above we mentioned the difference between incomes earned by place of work versus income by place of residence. Overall, 19 percent of income by place of residence is not generated from work within the four-county area. One difference was the "adjustment for residence", which was slightly negative for our four-study area, but very small. Other differences between income by place of work and income by place of residence are also due to sources of income received by people living in the four-county area, but derived from sources other than work in the four-county area. Two major sources are "Dividends, Interest, and Rent" and "Transfer Payments". These are sources of income or "new" dollars into the four-county area economy and can be considered as "export" dollars with multiplier impacts. A portion of beach spending might be made from these sources of income and therefore would have multiplier impacts that would not involve double-counting from other export industries in the four-county area economy. We estimate that in 2004 almost $117 billion in income out of the total income received by people living in the four-county area of $551 billion or 21 percent is export income that is available for discretionary spending for such things as beach activities (see Table 2).

Table 2. Personal Income by Place of Residence versus Work: 2004 (000's $)

Source	Los Angeles	Orange	Riverside	San Bernardino	Total
Place of Residence	329,048,068	124,853,736	49,443,185	48,116,593	551,461,582
Place of Work	280,557,128	103,362,666	29,789,598	32,570,281	446,279,673
Contribution Gov. Insurance	-31,003,949	-11,546,393	-3,450,636	-3,762,369	-49,763,347
Adj. for Residence	**-20,480,913**	**2,957,505**	**7,487,602**	**6,333,406**	**-3,702,400**
Net by Place of Residence from Work	229,072,266	94,773,778	33,826,564	35,141,318	392,813,926
Dividends, Interest & Rent	**51,021,690**	**19,115,079**	**7,720,064**	**4,984,356**	**82,841,189**
Transfer Payments	48,454,112	10,964,879	7,896,557	7,990,919	75,306,467
Retirement & Disability	**12,492,017**	**4,291,303**	**3,050,580**	**2,436,777**	**22,270,677**
Medical	23,841,453	4,236,700	3,021,492	3,351,456	34,451,101
Income Maintenance	**8,192,357**	**1,161,022**	**937,454**	**1,291,054**	**11,581,887**
Unemployment	**1,198,273**	**331,251**	**231,074**	**242,224**	**2,002,822**
Veterans	**428,557**	**145,950**	**177,686**	**158,495**	**910,688**
Federal Education	569,256	138,769	64,552	88,389	860,966
Other Transfers	75,515	11,490	7,368	8,860	103,233
Nonprofits	1,555,220	467,567	293,026	298,300	2,614,113
Individuals from Business	**601,464**	**180,827**	**113,325**	**115,364**	**1,010,980**
Total Non Work Related Income Export Income	**53,453,445**	**28,182,937**	**19,717,785**	**15,561,676**	**116,915,843**
Ratio: Work to Residence (%)	85.26	82.79	60.25	67.69	80.93

Note: Items in bold are sources of non work related income (export icome) available for discretionary spending.
Source: United States Bureau of Economic Analysis (2004)

Another justification for treating beach spending as if it were from export income sources is the argument called “import substitution”. Under this argument, even if all beach spending was from local sources of income, gains or losses associated with changes in beach activities due to water quality and/or beach closures might result in purchases of goods and services from outside the four-county area (imports). Thus, the four-county economy would experience lower multiplier impacts from export incomes as people spend their money on imports.

Our model predicts the number of beach trips that will not be taken to beaches in Los Angeles and Orange counties for a decrease in water quality or a beach closure. Some will substitute to beaches in San Diego, Ventura or Santa Barbara counties. And, some will spend their money on something else. For our estimates to be considered net changes in the local four-county economy, we must assume the money is spent on imports from outside the four-county area. This is the import substitution argument.

This ambiguity in economic impact analysis is why most economists focus on the economic welfare analysis. There is no ambiguity as to whether economic welfare estimates represent net gains or losses. CS is simply harder for many to understand because it cannot be verified by the standard economic accounts (the non market aspect).

Scenario Description

Scenario : An Improvement in Beach Water Quality at Long Beach

> *Long Beach Water Quality Improves from Heal the Bay (HTB) Baseline Value of 2.8545 to the Water Quality Condition of Huntington City Beach with a HTB Baseline Value of 3.915.* [1]
> In 2000, Long Beach has a low water quality rating of approximately C (2.8545 on a scale of 0 to 4). This hypothetical scenario explores the impact of improving water quality at Long Beach, perhaps by removing the breakwater or other measures, so that water quality improves to an average annual grade of B (3.915), which is the baseline value of water quality at Huntington City Beach. All other sites remain unchanged.
> An improvement in water quality at Long Beach increases by 5,633 visits over the course of the year. Most new visits are made by residents of Los Angeles County, the closest county (Table 3).

Economic Value (Consumer's Surplus) – Day Use

Improving water quality at Long Beach from it's baseline value to the water quality conditions at Huntington City Beach results in an estimated annual increase in economic value to beach users from the four-county study area of $517,427 measured in 2000 dollars and $602,781 measured in 2006 dollars (Table 3). Most of the increase in use and economic value is received by residents of Los Angeles County.

The above annual increase can be capitalized over a different periods of time to derive the net present value of the flow of future annual benefits. To do this requires a few assumptions. We assume that the annual flow of benefits is constant (e.g. our estimate of $602,781 in 2006 dollars). This implies that there is no increase in total visitation to beaches in Southern California and especially at Long Beach, and that the value per visit remains constant. These are conservative assumptions i.e., lead to lower bound estimates.

We estimate the capitalized value or net present value of the annual change in net economic value for three time periods (e.g. 10, 20 and 30 years) using a discount rate of 3%. Both the flow of annual benefits and the discount rate are in real terms or net of inflation. All final values are expressed in 2006 dollars.

We estimate the capitalized value of the change in water quality at Long Beach to be about $5.8 million over 10 years, about $9.7 million over 20 years, and about $12.6 million over 30 years (Table 4). These numbers represent the estimated benefits of the water quality change to compare against the costs of achieving the water quality change.

[1] For information about the Heal the Bay grading system, please go to the following URL: http://www.healthebay.org/brc/gradingsystem.asp

Table 3. Change in Beach Days and Net Economic Value Due to Water Quality Change at Long Beach (Annual Change) - Day Use

County of Residence	Change in Trips/Person-days[1]	Change in Net Economic Value[2] 2000 $	Change in Net Economic Value[2] 2006 $
Los Angeles	3,497	$321,334	$374,341
Orange	1,278	$118,068	$137,544
Riverside	391	$35,577	$41,446
San Bernardino	467	$42,448	$49,450
Total	5,633	$517,427	$602,781

1. All trips are day-trips so trips are person-days or the number of people that visit a beach for a day with any part of day counting as a whole day. The change in trips/person-days represent the change in the annual number of trips/person-days to Long Beach by residents of each of the four counties as a result of improving the water quality at Long Beach from a Heal the Bay score of 2.8545 to 3.915 (score for Huntington City Beach).

2. Net economic value is consumer's surplus or what people would be willing to pay above what they have to pay to go to the beach and thus is a net economic value. Here it is the net economic value associated with a change in water quality at Long Beach holding water quality at all other beaches constant. The change in net economic value is an annual amount of value gained by increasing the water quality of Long Beach to the water quality conditions found at Huntington City Beach.

Source: Southern California Beach Valuation Model

Table 4. Capitalized Value of Improving Water Quality at Long Beach to Water Quality Conditions at Huntington City Beach - Day Use

Time Period/Discount Rate	Capitalized Value 2006 $[1]
10-years at 3%	$5,744,625
20 years at 3%	$9,720,403
30 years at 3%	$12,567,317

1. Capitalized value is based on conservative assumptions. Annual beach use and value remain constant in the future. A real discount rate or interest rate of 3 percent is used. The real rate doesn't include inflation and so values are calculated in 2006 $. The annual flow of additional net economic value is estimated at $602,781 (see Table 1).

Expenditure Profile – Day Use

In 2001, the Research Team (SCBVP 2001) conducted a preliminary analysis of the economic impact of visitation to the beaches in Los Angeles and Orange counties. The analysis was limited to the three-month period of June – August 2000. Average daily attendance from lifeguard data was used to extrapolate average spending estimates to total spending. The analysis differentiated between whether visitors were locals or non-locals, with non-local's spending having multiplier impacts. Non-locals were defined as anyone not from the county where the beach visitation took place. A range of multipliers of 2 to 2.5 was used.

The previous report described the data in great detail and this won't be repeated here. The same survey data is used here. There were 272 panel members that visited the beaches during the fourth wave of data collection and answered the beach expenditure questions. These 272 survey respondents could have provided information on more than one trip. In deriving the average expenditure profile, we included information on all beach trips reported and develop weighted averages as in the previous report. Our sample size for beach trip profiles is based on reported information for 352 beach trips made by the 272 survey respondents during the summer of 2000. We use these expenditure profiles as representative for trips taken over the entire year.

Per our discussion of the study area, here we make no distinction between locals and non-locals, since all are residents of the four-county area. Previous results were based on two faulty assumptions: 1) that all expenditures were made in the county of the beach visited and 2) county-by-county economic impact analysis could be done (ignored the interconnections between the counties in the four-county area).

In the expenditure profiles presented here, we combine the locals and non-locals as presented in the previous report and do the same weighting by averaging all beach expenditure profiles.

On average, we estimate that visitors to the beaches in Los Angeles and Orange counties spent $20.33 per person per visit or day. Food & beverages accounted for over half of the expenditures, while shopping accounted for about 25%. Parking accounted for about 12.5% of expenditures, while spending on beach supplies and equipment rental accounted for relatively small shares of the spending (Table 5). The survey did gather information on fishing expenditures, but only one person in the sample reported making these types of expenditures, so they were dropped from the spending profile.

Total Expenditures – Day Use

To estimate total expenditures, we multiply the change in beach visitation under each scenario times the average expenditure per person per visit (day). We estimate that the change in total expenditures due to the water quality change would be about $114.5 thousand per year measured in 2000 dollars and about $133.4 thousand dollars measured

in 2006 dollars (Table 5). This is additional amount beach users would spend each year in the four-county study area due to the water quality change at Long Beach.

Table 5. Change in Total Spending Due to Changes in Water Quality at Long Beach (Annual Increase) – Day Use

Category	Average Per Day Spending 2000 $	Change in Total Spending due to Water Quality 2000 $	Change in Total Spending due to Water Quality 2006 $
Parking	$2.54	$14,308	$16,668
Food & Beverage	$11.12	$62,639	$72,972
Beach Supplies	$0.98	$5,520	$6,431
Rental Equipment	$0.65	$3,661	$4,265
Shopping	$5.04	$28,390	$33,074
Total	**$20.33**	**$114,519**	**$133,410**

IMPLAN Analysis

The next step in the economic impact analysis is to import the spending profiles and changes in beach visitation into the IMPLAN model. Each of the expenditure categories must first be mapped into industries for which economic accounts are organized. IMPLAN aggregates sectors in the North American Industry Classification System (NAICS), into IMPLAN sectors.

Food & Beverages were mapped into IMPLAN sector 454: Eating and Drinking Places. We assumed that all spending on food & beverages was done at restaurants and bars. Shopping and beach supplies were mapped into IMPLAN sector 455: Miscellaneous Retail, while rental equipment spending was mapped into IMPLAN sector 488: Amusement and Recreation Services. Parking expenditures were assumed to be all spent at municipal parking lots and was mapped into IMPLAN sector 512: Other State and Local Government Enterprises (Table 6).

Table 6. Expenditure Mapping into IMPLAN Sectors

Expenditure Category	IMPLAN Sector
Food and Beverages	454: Eating and Drinking Places
Shopping	455: Miscellaneous Retail
Beach Supplies	455: Miscellaneous Retail
Equipment Rental	488: Amusement and Recreation Services
Parking	512: Other State and Local Government Enterprises[1]

1. Assumes all parking is municipal

IMPLAN uses the "Social Accounts Matrix" (SAM), which specifies all the interrelationships between households, businesses, government entities, and private non profit organizations. Each IMPLAN sector has different production functions, which specify the inputs used in production. The SAM also includes "foreign trade" and "domestic trade", which represent inputs from outside the study area. This explains why "direct" output is less than initial expenditures. A portion of the expenditure revenue received goes outside the four-county area to purchase inputs in the production process. Also as noted above, IMPLAN produces estimates of direct, indirect and induced effects for output, value added, income and employment.[2] Also, because IMPLAN data are in 1999 dollars and the expenditure profiles are in 2000 dollars, the expenditures are first deflated to 1999 dollars when inputted into the model. On final output tables, dollars are inflated to 2006 dollars.

Economic Impact – Day Use

The annual increase in beach spending of $133,410 results in an increase in the direct effect on output of about $127.5 thousand, which would result in about $82.9 thousand in direct value added, $53 thousand in direct income, and 2.3 jobs in direct employment (Table 7). These impacts represent the amount required to purchase inputs for the final production of goods and services purchased as a result of the increase in beach visitation.

Table 7. Economic Impacts on the Local Economy of Changes in Water Quality at Long Beach to Water Quality Conditions at Huntington City Beach (Annual Increase) - Day Use

Measurement[1]	Direct	Indirect	Induced	Total
Output/Sales (2006 $)	$127,557	$39,552	$46,886	$213,995
Value Added (2006 $)	$82,914	$22,945	$30,118	$135,976
Income (2006 $)	$53,013	$15,083	$17,886	$85,982
Employment (Number of Jobs)	2.3	0.3	0.4	3.1

1. The local economy includes Los Angeles, Orange, Riverside and San Bernardino counties. Economic impact is estimated using the IMPLAN input-output model.

The total impact, after adding in the indirect and induced impacts (multiplier impacts), is about $214 thousand in output/sales, $136 thousand in value added, $86 thousand in income, and 3.1 jobs (Table 7).

[2] At this point, any expenditure categories that involve retails sales are categorized as such in order to take account the difference between the producer and the purchaser prices. The margin basis is set to "household." For this analysis, these categories were "shopping" and "beach supplies." The remaining categories are considered under IMPLAN to be services. Although some of the food and beverages were probably bought in grocery stores or convenience stores, which are considered retail, the judgment was made that this category consisted of eating and drinking places for the most part, and is thus a service industry, not retail.

Discussion

Estimates of Economic Value and Impact: Underestimates. The Southern California Beach Valuation Model (Hanemann et al, 2004) is limited to modeling changes in "day use" only.

King and Symes (2003) did a survey of California beach users in 2002. They concluded that over 97% of all California beach use was done in Southern California as defined by the counties of Santa Barbara south through San Diego County. King and Symes also provided expenditure profiles per person per day for four kinds of beach visitors; 1) CA Day trippers, 2) CA vacationers, 3) U S vacationers, and 4) Foreign vacationers.

For CA Day Trippers, Kings and Symes estimate spending of $20.73 per person per day. This is very close to our estimate of $20.33. The other three types of visitors correspond to those who are not included in the Southern California Beach Valuation Project model or multiple-day trippers. King and Symes estimates of spending include transportation and housing and were estimated at $51.30 for CA vacationers; $59.83 for U S vacationers; and $53.03 for Foreign vacationers.

King and Symes (2003) did surveys for nine beaches and report results for each of the nine beaches. Long Beach was not one of the nine beaches. Huntington State Beach had a Heal the Bay water quality score of 2.54 in our baseline model, while Huntington City Beach had a score of 3.915. Long Beach had a score of 2.85 or between the scores of the two Huntington beaches. King and Symes included Huntington Beach in their survey, but aggregated Huntington State and City beaches. So to estimate the economic value and economic impacts for all beach use, i.e. accounting for beach use other than day use (day-trippers), we use the results from King and Symes to derive extrapolation factors to estimate the total impacts of the water quality changes at Long Beach.

King and Symes (2003) estimate that day-trippers accounted for 80.63 percent of all beach use at Huntington State and City beaches. Applying this to our Long Beach estimates of change in use, we estimate at total change in beach use of 6,986 person-days of use (1,353 additional person-days of use from multiple-day users from outside our four-county study area).

For spending, King and Symes reported that visitors to Huntington State and City beaches had average daily per person spending of $21.92 for day-trippers; $36.20 for California vacationers; $55.83 for U S vacationers; and $40.39 for foreign visitors. Even though day-trippers accounted for 80.63 percent of the person-days of use, they accounted for only 65.23% of spending. We use the 65.23% of spending to extrapolate to the totals for all beach use, not only for spending, but also for output/sales, value added, income, employment and economic value.

Estimate of Economic Value and Impact Accounting for All Beach Use.

Use and Economic Value. Using the above extrapolation factors, we estimate that improving the water quality at Long Beach to that of Huntington City Beach will increase annual use at Long Beach by 6,986 person-days. Economic value (benefit) is estimated to increase by an annual amount of $924,086 measured in 2006 dollars. If we capitalize this annual increase, again assuming that the annual flow of value is constant and is discounted to net present value using a three (3) percent interest rate (see analysis on day use), we estimate a net present value of benefits of about $8.8 million for ten years, about $14.9 million for 20 years, and about $19.3 million for 30 years (Table 8). These values represent the benefits of the investments required to improve water quality at Long Beach to the water quality conditions at Huntington City Beach.

Economic Impact. Spending in the four-county study area is estimated to increase annually by $204,522 measured in 2006 dollars. This annual spending increase would result in annual increase in economic impact to the four-county economy, including multiplier impacts, of $328,062 in output/sales; $208,456 in value added; $131,814 in income; and 4.8 full and part-time jobs (Table 8).

Table 8. Changes in Economic Value and Economic Impact Due to Changes in Water Quality at Long Beach - All Beach Use

Measurement[1]	Day Use	Multiple Day Use	All Beach Use
Person-days	5,633	1,353	6,986
Economic Value	$602,781	$321,305	$924,086
Capitalized Value			
10 years @ 3%	$5,744,625	$3,062,102	$8,806,727
20 years @ 3%	$9,720,403	$5,181,341	$14,901,744
30 years @ 3%	$12,567,317	$6,698,854	$19,266,171
Economic Impact			
Spending	$133,410	$71,112	$204,522
Output/Sales	$213,895	$114,067	$328,062
Value Added	$135,976	$72,480	$208,456
Income	$85,982	$45,832	$131,814
Employment	3.1	1.8	4.8

1. 2006 $ and number of full and part-time jobs.

Conclusions

The Southern California Beach Valuation Model is a very reliable model for predicting changes in beach use and the corresponding changes in economic welfare and economic impact (when combined with the IMPLAN Model) for “day use”. However, day use visitation only accounts for 81% of all beach use at Long Beach and multi-day beach users have higher economic values and spend considerably more per person per day

resulting in significant under estimates of economic value and impact, if the analysis is limited to day use only.

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