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A Handbook for Economic Analysis of Coastal Recreation Projects

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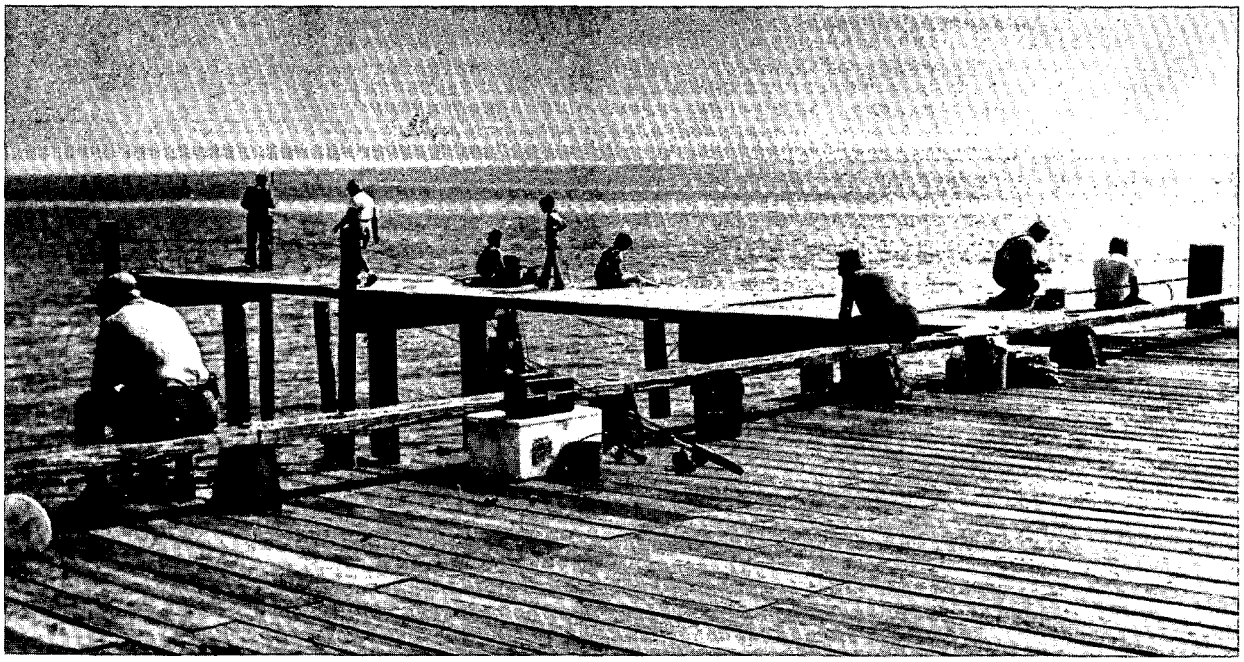

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A HANDBOOK FOR ECONOMICAL ANALYSIS OF COASTAL RECREATION PROJECTS

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with Grace Johns

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PREFACE

This handbook is intended for recreation planners and administrators who have little or no training in economics. The purpose is to provide a basic understanding of economic principles as they apply to outdoor coastal recreation activities. The text provides a discussion of the principal subjects in outdoor recreation economics and extensive footnotes give some guidance to readers interested in greater detail.

For the beginning student of recreation economics, this handbook will provide much useful information. However, it does not provide the comprehensive treatment of project analysis that one finds in texts such as E.J. Mishan's Cost-Benefit Analysis. There are several places in the handbook where references are provided to these comprehensive texts so that the reader can pursue these technical points in greater detail.

Finally, this handbook will be useful to practitioners of recreation economics in government agencies or academia. Chapter 3 provides a comprehensive review of current research in recreation demand analysis and discusses the status of different techniques currently used. Throughout the handbook the emphasis is given to the application of these techniques to coastal resource management issues.

A HANDBOOK FOR ECONOMIC ANALYSIS OF COASTAL RECREATION

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CHAPTER 1

THE USE OF ECONOMIC ANALYSIS IN COASTAL RECREATION PLANNING

1.1 INTRODUCTION

Inflation and higher taxes during the 1970's have created a public demand for increased efficiency and accountability in the allocation of public funds. This new environment presents many problems for coastal recreation planning. Traditionally recreation sites such as beachfront parks, fishing piers, and boating facilities have been considered "merit" goods and were provided when a need arose and public funds were available. In this new environment, however, public funds are in short supply but the need for new and expanded facilities has never been greater. In Florida, for example, three out of four new residents move into the coastal zone,[1] boat registrations increased from 221,619 in 1970 to 497,891 in 1980,[2] and nearly 90 percent of the state's 36 million visitors in 1980 expected to participate in at least one type of coastal recreation activity during their visit.[3] Deciding on the types, locations, and size of recreation sites that can fulfill these needs while efficiently using public funds that could be used for other public services is a difficult task. As one veteran observer of recreation planning notes:

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[1] 1980 Florida Statistical Abstract, R. B. Thompson, Editor, Bureau of Economic and Business Research, University of Florida, 1980.

[2] State of Florida, Department of Natural Resources, 1981.

[3] State of Florida, Department of Commerce, Division of Tourism, 1981.

> It is no longer sufficient to simply build or develop facilities on the premise that in the face of growing demands anything will be used by a grateful and nondiscriminating public. More than likely, almost any recreation area would be used, but the ones chosen may not be as valuable as some alternative that will be foregone because of them. There is an increasing need to provide better insight into recreational activity and the factors likely to influence use. Better justification for recreational expenditures is clearly in order.[4]

One factor that complicates planning for coastal recreation is the question of responsibility. Recreation in the coastal zone depends on a combination of private and public provision of sites and facilities. Private enterprise provides many types of recreation facilities such as marinas, campgrounds and fishing piers but, for the most part, the role of private enterprise is limited by the common property nature of most coastal resources. This common property characteristic means that no single private owner can control users of the resource or charge a price for using the resource. Common examples are beaches or artificial reefs where attempts to control entry or charge admission fees could be prohibitively expensive and could restrict profitability. In addition, many kinds of recreational demand such as bird watching or shell collecting are not reflected in any kind of market price that could guide private suppliers to meet the public demand.

As a result of the unique nature of coastal recreation, the public sector has shouldered a major part of the responsibility for providing coastal recreation sites. Local, state, and federal governments are involved in recreation planning with different concerns for the needs of recreationists. Because of this multiple level of involvement, conflicts often arise over the proper objectives of coastal recreation planning. Some efforts at federal and state coordination were attempted with the passage of the Coastal Zone Management Act and the creation of

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[4]Knetsch, J. L. Outdoor Recreation and Water Resources Planning, Washington, D.C.: American Geophysical Union, Water Resources Monograph #3, 1974, p. 3.

the Land and Water Conservation Fund but the anticipated harmony has not developed.[5]

Unfortunately there is no simple formula that provides an infallible guide to coastal recreation planning. An important insight, however, is that the provision of recreation sites and facilities requires some public or private sacrifice to yield benefits for recreationists. In this planning process, regardless of the level of government involved, economic analysis can play an important role in determining the magnitude of the sacrifices that must be made and the associated benefits. Economic analysis is principally concerned with determining what allocations of resources will lead to the most valuable products for society. The fundamental premise is that prices reflect the economic value of resources; in cases where prices are not revealed in a market setting, the individual's willingness to pay for a resource is the measure of value.[6]

The most commonly used technique for evaluating public resource use decisions is benefit-cost analysis.[7] The objective is to determine whether the benefits from a recreation site or facility (either existing or proposed) outweigh the sacrifices (costs) that must be incurred to provide the opportunity for recreationists. A properly conducted

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[5]An illustrative example of the problems can be found in A. T. Manus and J. J. Mertens "Recreational Planning and Decisionmaking in the Coastal Zone: A Case Study of Mustang Island State Park" Coastal Zone Management Journal Vol. 5, No. 1/2, 1979: 35-59.

[6]The concept of willingness to pay for recreational resources does not mean that user fees are required. This measure is a hypothetical concept that attempts to determine the value of a resource to an individual without requiring that the individual actually pay that amount to use the resource. This concept will be discussed in greater detail in Chapters 2 and 3.

[7]Benefit-cost analysis can be employed in a number of different decision frameworks. More detail on these applications is provided in Chapter 4.

benefit-cost analysis will provide an objective evaluation of alternative resource use decisions that can be an important input for the coastal recreation planning process.

1.2 ESTHETICS, ETHICS, AND ECONOMICS

Historically coastal recreation sites have been provided (or protected) for either esthetic and ethical reasons. It was argued that natural beauty as manifested by the bountiful resources of the sea deserved to be enjoyed and it was public officials' duty to insure that adequate opportunities were available for the public.[8] In a nation where competing uses for coastal resources were few, the costs of such a philosophy were relatively insignificant.

In today's climate of ever increasing demands on coastal resources, the costs of providing recreation sites are no longer insignificant. In addition there are many competing views about the proper role of government in the provision of outdoor recreation. Clearly there is some logic in evaluating which among these competing uses will provide the most happiness for society.

The criticism is often expressed that economics is useful only for commercial transactions and economics has no role in evaluating esthetic value. Furthermore, it is ridiculous to attempt to put monetary values on esthetic qualities. This criticism overlooks an important fact: art, music and poetry are priced according to the amount of satisfaction they provide to individuals. This "monetization" of esthetic qualities is not based on what economists think the value of these objects are but

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[8]This attitude was first expressed by members of the American Conservation Movement. For a review and discussion of the founders of the modern environmental movement, see H. Barnett and C. Morse Scarcity and Growth: The Economics of Natural Resource Availability, Baltimore: Johns Hopkins Press, 1963.

rather the value assigned by the public. The role of economics is not to determine whether these values are "too high" or "too low" but rather to determine what factors contribute to the relative value given these resources.

None of this is meant to suggest that coastal resources are not unusual or that an economic evaluation of coastal recreation sites is a simple matter. There are many qualities of coastal resources, especially as they relate to recreation, that make economic analysis a difficult task. The main point is that the mere presence of esthetic or ethical considerations does not make economic analysis inappropriate nor does the use of economic analysis imply that the recreation planning process should be merely a mechanistic computation and comparison of benefits and costs. Other analytical approaches such as those offered by psychology, sociology, and anthropology offer many important insights into that bundle of diverse activities we heroically label "coastal recreation" and make this a fruitful area for interdisciplinary work.[9]

The role of economic analysis in coastal recreation planning is to establish the relative value of sites and facilities so that informed decisions about the use of these resources can be made. Recreation economics is only a recent area of research[10] and considerably more progress in techniques and data collection are necessary. However, the

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[9]Carls makes the prudent observation that rigid adherence to the purely esthetic justification for coastal recreation may not be expeditious. He writes, "...the esthetic campaign has frequently been self-defeating in its insistence that esthetics are of immeasurable value to society. These arguments have been ineffective and sometimes counterproductive in the decision making maelstrom of budgeting, legislation, and litigation." (p. 120). Carls also discusses the status of research in the field of esthetics in E. G. Carls "Coastal Recreation: Esthetics and Ethics" Coastal Zone Management Journal Vol. 5, No. 1/2, 1979: 119-129.

[10]The first formal consideration of recreation economics was in a letter by an economist, Harold Hotelling, to the National Park Service in 1949. Prior to this, recreation was generally considered beyond the realm of economic analysis.

progress to date indicates that the coastal recreation planning process could benefit from the information provided by economic analysis. Recreation planning is a continuous process of assessments and modifications that is appropriately suited for improving the precision of the techniques used in recreation economics.

1.3 OVERVIEW OF THE HANDBOOK

This handbook is intended principally for practitioners in the area of coastal recreation who have little or no background in economic theory. The purpose is to provide an introduction to the theory and practice of recreation economics with special attention to coastal recreation issues. Since this area of specialization has been accessible principally through technical reports of government agencies and journal articles, this handbook is an attempt to synthesize this research for the use of the general reader. No special quantitative skills are necessary but some understanding of statistical regression analysis would be useful in understanding the techniques of empirical recreation demand estimation. Each chapter includes a bibliography of reference material for readers who are interested in pursuing particular topics in greater detail. Although this handbook explains the methods of benefit-cost analysis, it should be considered a complement rather than a substitute for more comprehensive treatments such as those by Mishan[11] or Sassone and Schaffer.[12]

Chapter 2 provides a general framework for determining benefits and costs in coastal recreation. A discussion of the concept of economic value is followed by a detailed look at how this theory of value applies

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[11]Mishan, E. J. Cost - Benefit Analysis, New York: Praeger, 1976.

[12]Sassone, P. G. and W. A. Schaffer Cost - Benefit Analysis: A Handbook, New York: Academic Press, 1978.

whether market prices exist or if an analytical method is used to determine a "shadow" price when no market exists. This chapter also presents definitions and explanations for terms commonly used in economic analysis that will help the recreation planner understand the jargon of economics.

Chapter 3 includes a detailed discussion of methods that can be used to implement the theory of economic value explained in the preceding chapter. First, a discussion of how market prices can be used to estimate the benefits of a recreation site is presented. This is followed by a step-by-step explanation of the two most commonly used methods of non-market valuation, the travel cost and contingent valuation methods. The emphasis here is on actual use of these methods and illustrative examples are provided.

Chapter 4 provides some insights into the use of surveys in economic research and offers some suggestions about the types of surveys that are better suited for different valuation methods.

Chapter 5 presents a comprehensive discussion of how benefit-cost data can be used in planning decisions. The focus is on public investment criteria and includes a comparative analysis of commonly used decision criteria such as benefit-cost ratios, net present value, internal rate of return, and other measures of investment feasibility. Some difficult aspects of the economic analysis of coastal recreation such as irreversibilities and equity are also presented.

Chapter 6 presents some concluding remarks.

CHAPTER 2

IDENTIFYING BENEFITS AND COSTS FOR COASTAL RECREATION

2.1 VALUATION AND QUANTIFICATION

A necessary first step in determining whether a recreation project will improve the public well-being is the identification of benefits and costs resulting from the project. This requires the quantification of two broad measures of public well-being: 1) the value of the recreational service provided by the recreation project, and 2) the value of the resources that must be given up to undertake the recreation project. Vague statements about these values such as "significant" or "minor" are relatively useless since they provide no concrete basis to analyze the tradeoffs between alternative recreation projects. While it is an easy task to press the need for quantification, the actual measurement of benefits and costs is not always a simple undertaking. However, the task is more straight-forward if the analyst has a clear understanding of the factors that determine the economic value of a resource.

The value of goods and services depends ultimately on their importance to individuals. A person would consider a good or service to be of value to him only if it contributes favorably to his personal welfare. Recreation facilities offer enjoyment to individuals through the pursuit of leisure activities such as fishing, swimming, camping, etc., or through the provision of esthetic experiences that enrich the quality of an individual's life. Examples of the latter are nature trails, scenic vistas, or wildlife preserves.

Economists use the term utility to describe the satisfaction that an individual receives from these activities. Utility is not a stable and inherent characteristic of recreation facilities but varies with each individual's own personality and social condition. Similarly,

utility depends on not only the physical existence of a recreation facility but also upon the attributes of particular facilities that contribute to an individual's enjoyment. For example, an ardent swimmer may derive considerable utility from a public beach whereas a confirmed city dweller might get little utility from a public beach. In addition, the swimmer might derive greater utility from a beach that offered amenities such as showers and a lush, tropical setting than a beach in a congested urban area that offered only swimming.

It is generally held that as the utility from an activity increases, the value to the individual increases. However, it is important to realize that the value to the individual also depends on the resources that must be given up to enjoy the activity. The resources given up, defined as the opportunity cost of the activity, are the costs that must be incurred to attain utility from the activity. Value then is determined by the net utility from the activity, or

Value = Total Utility - Opportunity Cost

In the preceding example, the swimmer may derive more total utility from the scenic beach with showers than the urban beach but a visit to the scenic beach may require a drive of several hours compared to the nearby urban beach. The value of each facility to the individual will depend on the net utility, also called net benefits, that the individual enjoys after assessing the costs of travelling to each beach. Clearly a recreational activity would only have value to an individual if it provides, at minimum, satisfaction equal to the resources which must be given up.

Different attitudes, desires, and social factors lead to different perceptions of value by individuals in a community. While this complicates the problem of trying to determine the value to an individual of a recreational facility, it is the foundation for assessing the social value of a recreation facility. The fundamental precept of benefit-cost analysis is that the social value of a project is the sum of the individual values of the project. These individual values are aggregated without regard for which groups bear a higher opportunity cost or which

individuals receive the most net benefits. In effect the benefit-cost criterion is "politically blind" to the distributive aspects of the project. Even though individuals may place a different value on a specific recreational activity, it is the net sum of these values that determines the economic value of a recreational project. The implications of disregarding equity aspects of project selection are discussed in greater detail in Chapter 5.

2.2 THE DEMAND FOR RECREATIONAL ACTIVITIES

Recreation activities satisfy individuals' needs. People engage in recreation activities to fulfill personal needs, whether they be physical, social, or esthetic, just as people purchase food, clothing, and shelter to satisfy their needs. In modern American society very few goods and services are purchased solely for physical needs; most are purchased with some degree of concern for esthetic qualities. A new sweater or a dinner in a restaurant are rarely selected only for their ability to provide warmth or satisfy hunger. Similarly, recreation activities are selected on the basis of their contributions to individuals' perceptions of physical and esthetic qualities.

While most people recognize the importance of recreation activities, the demand for recreation is poorly understood because many recreational facilities are not priced in a market setting like clothing and food. Some recreation activities such as sporting events or theme parks like Disney World are market goods and their value to society is determined through the interaction of supply and demand. Other types of recreation facilities such as beaches, fishing piers, nature trails, or wildlife preserves are usually provided by public authorities because of several factors that inhibit profitable private enterprise. For these recreation activities no market price exists because most public authorities only charge a fee to cover maintenance for the facility. As a result there is no direct information available to determine the value of these facilities to individuals.

Even though these recreation activities do not have a market price, this does not mean that these services are, or should be, free economic goods. Individuals decide which market goods and services to purchase on the basis of the amount of utility they expect to enjoy and the resources that must be given up as reflected in the price of the good and the time and effort necessary to acquire the good or service. These costs are opportunity costs and, when compared to the individual's utility, determine the value of that good or service to the individual. It follows that an individual would not purchase a good if the opportunity costs exceed the expected utility. Nonmarket recreation activities also involve opportunity costs for individuals in the form of time and resources that must be given up to engage in the activity. Individuals would choose to participate in specific recreational activities as long as the expected utility exceeds the opportunity cost of participation. These concepts are the basis for estimating the demand for specific recreation facilities.

2.3 DEMAND ESTIMATES WITH MARKET PRICES

To undertand how these concepts are useful for estimating the demand for recreation activities, consider an example using a recreation facility that has a market price. Serendipity Park is a privately owned lake that offers swimming, boating, and picnicking facilities for its customers. Wayne Waterbug is a frequent visitor to the Park. Over the past several years the Park has changed its admission price to reflect changes in the price of other nearby recreation activities.* During this period, Wayne's visits to the Park were as follows:

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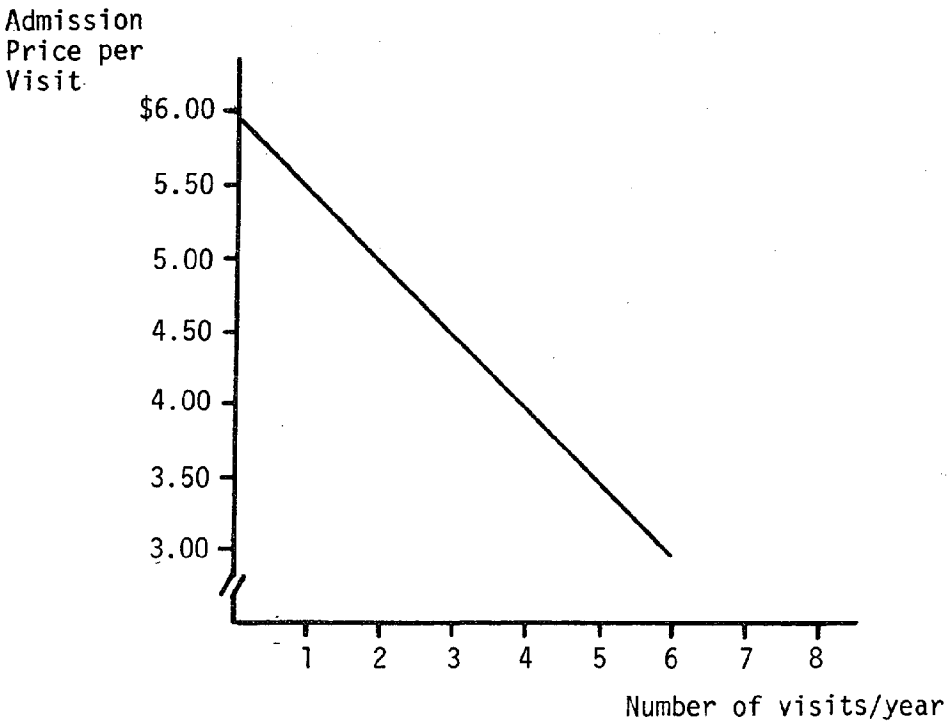
*For this example, it is assumed that the admission price changes do not reflect the effect of inflation.

Year	Admission Price per Visit	Number of Visits per Year
1976	$3.00	6
1977	4.00	4
1978	3.50	5
1979	4.50	3
1980	5.00	2
1981	6.00	0

This schedule shows Wayne's demand for the Park's facilities. It also demonstrates an important economic principle: as the price (or opportunity cost) for an activity decreases, the consumer will purchase more units (visits). These additional units, however, do not add as much to total utility because of the principle of diminishing marginal utility. This means simply that an individual gets less enjoyment per unit from successive use of a recreation facility. This same principle would apply to additional pieces of chocolate cake or purchases of movie tickets.

Wayne's demand for the Park's facilities can be presented in graphic form with the admission price on the vertical axis and the number of visits on the horizontal axis as in Figure 1.

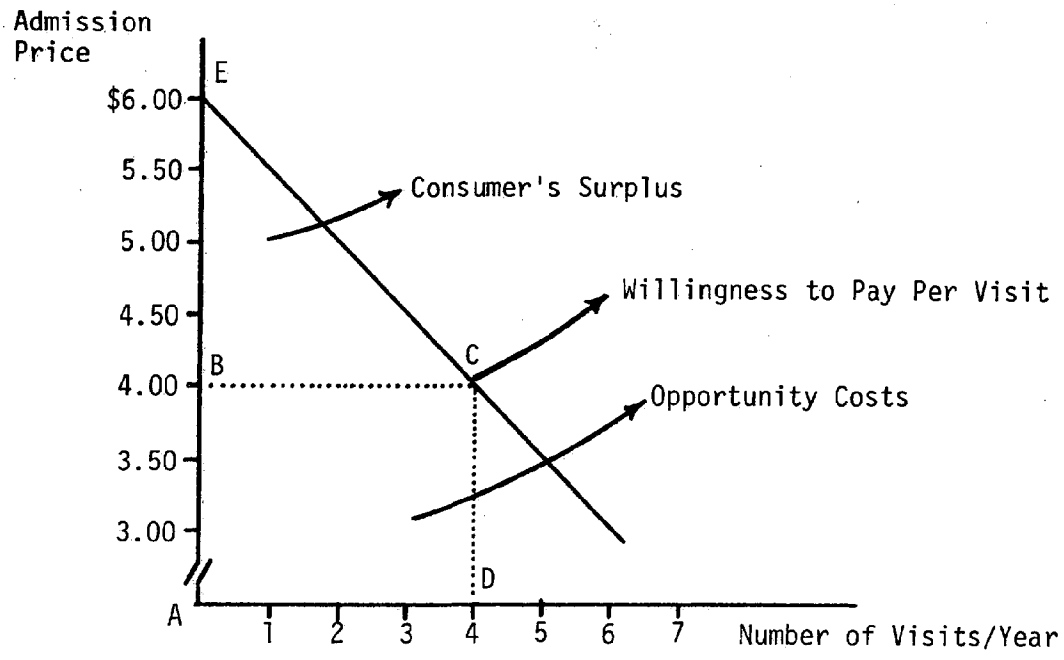
Figure 1: Wayne Waterbug's Demand Schedule for Serendipity Park



The demand schedule illustrates the inverse relationship between price and quantity. It also shows the willingness to pay for additional visits to the Park. Since Wayne is still willing to pay $5.00 for each of two visits per year to the Park, we can safely assume that Wayne is getting utility from each visit that is equal to $5.00 per visit.

Now that we have this information, we can demonstrate its usefulness for determining the value of a recreation facility. Let's assume that in 1982 the admission charge to the Park is dropped to $4.00 because of the decrease in the number of customers in 1981 resulting from the $6.00 admission charge. We know from our demand schedule that at $4.00 per visit, Wayne will visit the park 4 times. In Figure 2, the

Figure 2: Illustration of Willingness to Pay, Opportunity Costs, and Consumer Surplus for Visits to Serendipity Park



total opportunity costs are Wayne's expenditures of $16 ($4 x 4) and these are given by the rectangle ABCD. The total utility that Wayne enjoys from the 4 visits to the park is given by the area AECD. Clearly Wayne is enjoying more total benfits than he is giving up in the $4 cost of admission since his demand curve shows that he would be willing to pay more for each visit than the actual admission charge. The total utility that Wayne derives from his 4 visits then is equal to $19 ((1 x $5.50) + (1 x $5.00) + (1 x $4.50) + (1 x $4.00)). The value or net benefit of the facility to Wayne is given by:

Net Benefit = Total Utility - Opportunity Cost

$3 = $19 - $16

This value or net benefit that we have identified is also referred to as the "consumer's surplus." This concept was first proposed in 1844 by the French engineer Dupuit who defined consumer surplus as, "The difference between the sacrifice which the purchaser would be willing to make

in order to get it, and the purchase price he has to pay for the exchange."[13]

Since Dupuit, the concept and use of consumer's surplus have grown in popularity until today it is the most important component in a benefit-cost analysis. However, from a theoretical basis, the consumer's surplus is not a completely correct measure of the value of a recreational activity. The theoretically correct measures are either the compensating variation (CV) or the equivalent variation (EV). The compensating variation would determine the maximum amount of money that an individual would be willing to pay to purchase a good at some lower price. The equivalent variation would determine the minimum sum of money that a consumer would accept to give up the opportunity to purchase a good at a lower price. In both cases we are trying to leave the consumer at the same level of satisfaction but we are instead using money income as a substitute for the utility from consumption of a good. In our previous example, we could estimate the compensating variation by asking Wayne, "What is the maximum amount you would be willing to pay to be able to purchase 4 visits to the park at $4 per visit?" Or, alternatively, we could ask, "What is the minimum amount of money you would accept to give up the opportunity to visit the park 4 times at $4 per visit?" In each case we would expect an answer of about $3 but the differences between the answers could be large.

As a practical matter the use of compensating variation and equivalent variation measures of the value of a recreation activity is limited. In the case of a recreation facility that has a market price, the effort required to obtain estimates of these measures is not warranted. (This is not necessarily the case for goods with no market price as we shall soon see). In this situation, we can rely on the consumer's surplus measures as an accurate indicator of the value of a good to the consumer if two conditions are met:

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[13]Currie, J.M., J.A. Murphy, and A. Schmitz. "The Concept of Economic Surplus and Its Use in Economic Analysis," Economic Journal 81 (1971): pp. 741-799.

1) The price or quantity changes being considered in the analysis are relatively small and,
2) The portion of income spent for the good is a small part of total income.

For most recreational activities that bear a market price these conditions will be satisfied and the consumer surplus can be relied on as an accurate measure of the value of a good to an individual.

2.4 AGGREGATING TO TOTAL DEMAND WITH MARKET PRICES

The principles that apply for an individual's demand for a recreation facility are also appropriate for determining the total demand for a facility. The recreation experience produces satisfaction that users are willing to pay for according to the amount of pleasure they receive. According to economic theory, the total demand relationship for all users can be determined by observing the number of visits for individuals at different prices.

To illustrate this point, let's return to Serendipity Park. A summary of Park visitors during past years is presented in Table 1.

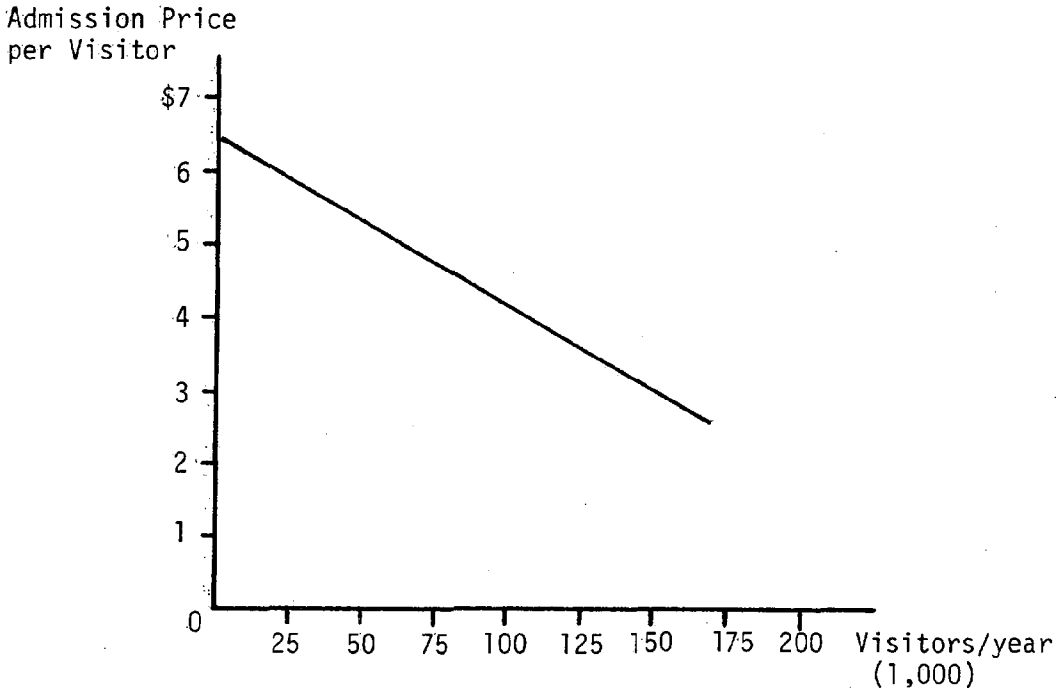
Table 1.--Demand Information from Users of Serendipity Park.

Year	Admission Price Per Visitor	Number of Visitors/Year (in 1000's)
1976	$3.00	150
1977	4.00	100
1978	3.50	125
1979	4.50	75
1980	5.00	50
1981	6.00	25

As in the previous analysis of an individual's demand for a recreation experience, the principle of diminishing marginal utility is indicated by the declining number of visitors as the admission price increases. We can now construct a total demand curve for Serendipity Park which shows the schedule of visitors that occur at different prices. The total demand curve, illustrated in Figure 3, shows the total willingness to pay of consumers for the recreation activity and is the summation of individual marginal values. As a result, the total value of the Park can be estimated using the total demand curve.

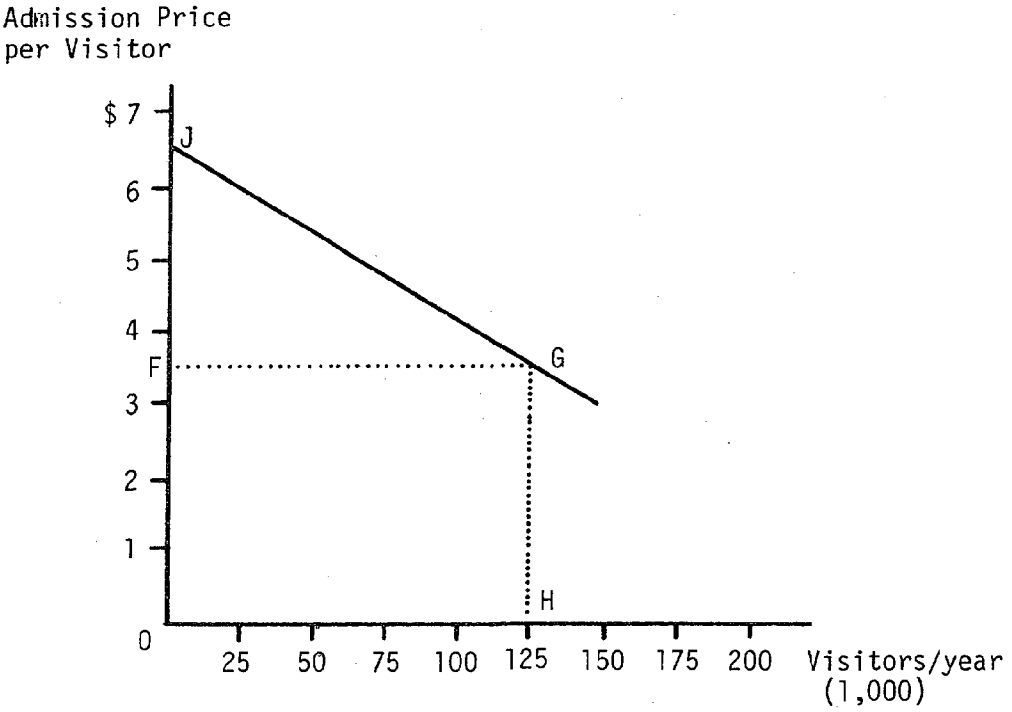
At the price of $3 per visit, 150,000 visitors will come to Serendipity Park. Thus each of these visits must have a value of at least $3. If the price were $3.50 per visit, some of these same people would make 125,000 visits indicating that many of the visits they could have obtained for $3 were actually worth more to them. The difference between what they would have paid and what was actually paid is the consumer's surplus. Now, in the context of the total demand curve, we can refer to this as the consumers' surplus since it represents a gain to all users of the Park.

Figure 3: Total Demand Curve for Users of Serendipity Park



We can estimate the total value of the Park in a manner analogous to the procedure used earlier to estimate individual value. Let us assume that the cost of maintenance and a fair return to the owners of the Park is $3.50 per visit. At this price we can estimate the net benefits from the Park. In Figure 4 the visitors pay $3.50 for 125,000 visits as shown by the area OFGH. Since some would have been willing to pay the consumers surplus also, the total actual willingness to pay is measured by the total demand curve in the area OJGH. The total net benefit is the difference between the total benefits given by the consumers' total willingness to pay and the cost of providing the recreation facility; this total net benefit is given by the area FJG in Figure 4.

Figure 4: Illustration of Total Net Benefits from the Total Demand Curve for Serendipity Park



It should be apparent that the total net benefit uses the same definition of value we introduced earlier, namely,

Value = Total Utility - Opportunity Cost

which in the case we are considering becomes

Total Net Benefits = Total Benefits - Total Cost

Thus, in our example, the total benefits are

$$\begin{aligned}\text{Total Benefits} &= (\$6.00 \times 25{,}000) + (\$5.00 \times 25{,}00) + \\ &\quad (\$4.50 \times 25{,}000) + (\$4.00 \times 25{,}000) + \\ &\quad (\$3.50 \times 25{,}000) + (\$3.00 \times 25{,}000) \\ &= \$650{,}000\end{aligned}$$

The total costs are $437,500 ($3.50 x 125,000). Thus, the total net benefits are

$$\$212,500 = \$650,000 - \$437,500.$$

This exercise has demonstrated that the economic value of a recreation facility can be estimated using relatively simple data. The market price of admission is an indication of the amount individuals are willing to pay to use a facility and the net benefits can be derived using the market price. For small changes in the amount of recreation provided, this approach will provide reliable estimates of the total net benefits. Although the same concepts apply, the analysis becomes more complicated when we consider recreation activities that do not have a market price.

2.5 DEMAND ESTIMATES WITHOUT MARKET PRICES

The reason why some goods and services are exchanged in a market is because these goods and services can be traded between individuals and one person's enjoyment prevents others from using the goods or services. These two conditions of private goods, referred to by economists as excludability and rivalry, are typically not present for many goods that are "public" in nature and, hence, are not exchanged in a market. For example, a beach cannot be readily exchanged between individuals and one person's use of the beach does not prevent others from enjoying it also.

These goods that are typically not provided by the market are difficult to value because they do not have a market price and there is

usually no charge for their use.[14] As a result there is no explicit, objective yardstick of their value. This creates a difficult problem because the analyst must find some way to determine the value of the good to individuals.

The simplest way would be to ask individuals what dollar value they give to a particular public good such as a public beach. The problem with this approach is that, unlike the market transaction, the person may try to conceal or misrepresent their true feelings. For example, someone in favor of more public beaches might overstate the value of a new beach in the hopes that this will bring about more public beaches. Similarly someone who dislikes open beaches and prefers more fishing piers might understate the value of the beach in the hope that this might lead to more piers. Additionally, someone who enjoys the use of a free recreation resource might understate the value if he suspects that his response will be used to set up a user fee system.

These problems of assigning a value to goods that do not have a market price are not insurmountable. To see how we can construct a demand curve for a public good, let's first define a measure of value that can be used in many different situations where market prices are absent.

Recall that in our earlier discussions we focused on the demand curve as a schedule of amounts that an individual would be willing to pay for certain quantities of a good. In this situation we could observe the change in quantity demanded that occurred with a change in prices. Consider now an individual's "income tradeoff" or "bid" curve

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[14]Quite often these public goods are provided by local, state, or Federal government and users are assessed an entrance fee. This fee, however, is usually intended only to cover maintenance costs and should not be confused with a true market price. Similarly, public goods are provided through taxation; this "indirect" price for the good may bear no relation to the value of the public good to an individual and is not an acceptable substitute for the market price.

illustrated in Figure 5.[15] The origin represents the individual's initial quantity of the good such as number of visits to the beach, number of times fishing on a pier, etc. Moving to the right away from the origin, such as to A, indicates an increase in the availability of the good while a move to the left of the origin indicates a decrease in the availability. The vertical axis measures income. Movement up the axis away from the origin indicates a decrease in income while a move down the axis reflects a gain in income.

The bid curve represents an individual's willingness to give up or receive income in exchange for more or less of a good.[16] For example, to gain an additional amount of the good equal to OA, an amount of income equal to OI_1, would be given up. This is comparable to the willingness to pay measure used earlier for increases in the amount of a market good. On the other hand, the individual would accept a decrease in the quantity of the good equal to OB only if he were compensated in the amount of at least OI_2. This willingness to accept measure is also a valid measure of individual welfare.

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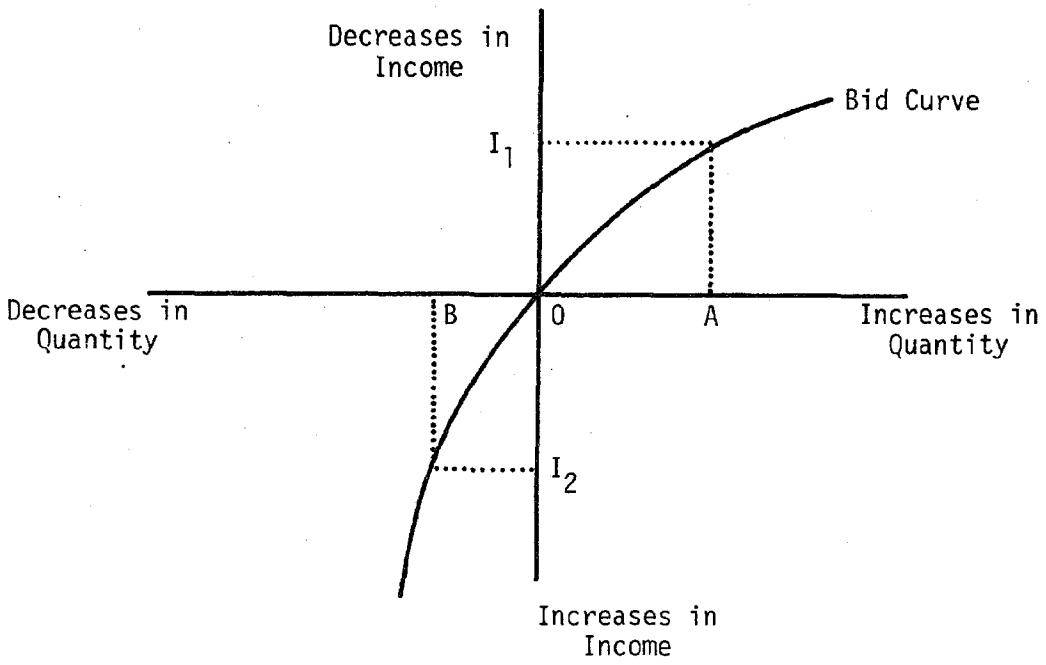
[15]This analysis is adapted from A. Randall Resource Economics, Columbus, Ohio: Grid Publishing, 1981: 297-299.

[16]Since the initial welfare level is used as the reference point, this corresponds to the compensating variation measure of welfare change.

Figure 5: Individual's Bid Curve for Changes in the Quantity of a Public Good



The bid curve can be used in a manner analogous to the demand curve. The area under the bid curve is a measure of the individual's gain or loss in consumer's surplus resulting from more or less of a good. For example, suppose that a new beachfront park is to be built using tax dollars. A study of individual bid curves[17] shows that the average person is willing to pay (give up an amount of income equal to) $20 for an additional visit to the beach each year. It is expected that an additional 75,000 beach visits will occur each year with the new park. Thus the total benefits of the new park would be:

Total benefits = Average Bid x Number of Visitors

$1,500,000 = $20 x 75,000

If the new park would cost $1 million per year, the total annual net benefit to society from the new park would be:

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[17]The different techniques for estimating individual bid curves are discussed in greater detail in Chapter 3.

Total net benefit = Total benefits - Total cost

$500,000 = $1,500,000 - $1,000,000

The bid curve can also be used to construct a demand curve by dividing the bid schedule by the quantity measure at different levels of the good. These and other related techniques will be considered in the following chapter.

2.6 THE COST OF RECREATIONAL FACILITIES

The key concept in determining the cost of a recreation facility is opportunity cost. This is a measure of the materials and productive services that must be used to create the facility and maintain it. Typically all inputs to a project will be treated as costs and priced at their acquisition cost. This cost of acquisition will reflect society's valuation of these inputs in alternative productive uses. However, in cases such as a project that would use estuarine marsh land, the acquisition cost may not reflect the full opportunity cost of using the resource. In these situations, it is more appropriate to consider the benefits that would occur if the input were not used in the project. This application of the opportunity cost concept is called the "with and without" test and will be discussed in greater detail below.

Inputs with Market Prices

The opportunity cost of inputs for recreation projects that use inputs purchased in the open market is a straightforward calculation. For these inputs, the market price reflects the value society places on their use. The total cost of the inputs then is simply the sum of the prices paid for each input.

Consider an example of an artificial reef project. Artificial reefs are constructed of old concrete pipes, scrap metal, worn tires, or a variety of otherwise junk items for the purpose of providing a haven for fish and recreation for anglers and divers. The inputs required for the project consist of:

- A barge and crane to transport and deposit the reef materials offshore,
- A boat to assist the barge and skilled workers to operate the equipment,
- A scuba diver to position the reef material and to check on the anchoring of the reef material,

The junk and scrap material to build the reef.

For the Tampa-St. Petersburg artifical reef project the following input costs were incurred during 1973-1976:[18]

Item	Cost
Barge and crane	$ 67,106
Boat, motor and accessories	7,735
Crane operator and crew	95,423
Operating and maintenance	28,100
Junk and scrap material	0
Total Cost	$198,364

These costs reflect the price of acquiring these resources for the project and are a reliable measure of the opportunity cost of using these resources for the project. Since the junk and scrap material were disposal problems that would normally go into a landfill, they were a costless input to the project.

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[18]This is only a partial listing of the costs incurred in the artificial reef project. For a complete listing of the actual and estimated costs see Eila Hanni and H.H. Mathews, "Benefit-Cost Study of Pinellas County Artificial Reefs," Florida Sea Grant Technical Paper No. 1, May 1977.

Inputs without Market Prices

Quite often with coastal recreation projects inputs will be needed that do not have a market price that reflects the full opportunity cost of using that resource. In this situation it is more appropriate to calculate a substitute or shadow price to properly measure the opportunity cost. While this seems like a simple exercise, in practice it can be very difficult. For example, in the artificial reef example above, the costs did not include an item for the sea bottom where the reef would be located. Since artificial reefs are typically located several miles offshore on sandy bottom, there are no prices for this land and the local ecological damage is minimal. As a result society does not give up anything in using this resource and hence there is no opportunity cost.

Consider now a marina project that would be located in a coastal marsh estuary. In this case, there may actually be a market price for the wetlands needed for the project but the price does not reflect the full opportunity cost of using that resource. Building the marina may cause damage to the ecosystem of the estuary and reduce biological productivity. The market price is thus a poor indicator of the resource's value to society.

Estimating the shadow price of the marsh land is one way of determining the true opportunity cost but this is a difficult task. It requires estimating the value of a variety of marine organisms that depend on the marsh land and are useful to society.[19] In practice this may require several years of research and the skills of biologists, chemists, environmental engineers, and economists.

An alternative is to apply a "with or without" test. This means simply that the costs of the project are defined as the benefits from the resources without the project. The implication is that a project

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[19]Lynne et al. provides one attempt at valuing marsh land in G.D. Lynne, F. Prochaska and P. Conroy "The Economic Value of Marsh," Journal of Economics and Environmental Management, Vol. 8, No. 1, June 1981.

would not be acceptable if the benefits from the proposed use of the resource are no greater than the benefits of the resource in its present use.

In the case of the marina project, it would be necessary to determine what benefits are derived from the marsh land in its current use, and compare these with the potential benefits from the marina. In this manner it may be easier to decide whether the project justifies altering the resource.

2.7 A TAXONOMY OF BENEFIT-COST TERMS

One of the major difficulties in evaluating a coastal recreation project is deciding on a clear definition of the benefits and costs of the project. In the past few years many terms have been developed to clarify the types of impacts a project can have. These terms, however, can create more confusion if they are not used properly. This section presents the major terms used in benefit-cost analysis and gives a description of their meaning and use.

Internal and External Effects

The primary concern of an analyst evaluating a proposed recreation project should be the benefits and costs accruing to the affected community. This "community" could be as small as a town or as inclusive as a multi-state region; the exact boundary will depend on the scope of the project and the proximity of expected users. Those benefits and costs which are internal to the project will accrue to individuals in the affected community and may be either direct or indirect. Direct effects result in an increase (decrease) in the productive output of the community or a change in the consumer's surplus of individuals in the community. For most recreation projects the direct effects will be measured using the consumer's surplus measure developed earlier in this chapter. For example, the direct effects of a proposed beachfront park to

be built by a county government would be the increase in consumer's surplus to users of the park[20] and the opportunity cost to the county of constructing and maintaining the park.

Indirect effects occur as a by-product of the project but are still internal. These effects may occur in response to the project and caution should be used in including them. Frequently used examples of indirect or "secondary" effects include employment benefits or improved business in areas surrounding the project.[21] In the case of a new beachfront park, the indirect effects might include employment for lower income workers and increased revenue for tourist and novelty shops near the beach. In most cases, however, these indirect effects should not be included directly in the project analysis unless:

a) the local area is chronically depressed and available resources are being used at below full capacity, and
b) the project does not draw productive resources away from other sectors of the local economy.

The external effects of a recreation project accrue to others outside of the affected community. In most situations these external effects are involuntarily received and are not deliberately caused by the project. In economic terms these external effects are called externalities. In the example of a new beachfront park, new tourists may be attracted to the park from other park facilities outside the community. This could result in lower revenues for these other parks and the

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[20]The users of the park may be either county residents or visitors from outside the county. Some overstatement of benefits may occur if users of the new park previously used other county parks and the net visits per year of users does not increase.

[21]These benefits are often assigned through the use of an "income multiplier." For a discussion of the appropriate use of multipliers see B.H. Archer "The Uses and Abuses of Multipliers" in Planning for Tourism Development, edited by C. Gearing, New York: Praeger, 1976, or L.S. Davidson and W.A. Schaffer "A Discussion of Methods Employed in Analyzing the Impact of Short-Term Entertainment Events" Journal of Travel Research Vol. 18, No. 3, Winter 1980: 12-16.

surrounding businesses. These lost revenues, however, occur outside the boundary of the project and therefore should not be included in the analysis.

The most frequently made mistake in recreation project analysis is double-counting. This refers to the inclusion of real benefits and costs more than once in the analysis. For example, if the benefits of a new beachfront park are based on more beach visits for the affected community, then the benefits should not include increased tax revenues from increases in the tax base of businesses close to the beach. Even though this reflects a source of revenue to the residents of the affected community, it is really only a transfer of income from some members of the community to others. To emphasize once again, the benefits and costs should reflect real changes in the welfare of the affected community and not transfers of resources between members of the community.

Incommensurables and Intangibles

The terms incommensurables and intangibles refer to legitimate direct effects of a project that cannot easily be expressed in dollar terms. Many, if not most, recreation benefits can be quantified using the techniques described in Chapter 3. These benefits are termed incommensurables because they are elusive but possible to evaluate. On the other hand, intangibles are effects of a project that cannot be translated into the common denominator of a dollar value. Examples of intangibles might be the reduced delinquency among juveniles due to a new park or the esthetic value of an undeveloped beach.

There are two ways of treating intangibles in a project analysis. The first is to develop a descriptive analysis of the intangible effect that would serve as a complement to the quantified effects in the benefit-cost analysis. An alternative approach is to identify a particular intangible effect as the objective for the project (e.g., minimize juvenile delinquency in a certain area) and then use a cost-effectiveness analysis to determine if the project is the best alternative (See Chapter 4 for a discussion of cost-effectiveness analysis).

Regardless of whether the effect is an incommensurable or an intangible, a complete analysis of a recreation project should address the magnitude of the possible effects. All too often recreation projects are justified on their "merit" alone, with little consideration of the costs for the community. A complete inventory of all the possible effects of a project will increase a decision maker's understanding of the alternatives for improving community welfare.

CHAPTER 3

ESTIMATING THE DEMAND FOR COASTAL RECREATION

3.1 INTRODUCTION - WHAT DO YOU WANT TO ESTIMATE?

Recreation and recreation facilities include a wide variety of activities and locations for these activities. Coastal recreation such as swimming, fishing and boating requires beaches, fishing piers, launching ramps, and marinas to carry out these activities. Quite often the view is expressed that the benefits from these recreation facilities more than offset the costs of providing them and therefore as many recreation facilities as possible should be provided. This view overlooks an important consideration: if the benefits from a facility are not greater than the costs, then society would be better off if the funds (either public or private) for providing the facility were used for some other purpose. Therefore it is vitally important to be able to estimate the dollar value of coastal recreation activities and facilities.

There is considerable misunderstanding about the term "demand" when applied to recreation. Frequently this term is used to mean the actual or predicted number of visits to a recreation site within a period of time. The use of 'demand' in this context neglects the important relationship between the number of visits and the price of these visits described in the preceding chapter. In addition, with no information about the price that visitors are willing to pay for the use of the facility there is no way to determine the value of the facility to society. Therefore the appropriate definition of demand is the relationship between the number of visits during a specific time period (quantity demanded) and the price per visit with appropriate regard for income and other important factors.

This important distinction is the key to understanding the different types of models used to estimate recreation demand and the benefits

of a recreation facility. We can broadly classify these models into two types: (1) socioeconomic participation models, and (2) economic demand models. The first type of model is used to estimate the visitation rates for different groups in the population according to race, sex, age, income, etc. This information is useful since it can be used to predict participation at a recreation site and it provides some understanding of the users of recreation facilities.[22] These models also have the advantage of being relatively easy to collect data for and to estimate. The major shortcoming is that these models provide no direct estimates of the benefits from a recreation site. Since a price variable is not included in the model, the true economic demand cannot be estimated. Some indirect methods of determining the value of a recreation facility with a participation model have been devised using the concept of a "user day value." This "value" is supposed to be an "average price" that users would be willing to pay for the use of facility. However, quite often this value is selected arbitrarily or represents a national average. For example, the U.S. Army Corps of Engineers employs user day values established by the U.S. Water Resources Council for general and specific types of recreation. No distinction is made for regional or local differences in preferences, income, or other factors that influence the willingness to pay for recreation. An estimate of the total value can be made by multiplying the estimated number of visitor days from a participation model times the user day value. The

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[22]A socioeconomic-participation model is used as a part of the statewide recreation planning process by the Florida Department of Natural Resources. The model is based on a survey of residents and visitors to determine their use of recreation facilities in different regions of the State. These "user-occasions" are extrapolated to determine participation rates for all residents and visitors. Predictions of future participation are made on the basis of trends in population growth. The method does not consider the price of participation, the income of users, or changes in recreation patterns. For more details on the models see Outdoor Recreation in Florida - 1981, State of Florida, Department of Natural Resources, Division of Recreation and Parks, Tallahassee, Florida (1981).

method is simple and is commonly used by Federal agencies. However, this must be considered a relatively crude method when applied to local recreation projects.[23]

The second type of recreation model, the economic demand model, focuses directly on the value of recreation to individual users. Economic demand models represent the individual's willingness to pay for recreation and can be classified into two groups: population user models and site user models. The population user model is usually developed from a survey of residents in the area served by a recreation facility. The purpose is to collect socioeconomic information that can be related to the participation and willingness to pay of different individuals. This information is useful for identifying the demand for recreation activities in particular areas and for obtaining information about non-users.

Site user models typically are based on surveys of users at a specific recreation site. Socioeconomic as well as willingness to pay information is collected on those using the facility and this data can be used to estimate the demand curve.

The principal shortcoming of both groups of economic demand models is that they are based on the demand for existing facilities. The demand curve may change with the introduction of new facilities or a new facility may offer an activity that is unlike any other. Despite these problems, estimates of the value of recreation can be based on the demand for existing facilities as long as one is aware of the potential limits.

In the sections which follow a more detailed analysis of economic demand models that can be used to determine the benefits from coastal

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[23]The user day value approach is useful for making relative comparisons between competing projects at the national level. Since this approach does not consider the marginal utility of additional user visits or differences in value due to location or income, it is of no use in determining local issues such as the optimal size of the recreation facility.

recreation is presented. The discussion begins with a consideration of the use of market prices in estimating recreation demand. The next section presents the "travel cost" method which is a site user type model for estimating demand when no market price exists for the recreation activity. The last section discusses an alternative method to estimate demand without market prices called "contingent valuation."

3.2 THE USE OF MARKET PRICES

As discussed in the previous chapter, information on the use of a recreation facility at different market prices can be used to construct an economic demand curve. Quite often, however, the concern is to estimate the demand and value for an existing public facility or a new public facility that only charges to cover maintenance and/or operating costs. If information is available about market prices for a comparable recreation facility, then these market prices can be used as a measure of the "average" willingness to pay for the recreation facility.

Consider an example of a proposed public marina. The local recreation planning authority estimates that the community needs at least 100 new slips to meet community growth. In the local area the market price for slip rentals is $700 per year.[24] This situation is depicted graphically in Figure 6. Since we don't have any reliable information about the entire demand curve, we cannot estimate the total benefits from the marina. However, we do know that the 100 slips would be 100% utilized at a price of $700 per year. Therefore a minimum estimate of the benefits would be the rectangle OABC or, in this case, $70,000 per year.

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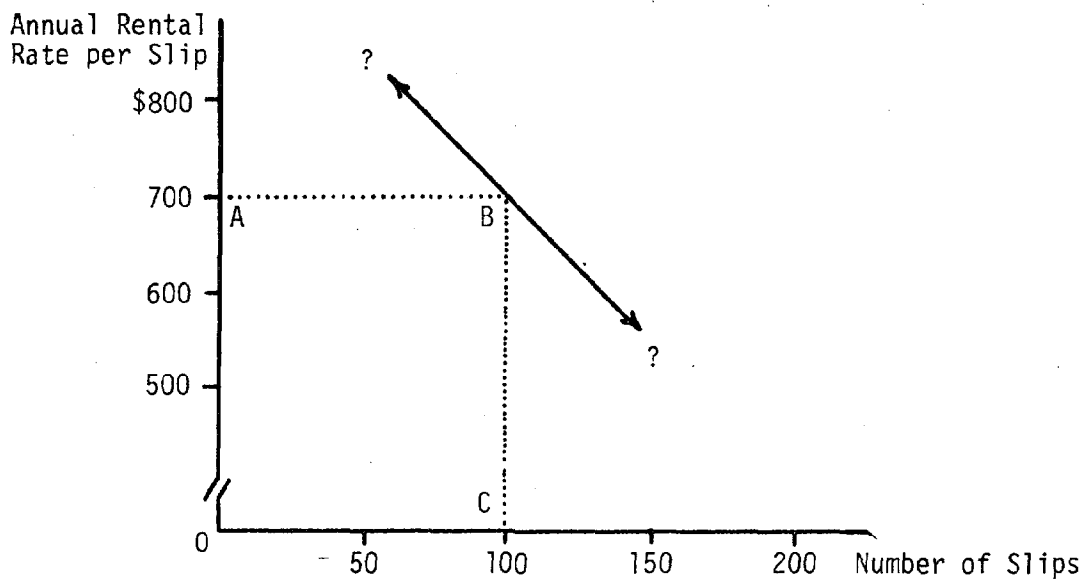
[24]This example assumes that the new public marina would not draw customers from existing private marinas and the market price would not be changed due to the new capacity.

Figure 6: Market Price as an Estimate of Average Willingness to Pay for Marina Slips



When sufficient market information is available to estimate the total demand curve, this should be done since it will provide more complete information about the total benefits. In situations where this information is not available, the market price will serve as an acceptable proxy for the average willingness to pay. Considerable caution must be exercised, however, in using market price in this manner. First, the market price should always apply specifically to the recreation activity being considered. An artificial reef could be constructed to provide a fishing spot for anglers. Even though one of the benefits of the reef would be fish for the dinner table, it is incorrect to determine the total benefits according to the market value of fish that would be caught on the reef. A correct approach would be to recognize

that the reef provides a recreational opportunity for anglers and the true benefit depends on each angler's willingness to pay for that opportunity.[25]

Second, the market price should not include other recreational expenditures. In the artificial reef example, the benefits from fishing would not be equal to the total amount spent on fishing equipment. This gross expenditure method is incorrect because it does not measure the change in benefits to anglers resulting from the provision of a new recreational opportunity. These total expenditure estimates are useful as indicators of economic activity associated with recreation but they are not a proper yardstick for evaluating specific coastal recreation activities or facilities.

While market prices are useful for estimating total demand or as a proxy for the average willingness to pay, market prices generally do not exist for coastal recreation. Activities such as a day at the beach are "unpriced" and therefore it is necessary to use alternative methods to determine the demand for coastal recreation.

3.3 NO MARKET PRICES - THE TRAVEL COST METHOD

The Basic Model

One of the unique characteristics of outdoor recreation, and coastal recreation in particular, is that to enjoy the amenities of a particular site or facility a user must travel to and from the site. Often these sites (beaches, parks, etc.) have no admission price or only a nominal fee that covers maintenance cost; hence, there are no data to

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[25]One way to use market prices to determine the benefits from artificial reefs for private boaters is to use commercial charter boat rates as a measure of willingness to pay. This approach is used in E. Hanni and E.H. Mathews "Benefit-Cost Study of Pinellas County Artificial Reefs," Florida Technical Paper No. 1, May 1977.

estimate a total demand curve to estimate an average willingness to pay. This basic travel requirement for recreation activities, however, suggests that one way to develop an estimate of a site's value is to measure the users' travel costs as a substitute for the individuals' willingness to pay for the site. This travel cost method of estimating recreation demand has been used since the 1950s and is accepted by most Federal agencies including the U.S. Army Corps of Engineers, the agency most often involved in coastal projects.[26]

The basic principle of the travel cost model is that the quantity demanded (i.e., number of visitors) is inversely related to the price of using the recreation site as measured by the costs incurred in traveling to the site. These costs should include all out-of-pocket expenses including meals, lodging, car maintenance, and travel time.

The main elements of this method can be seen by considering a simple example. A county planning board wants to know the economic value of a seaside park and beach that serves a multi-county area. A survey procedure is set up that uses vehicle counters (mechanical) on the main access roads to the park to record the number of vehicles during the following year. A questionnaire is designed to use in random personal interviews with visitors to determine the place of permanent residence, the distance traveled, the number of people per party, the expenses incurred en route, and the length of stay. After the data are collected, the interview data are then extrapolated as a description of the total number of visitors to the park during the year.

To assist in constructing the demand curves, the visitors are divided into 3 distance zones around the park. These zones are illustrated in Figure 7. Major population centers in each zone are marked with an asterisk (*). It is assumed that the approximate costs of travel to the park for people within each zone are the same.

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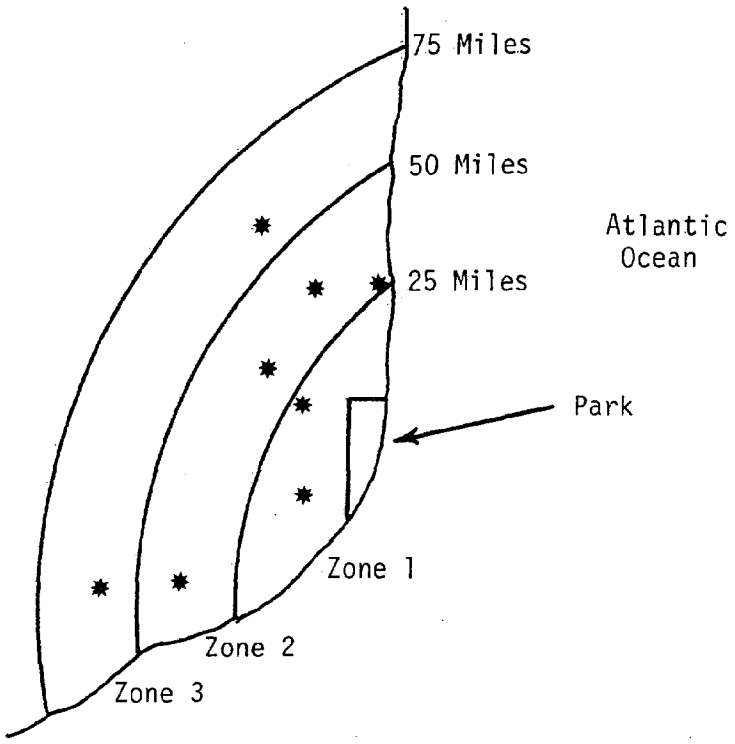
[26]A complete discussion of the development of the travel cost model is presented in P.F. Wilkinson "The Use of Models in Predicting the Consumption of Outdoor Recreation," Journal of Leisure Research 5, No. 3 (1973): 34-47.

Figure 7: Distance Zones for Visitors to Coastal Park



The data from the survey can then be used to estimate the total demand curve. The zones and the total population in each zone are shown in Table 2. The participation rates are estimates from the surveys based on the number of visitors from each zone as a percent of the total visitors and are expressed as a percent of each zone's total population.[27] The cost per visitor for each zone is an average cost from the travel expense estimates obtained in the personal interviews.

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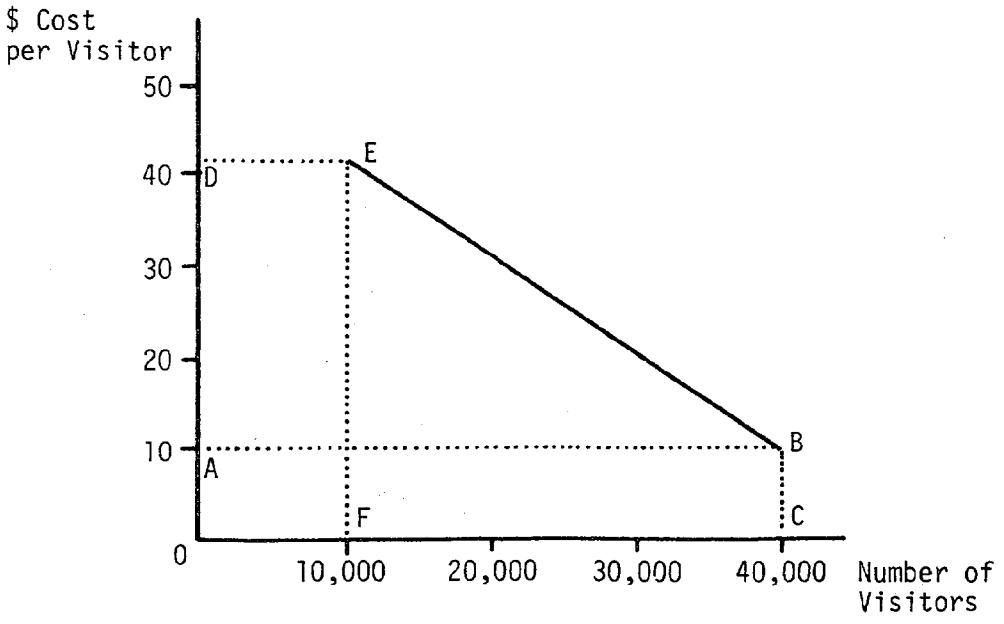
[27]This can be expressed as: $(N_i \times TV) \div P_i$ where N_i is the percent of visitors interviewed who resided in zone i, TV is the total number of visitors counted, and P_i is the total population in zone i.

Table 2.--Travel Cost Data for Visitors to Coastal Park

Zone	Population	Participation Rate	Number of Visitors	Travel Cost Per Visitor
1	100,000	40%	40,000	$10
2	100,000	30%	30,000	20
3	100,000	10%	10,000	40

The average travel cost per visitor can be plotted against the number of visits for each zone to determine the total demand curve for the coastal park. This is illustrated in Figure 8. The curve is an approximation of the willingness to pay of individuals for the coastal park. Using this information we can now determine the net benefits from the park. Note that the area OABC represents the total travel expenditure by park visitors from Zone 1. Using the measure of economic value introduced in the preceding chapter, we can now calculate the consumers' surplus for residents of Zone 1. We assume that all visitors receive

Figure 8: Total Demand Curve for Coastal Park Using Travel Cost Method



the same maximum benefit (maximum willingness to pay) and this total benefit is equal to the travel cost of the most distant visitor. Thus the consumers' surplus[28] for Zone 1 is:

$$\$750,000 = \$1,150,000 - \$400,000$$

where the total benefits are given by the area ODEBC and the travel cost is OABC. Similarly we calculate the consumers' surplus for Zone 2 as the difference between the total benefits and the total travel costs[29] for visitors from Zone 2:

$$\$400,000 = \$1,000,000 - \$600,000$$

Because the travel cost method uses the assumption that the travel cost of the visitors from the farthest zone is the maximum willingness to pay, the consumers' surplus to visitors from Zone 3 is zero. Thus we can summarize the results of the study in Table 3. The net social benefit is the sum of the consumers' surpluses in all three zones, \$1,150,000, or \$14.38 per visitor. Since we do not have any data about the true maximum willingness to pay, a part of the area under the demand curve was not included in the estimate of the consumers' surplus. In practice, however, this area is usually small and will not greatly

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[28]For simplicity a linear demand curve of the form V=50-C has been used, where V=number of visits (in thousands) and C=cost per visit. Consumers' surplus can be estimated with the linear demand curve using the formula: $(C_0-C_1)((V_0+V_1)/2)$ where C_0 and V_0 are the costs and visits from the most distant zone and C_1, V_1 are for the zone being evaluated.

[29]The benefits are calculated as the area under the demand curve up to 30,000 visitors, and hence the amount differs from the benefits when Zone 1 is included.

affect the estimates. Estimates made using this method should be considered conservative estimates of the true net benefit.[30]

Table 3.--Summary of Travel Cost Demand for Coastal Park

Zone	Number of Visits	Consumers' Surplus
1	40,000	$750,000
2	30,000	400,000
3	10,000	0
	Total Surplus	$1,150,000
	Average Surplus/Visitor	$14.38

The travel cost method of estimating the economic value of a recreation facility is simple and straightforward. As with all simple approaches to complex problems, this method requires a number of strong assumptions about the users of the recreation site. These assumptions are:

[30]The procedure presented here is only one version of the travel cost method. An alternative approach uses a hypothetical incremental charge to determine the change in the quantity of visits due to increased costs for using the recreation site. The maximum willingness to pay is estimated by simulating what visitors would pay after having incurred the travel expenses. The difference between the two methods will be greater the more concave is the curve relating the number of visits and cost per visit. In general, this second approach is more appropriate when there are large differences in the population for each zone. For a more detailed explanation of this alternative, see M. Clawson and J.L. Knetsch, Economics of Outdoor Recreation, Johns Hopkins Press, 1966.

1) Users across all zones have the same incomes and preferences. All users react the same to changes in travel cost and the highest value of the facility to each user is the travel cost of the users from the most distant zone.
2) There are no alternative recreation facilities that can substitute for the facility considered. This implies that users would have to do without the recreation facility if it were eliminated. Also, the travel costs incurred are for the sole purpose of using the facility, no other reasons for the trip are considered.
3) The amount of time spent using the recreation facility and the costs incurred at the facility are not a determinant of user satisfaction.
4) All visitors have the same opportunity cost for their time. This implies that the extra time spent in travel from more distant zones is compensated by a reduction in the on-site time with no effect on the value of the site to the user.
5) Congestion at the recreation facility does not affect the value to users. Increased use of the facility does not cause inconvenience or reduce the quality of the recreation experience.

Each of these assumptions has an important effect on the economic value of recreation. Researchers have recognized that the simple travel cost method can lead to biased estimates of recreation's true value. In the following sections, some of the modifications that have been suggested to improve the travel cost method will be reviewed and their applicability in evaluating coastal recreation discussed.

Extensions of the Basic Model

The simple travel cost model is based on the assumption that travel costs are an appropriate proxy for individuals' willingness to pay for a recreation site. Mathematically this could be represented as:

$$V_j = f(TC_j)$$

or, in linear form as

$$V_j = a - bTC_j$$

where V is the number of visits from zone j in a given time period and TC is the travel cost per visit from zone j. This expression will yield a demand curve such as that illustrated in Figure 3. One way of relaxing the homogeneity of users assumption (Assumption 1 above) is to add an income variable to the estimating equation so that the linear specification becomes:

$$V_j = a - bTC_j + cI_j$$

where I represents income. Using data on V, TC and I the coefficients of the demand equation can be estimated using multiple regression analysis.[31] This addition to the travel cost method corrects for differences in visits that occur due to differences in income across the travel zones and leads to more precise estimates of the change in visits due to changes in travel cost.[32] Unfortunately, with the travel cost

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[31]Multiple regression analysis is a statistical precedure that fits a line to a set of observations involving one dependent variable and two or more independent variables. A complete discussion of this procedure is beyond the scope of this handbook. For a straightforward discussion the interested reader should consult Wheelwright, S.C. and Makridakis, S., Forecasting Methods for Management, 3rd Edition, New York: Wiley and Sons, 1980, Chapters 6-8.

Multiple regression analysis has become a commonplace tool for almost all levels of business and government. Several companies market calculators that perform the calculations or the analyst could use the Statistical Analysis System (SAS) or the Statistical Package for the Social Sciences (SPSS) available through any university computing center. Both offer easy-to-use, relatively inexpensive methods of performing multiple regression analysis.

[32]Stoevener, H.H. and W.G. Brown, "Analytical Issues in Demand Analysis for Outdoor Recreation," Journal of Farm Economics 49, No. 5, 1967: 1295-1304.

method there is no way to correct for differences in preferences across travel zones.[33]

The assumption that there are no available substitutes for a recreation facility (Assumption 2) is an obvious shortcoming but one which can be easily remedied. The only way that the basic model considers alternative recreation facilities is through the participation rate at a particular facility. This can lead to an overestimation of the demand for a facility when changes occur in travel costs, user fees, or other factors affecting participation.

The most commonly used method for correcting the basic travel cost model to account for substitution effects is to add a variable for the reciprocal of the distance to an alternative facility. In the linear form, this can be expressed as:

$$V_j = a - bTC_j + cI_j - dD_j$$

where D_j is (1/distance to an alternative facility from zone j). The further an alternative facility is from a travel zone, the less substitution effect it will exert. The negative sign on the coefficient indicates that the availability of a close-by substitute would reduce the number of visits. Alternatively, if several alternative facilities exist, D can be an index that is the summation of the distance reciprocals for the alternatives, $D = \sum_{i=1}^{n} 1/d_i$, where d_i is the distance to the ith facility and n is the total number of alternatives. Typically the alternative facilities are limited to those that are of equal or closer distance to the travel zone than the facility under study.

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[33]One exception is Sinden's approach which uses direct interviews with visitors to determine their recreation preferences. This information is then included in the estimating equation along with other socioeconomic data. This interview technique will be discussed in more detail in the following section. For an application of this approach, see J.A. Sinden, "A Utility Approach to the Valuation of Recreational and Aesthetic Experiences," American Journal of Agricultural Economics, February 1974: 61-72.

One shortcoming of the distance index approach is that it ignores the fact that alternative facilities will be attractive to recreationists depending on the amenities available. Two beachfront parks could be equidistant from a travel zone yet one will be more attractive due to its physical attributes and the facilities provided by the park management. One method of improving the specification of the substitution effect is to include a distance-attractiveness index of the form:

$$N_j = \sum_{i=1}^{n} \frac{A_i}{D_{ij}}$$

where A is the attractiveness of the ith site and D is the distance between the alternative site i and the travel zone j. The difficulty arises in defining an acceptable attractiveness rating. One approach is to rely strictly on the judgment of recreation managers. This subjective approach is easy to implement but potentially erroneous. An alternative is the use of user preference surveys or statistical analysis of visitation rates at alternative facilities to determine the most important factors contributing to site attractiveness. Each method has its advantages and a number of different techniques have developed in recent years.[34] There is as yet no clear consensus on the most appropriate technique.

One final method of dealing with the effect of substitution in the travel cost model is the use of a simultaneous system of equations for alternative recreation facilities. This method as developed by Burt and

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[34]For examples see Cesario, F.J. and J.L. Knetsch, "A Recreation Site Demand and Benefit Estimation Model," Regional Studies, Vol. 10, 1976: 97-104; Knetsch, J.L., R.E. Brown and W.J. Hansen, "Estimating Expected Use and Value of Recreation Sites" in Planning for Tourism Development, edited by C. Gearing, W. Swart, and T. Var, New York: Praeger, 1976; Ravenscraft, D.J. and J.F. Dwyer, Reflecting Site Attractiveness in Travel Cost-Based Models for Recreational Benefit Estimation, Report No. 78-6, Dept. of Forestry, Univ. of Illinois at Urbana-Champaign, 1978.

Brewer[35] and Cicchetti, Fisher, and Smith[36] requires a number of simplifying assumptions to implement and has many of the same limitations as the basic travel cost model. In addition, implementation and interpretation require a degree of statistical expertise that is above the expected capabilities of users of this handbook.

One of the major problems in the basic travel cost model is the consideration of time. In Assumption 3 and 4 we see that there is no distinction for the amount of time a visitor spends at the recreation facility nor is there any cost assigned to the time spent by the visitor traveling to the recreation facility. One method of overcoming the first problem was suggested by Pearse[37] who separated trip costs into a fixed component (costs incurred traveling to the site) and a variable component (costs incurred on-site over the course of the visit). The demand curve could be estimated not with travel cost as an independent variable but with on-site variable costs as the true indicator of consumer's willingness to pay for the facility. In addition, the dependent variable becomes the number of days spent at the facility during some time period (usually a season). In notational form this is

$$D_i/t = f(VC)$$

where D_i/t are the number of days at facility i in period t and VC is the variable costs incurred during the visit. Pearse suggests that the demand curve should be estimated separately for different income groups

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[35]Burt, O.R. and D. Brewer, "Estimation of Net Social Benefits from Outdoor Recreation," Econometrica Vol. 39, No. 5, 1971: 813-827.

[36]Cicchetti, C.J., A.C. Fisher, and V.K. Smith, "An Econometric Evaluation of a Generalized Consumer Surplus Measure: The Mineral King Controversy," Econometrica Vol. 44, 1976: 1259-1276.

[37]Pearse, P.H. "A New Approach to the Evaluation of Non-Priced Recreational Resources," Land Economics Vol. 44, No. 1, February 1968: 87-99.

to determine the consumer surplus but this raises a number of serious problems that are summarized by Gibbs.[38] One alternative is to use a separate equation to estimate D_i/t and V as functions of variable costs and fixed costs, respectively, and then form a new variable defined as usage per time period (V_t) where $V_t = (D_i/t)(V)$. This yields a demand curve that overcomes the simple assumption in the basic travel cost model of no difference in visitor time at the facility.[39]

As a practical matter the assumption of no variation in the length of stay at a recreation facility may not be unreasonable for most coastal recreation facilities. With the exception of camping in coastal parks, most activities can be characterized as daily events (e.g., a day at the beach, a day of fishing, etc.) Thus the basic model using the number of visits by travel zone (V_j) would be appropriate.

It is not such an easy matter, however, to accept Assumption 4. Travel of equal distances may not entail equal times due to differences in road quality, areas traveled, etc. Also visitors will have a different value to the time foregone traveling to the facility. If these 'costs' to the visitor are ignored, the estimated demand equation will underestimate the true demand.

From an economic perspective, the appropriate measure of the time costs incurred traveling to a recreation site is foregone income. This is typically estimated by calculating a new variable, Y, which is

$$Y = T_j \times W$$

where T is the travel time from zone j and W is the wage rate ($/hour). Analysts using this approach have used estimates for W

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[38]Gibbs, K.C. "Evaluation of Outdoor Recreational Resources: A Note," Land Economics Vol. 50, No. 3, August 1974: 309-11.

[39]For an example of this approach see T.A. Jennings, "A General Methodology for Analyzing Demand for Outdoor Recreation with an Application to Camping in Florida State Parks," Ph.D. dissertation, Department of Food and Resource Economics, University of Florida, Gainesville, March 1975.

ranging from one and one-half the usual wage to reflect the possibility of overtime to one-fourth the normal wage reflecting a low value for leisure time. There is no agreement on the correct procedure, but Knetsch and Cesario[40] suggest that some fraction of the normal wage is best for leisure time.

An alternative approach circumvents the problem of choosing an appropriate wage rate and instead uses a proxy variable for travel time cost defined as:

$$C_{ji} = D_{ji} + T_{ji}$$

or

$$C_{ji} = D_{ji}(T_{ji})$$

where D is the distance between site i and travel zone j and T is the travel time. Either form is acceptable but the multiplicative form is more theoretically defensible since it implies that short trips are influenced more by time factors than long trips.[41]

The fifth and last assumption that congestion does not affect the value of the recreation facility to the visitor is also a problem. Defining congestion is a difficult matter since it can apply to either physical limits on the capacity of a site or perceived levels of social interaction.[42,43] In general it is expected that congestion would influence the visitation rate but few studies using the travel cost method have included a variable of this nature. Most attempts to "value"

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[40]Knetsch, J.L. and F.J. Cesario, "Some Problems in Estimating the Demand for Outdoor Recreation: Comment," American Journal of Agricultural Economics, August 1978: 596-597.

[41]Cesario and Knetsch, 1976, op. cit.

[42]Anderson, F.J. and N.C. Bonsor, "Allocation, Congestion and the Valuation of Recreational Resources," Land Economics Vol. 50, February 1974: 51-57.

[43]Shelby, B. "Crowding Models for Backcountry Recreation," Land Economics Vol. 56, February 1980: 43-55.

congestion have used techniques other than the travel cost method. For example, McConnell[44] collected survey responses to determine preferred densities at beaches and used beach attendance per acre as a measure of congestion. Unfortunately, empirical work in this area is limited and there is no agreement about the appropriate variables that can be added to the basic travel cost model to remedy this problem.

Using the Travel Cost Model

Despite the limitations and problems of correcting for unrealistic assumptions, the travel cost model is an extremely useful and widely accepted method of estimating the demand for and benefits from recreation facilities. Like any other analytical tool, the travel cost model must be used with caution. First, the model will yield more reliable estimates of demand when there is sufficient variation in the travel costs of users. This would imply that the model is more appropriate for regional sites that draw users from a wide geographic area than local or urban sites that have most of their visitors from surrounding neighborhoods. One method of adding some variation for local sites is to assign travel zones according to zip codes but this also may not provide sufficient variation. On the other hand, some degree of selectivity should be exercised in including visitor data from remote travel zones. Quite often these visitors' profiles will be so different from the majority of site visitors that their inclusion in the estimates could bias the results. Smith and Kopp[45] offer a general statistical test to determine what spatial limits should be imposed for a particular recreation site study.

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[44]McConnell, K.E. "Congestion and Willingness to Pay: A Study of Beach Use," Land Economics Vol. 53, No. 2, May 1977: 185-195.

[45]Smith, V.K. and R.J. Kopp, "The Spatial Limits of the Travel Cost Recreational Demand Model," Land Economics Vol. 56, No. 1, February 1980: 64-72.

A second consideration is that the travel cost model is most effective when the travel expenses have been incurred principally for the purpose of visiting the recreation facility. The simplest way to determine this is simply to include a question on a visitor survey asking whether the facilities provided at the site were the reason for the travel. If many other motives for the travel exist (i.e., shopping, visiting relatives, etc.), then the estimates yielded by the travel cost model will be less reliable.

Finally, great care should be taken to include socioeconomic factors such as income, race, age, etc. in the analysis. These factors may have a strong effect on the participation rates from different travel zones. In addition, since recreation facilities are typically considered to be 'merit goods' by public officials who allocate funds for construction and maintenance, information about the user groups of recreation sites can be an important input to the budget-making process.

An additional way of assessing the validity of demand estimates from the travel cost model is to compare them with estimates from other methods. We now turn to a discussion of these alternative methods.

3.4 NO MARKET PRICE - THE CONTINGENT VALUATION METHOD

Introduction

The fact that market prices do not exist for many coastal recreation sites creates many problems when questions are raised about the value of these resources to society. The travel cost model is one approach to estimating the economic value of a facility but it has its shortcomings. One alternative to using a proxy such as travel cost for the economic value of a recreation site to individuals is to ask individuals directly what value they place on the facility. The primary advantage of this approach is that the responses indicate the willingness to pay of individuals and can be used directly to estimate a demand curve for a site without the restrictive assumptions of the travel cost

model. In addition, the contingent valuation method is applicable in a variety of situations that cannot be addressed using the travel cost model. Issues such as congestion at a beach, the value of sport fishing, or the value of improvements in water quality can all be addressed within the contingent valuation framework.

The major shortcoming of the contingent valuation method is the hypothetical nature of the questions. Even though this method seeks distinct information about individual willingness to pay for recreation goods, it is still open to the charge that this information is based on what people say they will do rather than what they actually do. Examples abound in the social psychology literature that these two are not always the same.[46] Moreover, different estimates of value may be expressed for the same recreation good depending on the manner in which the question is presented.

These practical problems of using the contingent valuation method will be discussed in more detail in the last section of this chapter. Before that we look at the use of both the direct questioning method and the iterative bidding method of contingent valuation.

Direct Questioning

The purpose of the direct question approach is to elicit honest and accurate responses from individuals about the value of a resource. The discussion in the preceding chapter emphasized that there are two ways of measuring value. When the purpose of the evaluation is to establish a new recreational facility or improve the quality of an existing facility, the amount that users would be willing to pay for rights to use the resource is the appropriate measure. When the evaluation seeks to value the loss of an already existing facility, then the amount that recreationists would be willing to accept to give up their use of the facility

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[46]Schuman, H. and M.P. Johnson. "Attitudes and Behavior." Annual Review of Sociology 2(1976): 161-207.

is the appropriate measure.[47] Both measures will yield estimates of individual's demand curves and can be aggregated to determine the total consumers' surplus.

The simplest form of the direct question method uses a single question that elicits responses about the maximum value of a resource to an individual. This could be stated as follows:

> "What is the maximum amount you would be willing to pay (accept) for the use of this resource?"

Alternatively the single question could be defined in the context of expenses incurred using the resource to give the respondent some frame of reference.[48] This type of question could be:

> "What is the maximum amount you would spend to use this resource (annually, seasonally) before you stopped using it because it is too expensive?"

Using expenses incurred as a frame of reference in a contingent valuation question is also a handy way of generating value estimates that can be directly compared with estimates from the travel cost method. For example, an interview survey could collect information about the travel expenses incurred and socioeconomic characteristics of visitors and could include the question:

> "What is the maximum amount of travel expenses you would incur before you stopped visiting this recreation site?"

The value estimates from the single question method can be combined with socioeconomic information about the respondents to estimate the demand curve for the resource. In linear form this could be expressed as:

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[47] See the discussion in the appendix to Chapter 2 to determine under what conditions this would be a compensating variation or an equivalent variation.

[48] A variation of this type of question is used in the National Survey of Fishing, Hunting, and Wildlife Recreation conducted by the Bureau of the Census, U.S. Department of Commerce.

$$V = a + bI - cQ + dSE$$

where V is the expressed willingness to pay (accept), I is income, Q is the number of visits to the recreation site during the year, and SE represents other socioeconomic variables. We would expect the negative sign on the coefficient c to reflect the principle of diminishing marginal utility explained in the preceding chapter. To illustrate, in a study on the effect of congestion on beach use, McConnell[49] estimated the following demand equation for a visit to a Rhode Island beach:

$$\ln V = -4.7 + .00001I - .0025C + .076T - .058Q$$

where V, I, and Q are defined as above, C represents congestion at the beach (attendance/acre), and T is temperature. If we construct an example for a representative visitor where income is $25,000, beach congestion is 250 people/acre, the temperature is 85 degrees and the number of visits per year by the visitor is 10, then the willingness to pay predicted by the demand equation would be $1.52.[50] The net benefits to this visitor from the 10 visits per year would be $15.20. In a similar fashion an average willingness to pay for all visitors could be calculated using the mean values of I, C, T and Q from the sample and the total net benefits calculated by multiplying the average willingness to pay times the annual attendance. Note the sign and value of the coefficient on C (-.0025). This implies that an increase in beach attendance of 100 persons/acre would reduce the average willingess to pay of beach visitors by 25 percent.

The single direct question approach to contingent valuation is flexible enough to be used in either mail surveys or personal interviews. The main objection to this approach is that the response is

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[49]McConnell, K.E. "Congestion and Willingness to Pay: A Study of Beach Use," Land Economics Vol. 53, No. 2, May 1977: 185-195.

[50]Plugging in the given numerical variables to the right hand side yields $.42 but since the equation is in semi-log form we take the natural log of $.42 which yields $1.52 ($\ln V = \$.42$, hence, $e^{\$.42} = \$1.52$).

open-ended and quite unlike any other kind of economic transaction an individual might engage in. One way to correct for this problem is to use "convergent direct questions" in a personal interview. The purpose is to simultaneously move up from a low money value and down from a high value to converge on the maximum willingness to pay. For example, suppose a planning team wanted to know the maximum willingness to pay of fishermen for a new offshore artificial reef. The team selected a range of possible responses[51] of from $20 to $200 and asked the following set of questions (responses are shown in parentheses).

Question 1: Are you willing to pay $20 for the opportunity to fish at least once a year on a new artificial reef? (Yes)

Question 2: Are you willing to pay $200 for this opportunity? (No)

Question 3: Are you willing to pay $40 for this opportunity to fish on a new artificial reef? (No)

Question 4: Are you willing to pay $30 for this opportunity? (Yes)

The questioning would continue until the maximum willingness to pay was established somewhere between $30 and $40 but in most cases a mid point estimate, in this case $35, is acceptable. A brief review of the question shows that 1 and 2 established that the respondent's willingness to pay for the artificial reef was indeed between $20 and $200.[52]

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[51]The range of possible values selected is arbitrary but a reasonable range improves the respondent's belief in the validity of the exercise. It is helpful if the results of similar studies in other areas are available to provide an initial basis for the range of possible values.

[52]If the response to the first question was No, then the second question would have been "Are you willing to pay $10 for this opportunity?" If the response was again No, then another lower value could be asked until a positive response is given. Alternatively, if the response to Question 2 had been Yes, then the scaling process for the following question would have been upward until a maximum willingness to pay was elicited. It is also possible that respondents will not express any willingness to pay or refuse to answer questions of this nature. The interviewer should keep a careful count of these zero bids and refusals and the tally should be reported along with the survey result.

Question 3 revealed that the maximum willingness to pay was at least $30. In practice the number of questions needed to converge on a final response may be considerably greater than this simple example.

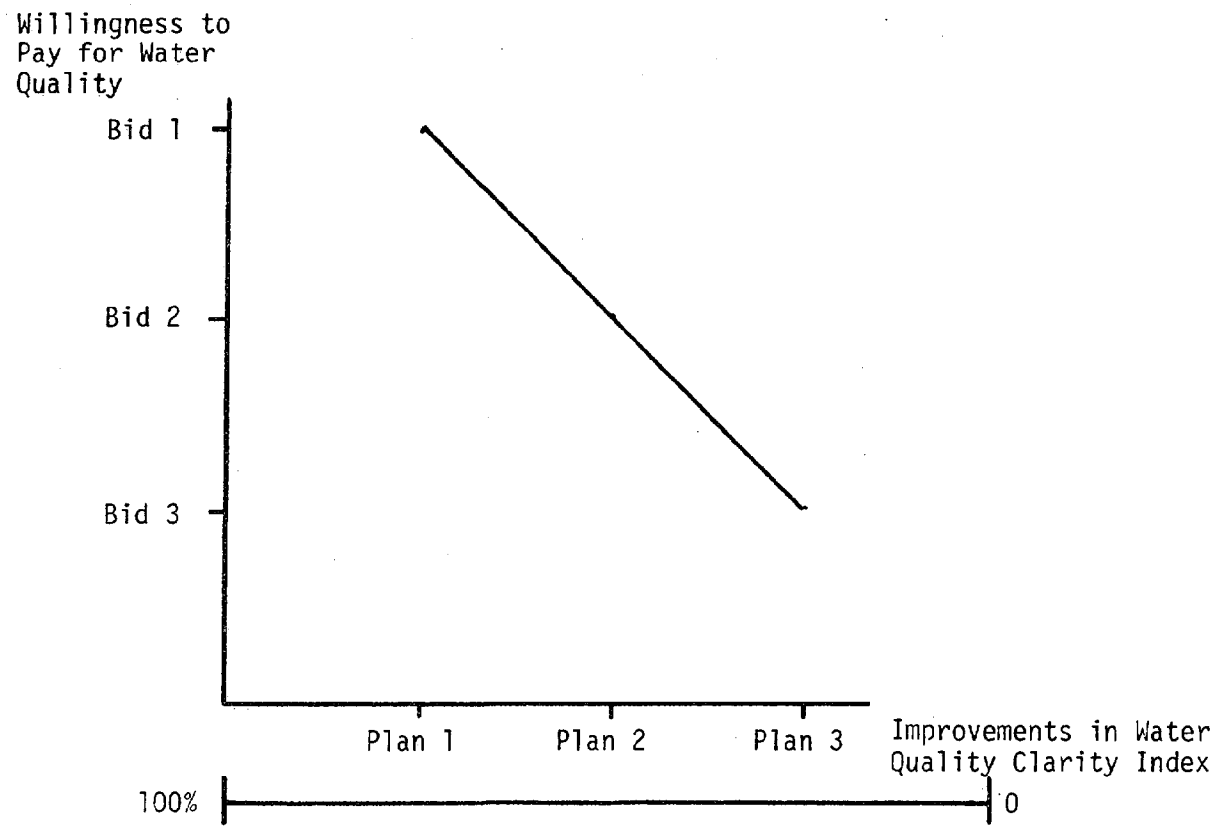
Iterative Bidding

The iterative bidding approach to contingent valuation also uses a convergent questioning process but alternative payment systems are sometimes used and greater attention is given to specifying the type of change in the recreation facility which the respondent is asked to evaluate. This approach is limited exclusively to personal interviews.

The easiest way to explain this approach is to consider an example. The concern is to determine what the benefits to recreationists would be if a coastal city implemented controls to improve the water quality of the bay adjoining the city. The improvements in water quality would be characterized principally by increases in the visual clarity of the water. The city is considering three plans, each of which would lead to a different level of water quality. To implement the iterative bidding approach, interviewers would show three photographs (or three containers of water) that correspond to the likely water quality resulting from each of the three plans. The respondents would then be asked their willingness to pay for each level of water quality (on a daily or annual basis) using the convergent questioning process.

The main advantage of the iterative bidding method is that it directly leads to a demand curve for water quality for each recreationist and these individual curves can then be summed to yield the total willingness to pay for all recreationists. In Figure 9 we have the three bids elicited from one recreationist with each bid attributed to the corresponding plan to improve water quality. The clarity index indicates the different degrees of water quality that would result from each plan. The curve indicates the expected result that recreationists would be willing to pay progressively higher amounts for increases in water quality. In order to determine the total willingness to pay for

Figure 9: Recreational Demand for Water Quality Resulting from Iterative Bidding Process



all recreationists, all that would be required would be to add each of the recreationists' bids for each different level of water quality. The result would be an estimate of the total recreation benefits that would result from each of the three plans.

The role of property rights in determining whether to use the willingness to pay measure or willingness to sell is very important in the iterative bidding approach. In the preceding example the recreationists were assumed to have no perceived rights to cleaner water and, hence, the willingness to pay measure (a compensating variation) was appropriate. An alternative way to formulate the problem would have been to assume that the individual did have a perceived right to the water quality improvements. In this case the iterative bidding process

would have focused on the recreationist's willingness to accept compensation (an equivalent variation) to give up the right to use the bay at each of the improved water quality levels. In most cases it is useful to utilize both measures of welfare change since the recreationists may have different perceptions of the rights to use the recreational resource.

Similarly, if we had instead been considering plans that would decrease the level of water quality in the bay, the rights structure would again be important. If recreationists had a perceived right to clean water in the bay, the iterative bidding process would have focused on the amount of compensation necessary for the recreationists to accept lower levels of water quality (a compensating variation). On the other hand, if recreationists did not have a perceived right then the amount recreationists would be willing to pay to keep water quality at existing levels (an equivalent variation) would be appropriate.

A number of alternative techniques for using the iterative bidding process have been developed in the past few years. Most of these alternatives use variations of the bidding process where the respondent is asked to compare and select an outcome from a set of alternatives. In some cases the result is a dollar value for the willingness to pay (accept) but in other cases only a ranking of alternatives is achieved. For a discussion of these alternative techniques, see Sinden and Worrell,[53] Chapters 10, 11 and 14.

Using the Contingent Valuation Method

Recreation planners using the contingent valuation method should be aware that the value estimates produced are based on hypothetical responses and these estimates may have several shortcomings. One of these shortcomings is that there is no way to make an independent verification

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[53]Sinden, J.A. and A.C. Worrell, Unpriced Values - Decisions Without Market Prices, New York: J. Wiley and Sons, 1979.

of a respondent's value estimate. The uniqueness of the iterative bidding process for some hypothetical change in recreation opportunities may be so foreign to some respondents that they do not have an opportunity to reflect and consider their responses. If the respondent does not understand the questions being asked or does not take the bidding process seriously then the resulting estimate will be a poor indicator of the respondent's true preferences.

Another shortcoming is the possibility that respondents will engage in strategic behavior to influence the outcome of public policy. A respondent who is asked his willingness to pay for a new recreation facility but is never asked to actually pay that amount may overstate the benefits to him in the hope that the facility will in fact be provided. Conversely, a respondent might feel that his response would lead to an increase in taxes and the new facilty would be of little use to him. In this case the respondent might understate his true preferences in the hope that taxes would not be increased even though this has nothing to do with the real problem at hand.

Another important problem in the contingent valuation method is the initial assignment of the respondent's rights to the recreational resource that is being valued. Differences between the dollar amounts that recreationists are willing to pay and the amounts at which they would be willing to sell are common and the magnitude of these differences have been as great as 20 to 1.[54] In part this may be due to the fact that respondents understate their true willingness to pay for recreation facilities because they are usually free (or have only a minimum user charge). However the frequency of studies which report willingness to sell bids that are larger than willingness to pay bids indicates that respondents' may not view the 'pay vs. sell' decision as two sides of the same coin.

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[54]Gordon, I.M. and J.L. Knetsch. "Consumer's Surplus Measures and the Evaluation of Resources." Land Economics 55, 1 (February 1979): 1-10.

A further complication in the issue of respondents' rights is the possible difference between a recreationist's perceived rights and the law. Many coastal recreation resources are common property and recreationists may feel that they have an inalienable right not only to use the resource but also to have it maintained and enhanced by public agencies. When presented with a question about how much they would be willing to pay for some coastal resource, the respondent may view this as an attempt to deprive him of his rights and refuse to answer the questions. The best that can be done is to report these refusals, but the study as a whole may suffer due to the inability to include recreationists who may have strong preferences about the use of the resource.

Unfortunately there is no single cure-all for these possible difficulties in using the contingent valuation method. The interview process should attempt to provide respondents with as much information as possible about the situation being considered and the alternatives so that the survey approximates a realistic setting in which the respondent understands the consequences of his responses.[55] The closer the hypothetical setting accords with the respondent's experience and understanding of the situation, the more likely it is that honest and accurate responses will result.

Contingent valuation is a relatively new and promising method of measuring the economic benefits of coastal recreation facilities and activities. This method is applicable in a variety of problems in which the travel cost method cannot be used. When carefully used, the contingent valuation method provides important information about the economic value of coastal recreation.

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[55]An excellent example of this can be found in a study of the economic benefits of recreational clamming in Massachusetts. The researchers used a combination mail and telephone survey with direct questions about willingness to pay and sell for clamming permits. The interview telephone call was preceded by two letters in which the purpose of the study and the type of questions that would be asked were explained. For more details see R.W. Smith, et al., An Economic Valuation of Recreational Clamming in Massachusetts, Research Bulletin #654, College of Food and Natural Resources, University of Massachusetts at Amherst, April 1978.

CHAPTER 4

SURVEY RESEARCH IN OUTDOOR RECREATION ECONOMICS

Surveys play a particularly important role in studies of outdoor recreation because of the common property or non-market aspects of most recreation sites and facilities. Unlike the market goods that are used in outdoor recreation such as boats, fishing tackle, and recreation apparel, only a very limited amount of data is available about attendance and use of recreation facilities and even less is known about the economic value to the users. This lack of basic data for resource management decisions necessitates the use of surveys to provide information about the benefits and costs of coastal recreation.

This chapter is intended to provide a general overview of the use of surveys in economic analysis and some of the problems that may be encountered. This short discussion is not a substitute for a more comprehensive analysis of survey research such as can be found in Selltiz et al.,[56] Warwick and Lininger,[57] or Dillman.[58]

Types of Surveys in Recreation Economics

The type of survey that is used to obtain economic data for a benefit-cost analysis depends on the type of problem being considered and the method of benefit estimation employed. Most recreation surveys

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[56]Selltiz, C., L.S. Wrightsman, and S.W. Cook, Research Methods in Social Relations, New York: Holt, Rhinehart and Winston, 1976.

[57]Warwick, D.P. and C.A. Lininger, The Sample Survey: Theory and Practice, New York: McGraw-Hill, 1975.

[58]Dillman, Don A. Mail and Telephone Surveys, New York: Wiley and Sons, 1978.

collect two kinds of data: 1) basic descriptive data about the recreationists such as age, education, income, family size, and other socioeconomic characteristics and, 2) measures of the recreationists' preferences and attitudes. The basic descriptive type of data is usually relatively straightforward and easy to obtain using either a mail, telephone, or personal interview survey. The second type of data is more difficult because it may require the survey respondent to recall past events or express opinions and value judgments that have not been previously considered.

The use of mail questionnaires is usually the least expensive survey method. It is relatively easy to determine who will receive the questionnaire but the actual sample size will depend on the response rate. In this format descriptive data is easy to obtain if the purpose and use for the data is clearly explained. Preference data in this format can be a serious problem because the questions may require recall of events that occurred several months ago or issues the respondent is asked to evaluate may not be clearly understood. For example, if a mail questionnaire is used for an existing recreation site, information about the frequency of visits to the site and the travel costs incurred would be necessary. If the respondent is asked to recall events and expenses that occurred for the past year, the likely result would be inaccurate responses and biased results. Similarly, if one of the contingent valuation methods is used the respondent may be confused by the hypothetical nature of the questions and either refuse to answer or give fictitious responses. The only remedies for these problems of mail questionnaires is to limit respondent recall to a relatively short period of time (less than 6 months) and provide as much explanation as possible about the purpose of the questions without making the questionnaire unduly long.

Telephone interviews are also relatively inexpensive but, as with the mail questionnaire, it may be difficult to obtain lists of a particular recreation site or activity. In addition, the usual sources of telephone numbers (phone books, association listings, etc.) may not

be representative for the problem under study. In this format descriptive data is easy to obtain and more attention can be given to explaining the purpose of the survey and the intent of specific questions. However, once again, if heavy reliance is based on recall of previous recreation experiences, the responses may not be accurate.

The most common type of survey used in recreation economics research is the personal on-site interview. This technique has the advantage of assuring contact with recreationists using the resource and minimizes the necessity for lengthy recall. In addition the interviewer can provide in-depth explanations for the study and more detailed or involved questions are more easily handled than in the mail or telephone formats. The personal interview is also more appropriate for the iterative bidding technique. One drawback though is that the survey depends on participation and the ability to contact on-site users. It is best to schedule the interview process over a reasonable period of time so that holiday and weather influences can be controlled. Interviews can be conducted at major access points if possible so that a representative distribution of users is obtained[59] or they can be done on-site. The most serious problem with personal interviews is the cost. For most types of coastal recreation that are dispersed over wide areas, the expense of training and keeping interviewers in the field can be high. A preliminary assessment of the importance of the study, the need for accuracy, and the available resources should be made before either type of survey technique is selected.

Sampling Considerations

In survey research for economic evaluations of coastal recreation it is inappropriate and unduly expensive to expect 100 percent enumeration. A survey must be based on scientific sampling so that the costs are realistic and the results representative of the population.

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[59]Lucas, R.D. and J.L. Oltman, "Survey Sampling Wilderness Visitors," Journal of Leisure Research Vol 3, No. 1, 1971: 28-42.

The first and most critical issue is to define the relevant population. To do this two questions must be resolved: 1) Whose attitudes and preferences should be included in the analysis? and, 2) What is the geographic area covered by the individuals included in the analysis? The answer to the first question depends on the type of problem being considered. If the problem is to determine the economic value of an existing coastal recreation facility, then the users are the relevant population. However, if the concern is the economic value of a new recreation facility, then all potential users should be included in the population. Once the nature of the user group is decided then the appropriate geographic boundaries can be drawn. Quite often these boundaries will depend on political considerations such as which level of government authority controls the resource. Thus a local recreation planning group evaluating a locally controlled resource would limit the relevant population to the local residents of the areas while a state level group considering a resource used by state residents and tourists would use a significantly larger geographic area.

In some cases, such as the demand for an existing facility, the size of the user group may be unknown. In these situations a simple head-count possibly using mechanical counters at major access points can be sufficient to establish the size of the user population.

Ideally, the sample size chosen for a survey should be based on how reliable the final estimates must be. A tabulation of population sizes with the necessary sample size to achieve different levels of confidence that the sample results are representative of the population is presented in Table 4. Note that as population size increases the necessary sample size increases at a slower rate.

In practice usually a trade-off is made between the ideal sample size and the expected cost of the survey. The analyst must weigh the importance of the information acquired through the survey with the costs of performing the survey and the availability of existing information that can be used in the decision process.

Table 4: Sample Size Necessary for Specified Confidence Limits of Different Populations

Population Size	Sample Size for Precision of			
	±1%	±3%	±5%	±10%
500	*	*	222	83
1,000	*	*	286	91
2,500	*	769	345	96
5,000	*	090	370	98
10,000	5,000	1,000	385	99
50,000	8,333	1,087	397	100
100,000	9,091	1,099	398	100
over 100,000	10,000	1,111	400	100

*Sample size cannot be determined.

Constructing a Questionnaire

The actual form of the questionnaire will depend on the type of survey used and the method of benefit estimation. Mail surveys should use as many "check box" type responses as possible. In the telephone or personal interview survey the questions should be structured so that mostly "Yes" or "No" responses are possible.

Descriptive data about age, education, etc. should be in the first part of the questionnaire since this information is usually readily provided and these questions allow the respondent to "warm-up" to the survey. Income can be a difficult subject and it is best to give respondents a range of responses such as $15,000 - $19,999; $20,000 - $24,999, etc. Income related questions should be at the end of the questionnaire.

Preference related data is the most difficult to obtain and the questions should be as precise and informative as possible without being

overly wordy. In general, open-ended questions that allow a respondent to construct their own answers should be avoided as this complicates interpretation of the survey results. Questions about travel related expenditures can be open-ended but a specific response should be clearly implied. For example, the question "How much did you spend for food and lodging while traveling to this recreation site?" clearly implies a definite dollar amount. Similarly, contingent valuation type questions should be as specific as possible and clearly indicate that a definite dollar amount is requested. Previous experiments with the contingent valuation method indicate that the convergent bidding technique is the most successful,[60,61] but this technique is limited to either the telephone or personal interview survey.

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[60]Randall, H., B. Ives and C. Eastman, "Bidding Games for Valuation of Aesthetic Environmental Improvements," Journal of Environmental Economics and Management Vol. 1, No. 2, 1974: 132-149.

[61]Brookshire, D.S., B.C. Ives and W.D. Schulze, "The Valuation of Aesthetic Preferences," Journal of Environmental Economics and Management Vol. 3, No. 4, 1976: 325-346.

CHAPTER 5

PROJECT SELECTION CRITERIA

5.1 Introduction

Local, state, and federal governments must make decisions about the ways to use coastal resources to satisfy the demand for recreational facilities. There are many different criteria that can guide the decision process in selecting among proposals for new recreation facilities and each of these criteria may lead to a different choice from the proposals. The purpose of this chapter is to acquaint the reader with the most commonly used project selection criteria and to illustrate how these criteria can be used for recreation project evaluation.

Since almost all recreation projects require some consideration of how the project will affect present and future generations, this chapter begins with a discussion of the way individuals, businesses, and society decide on the relative value of present and future enjoyment. This issue is vitally important because an economic analysis must consider the value of the benefits and costs received over the life of a project. The traditional approach in economic analysis is to give progressively less weight to benefits and costs received further in the future. This 'discounting process' is examined in the section on the net present value, benefit-cost ratio, and internal rate of return selection criteria.

The discounting process may not always be appropriate for evaluations of recreation projects either because of the nature of the project or because insufficient information is available about future benefits and costs. In these situations alternative investment criteria such as the payback period, cost-effectiveness, or cost-utility analysis may be preferred. These are discussed in section 5.7 of this chapter. We

conclude with a word about the role of equity and intergenerational concerns in recreation project selection and the limits of any selection criteria in accurately evaluating the future.

5.2 INDIVIDUAL INVESTMENT DECISIONS - THE INTEREST RATE

Individuals make decisions about how to use their income. They can choose to buy items such as food, clothes, entertainment, and furniture or they can save part or all of their income to buy these items in the future. Individuals decide how much of their income should be spent on present consumption and how much should be saved for future consumption depending on the value of each alternative to them. If an individual decides to save part of his income then he has decided that the value of present consumption is less than the value he will receive by using his income, plus earnings from investing that money, at some future time.

Income can be saved through savings accounts, treasury and investment bonds, certificates of deposit or other types of assets. People save money because they are concerned about their future consumption. But, the future always implies a degree of uncertainty. The amount of money people save depends on one's expectations about future income, the need for available money for current use, and the desire to save for large expenditures or for emergencies. When one saves income, he is doing so at the expense of present consumption. Because saving is done at a cost (i.e., foregone consumption) it requires a return, or payment, which will make the individual as happy to save his income as he would be if the income were spent now. This return is called the interest rate. It is the percentage of each dollar which will be paid in exchange for saving income.

Suppose a person's savings initially is 100 dollars. If the interest rate is 10 percent then at the end of one year the value of the 100 dollars will be 110 dollars. This is determined from the equation:

$$\text{Future returns} = \text{Initial value} \times (1 + \text{interest rate})^{i}$$

where "i" is the number of years that the money is saved: In this example,

$$\text{Future returns} = \$100 \times (1 + .10)^{1} = \$110.$$

Therefore, when a year has passed the value of the income is equal to the original amount saved plus the earned interest.

When a person saves money, the interest received is a measure of the preference that person has for saving instead of using that income for present consumption. This is called an individual's time preference. A person who is interested in maximizing the enjoyment of his income will put money into savings in accordance with his preferences for present and future consumption based on the highest available interest rate.

The rate of inflation is considered when deciding whether or not to save income. The inflation rate is the percentage decrease in the purchasing power of the dollar from year to year. If the purchasing power of each dollar is declining by 12 percent each year and the interest paid to each dollar saved is 10 percent, then the actual purchasing power of the income at the end of each year will decline by 2 percent. Since the interest rate would not compensate savers for the reduced purchasing power of the income they have saved, there would be no incentive to postpone present consumption.

5.3 BUSINESS INVESTMENT DECISIONS - THE DISCOUNT RATE

Businesses also make decisions to achieve goals. These goals may be to expand production capacity, keep employees working efficiently, design products which will be acceptable to consumers, or to increase the quality of their technology. These goals are set so that the firm can increase its profit.

To undertake these goals, the business must spend money to buy buildings, machines, professional advice, or research facilities. When businesses buy these capital goods they are investing in the future so that their goals will become a reality and profits will be earned in the future.

Businesses, like individuals, value present income more heavily than they do future income because of the two costs involved in waiting for future income. The first cost is the uncertainty of what the future holds and the second is the sacrifice of present consumption. When a business is deciding whether or not to invest, it is deciding whether to increase the owner's present income or increase capital investment to increase their income in the future. The owners of the business must be as satisfied to invest their money as they would be if they increased their present income.

In deciding which types of capital investment to pursue, the business must decide which investments will maximize its income over time. It must calculate the expected costs and returns in each year that the capital is used. The yearly costs are then subtracted from the yearly returns to get the annual net revenue that will be received from the capital investment.

The rate of return that the business requires to invest for the future is measured by the discount rate. The discount rate is used to determine the present value of income received in the future. When a capital investment is being considered, the net revenue accruing in each year from the investment must be discounted back to the present year. These yearly discounted returns are summed together to determine the net present value of the investment. The equation used for discounting is:

$$\text{Net present value} = \sum_{i=1}^{n} \frac{\text{Annual returns - Annual costs}}{(1 + r)^i}$$

where

i = the year in which the net return is received (1,2,3,...,n)

n = the duration of the project

r = the discount rate.

The summation symbol $(\sum_{i=1}^{n})$ means that after all net returns occurring each year are discounted back to the present year, and these annual discounted net returns are summed together. If the net present value is greater than zero then the investment would yield a return that is greater than the minimum rate of return required by the business.

Suppose two alternative investments are being evaluated to determine which alternative will increase income faster over its lifetime. The discount rate is used to determine if the future net returns will increase at a rate which is acceptable to the business. In this example, the business decides to use a discount rate of 10 percent. This number is the business's opportunity cost of capital. It reflects the highest rate of return which the business can expect to receive if it employed its money in another business venture. An investment which has an annual return of 10 percent or greater will have a net present value which is equal to or greater than zero.

The business projects the annual costs and returns which will be expected throughout the life of each alternative. The costs are subtracted from the returns to get the net return for each year. The net returns for each year of use are given in Table 5:

Table 5: Initial Cost and Net Returns for Two Alternative Investments

Costs and Returns	Alternative A	Alternative B
Initial Cost	$5,000	$5,000
Annual Net Returns		
Year 1	5,000	2,000
Year 2	3,000	3,000
Year 3	3,000	12,000
Year 4	3,000	500
Year 5	4,000	500
Total Net Returns	$13,000	$13,000

At first look the two alternatives seem almost the same, both have the same initial cost and total net returns. However, a different picture emerges when we consider the discounted value of the net returns over the five years. The calculations are:

Alternative A

$$\text{Net Present Value} = (-\$5{,}000) + \frac{\$5{,}000}{(1 + .1)^1} + \frac{\$3{,}000}{(1 + .1)^2} + \frac{\$3{,}000}{(1 + .1)^3}$$

$$+ \frac{\$3{,}000}{(1 + .1)^4} + \frac{\$4{,}000}{(1 + .1)^5}$$

$$= \$8{,}812.24$$

Alternative B

$$\text{Net Present Value} = (-\$5{,}000) + \frac{\$2{,}000}{(1 + .1)^1} + \frac{\$3{,}000}{(1 + .1)^2} + \frac{\$12{,}000}{(1 + .1)^3} + \frac{\$500}{(1 + .1)^4} + \frac{\$500}{(1 + .1)^5}$$

$$= \$8{,}966.35$$

Under the net present value criteria, alternative B should be chosen over A because B will produce more net income than A. Both alternatives provide a higher annual return than 10 percent because their net present value when discounted at 10 percent is greater than zero.

5.4 PUBLIC INVESTMENT DECISIONS - THE SOCIAL DISCOUNT RATE

We have discussed how individuals and businesses value present consumption over future consumption. We determined that individuals will save money and businesses will invest money if they believe that they will receive a higher future income as a result of giving up present consumption.

Taxpayers, too, are giving up part of their present income for future consumption when they pay taxes to the government. The government makes investment decisions which provide services to taxpayers that may not be provided through private businesses. Examples of these services include garbage disposal, wastewater treatment, flood control dams, recreation facilities, urban development projects, scientific research, and water management. These and other services are provided by tax revenues from local, regional and/or national residents.

Public projects which provide benefits over a period of time should be evaluated to determine if the expected annual flow of costs and returns over time is consistent with the time preference rate of the public. Remember, the time preference rate measures the return on each dollar which must be received in the future to give up present consumption.

The government represents the aggregate of all individuals in the town, region or nation. Because of future uncertainty and the public's preferences for present consumption, the government should use a discount rate so that the net benefits from public projects can be valued in terms of the present value of each project. The percentage rate of return that reflects the cost of public investment is called the social discount rate or social time preference rate.

Suppose two alternatives for marine recreation facilities are being evaluated. One choice is to construct a fishing pier and the other is to construct a marina. The goal of this investment is to provide recreation opportunities for the residents of the area. The initial cost and net benefits are presented in Table 6.

Table 6: Hypothetical Initial Cost and Net Benefits from Two Alternative Recreation Projects.

Project	Initial Cost	Net Benefits			TOTAL BENEFITS
		Year 1	Year 2	Year 3	
Fishing Pier	$1,000,000	$1,000,000	$600,000	$300,000	$1,900,000
Marina	1,000,000	300,000	600,000	1,000,000	1,900,000

For illustrative purposes, assume that each project would only last three years and the social discount rate is 5 percent. The resulting net present values would be:

$$\text{Fishing Pier} = (-\$1{,}000{,}000) + \frac{\$1{,}000{,}000}{(1 + .05)^1} + \frac{\$600{,}000}{(1 + .05)^2} + \frac{\$300{,}000}{(1 + .05)^3}$$

$$= \$755{,}900$$

$$\text{Marina} = (-\$1{,}000{,}000) + \frac{\$300{,}000}{(1 + .05)^1} + \frac{\$600{,}000}{(1 + .05)^2} + \frac{\$1{,}000{,}000}{(1 + .05)^3}$$

$$= \$693{,}520$$

These projects had the same net benefits and initial cost. However, the fishing pier, which had most of the net benefits occurring at the beginning of the period had a higher net present value than the marina whose net benefits increased over time. With discounting, net benefits which occur further into the future have less value than those which occur early in the life of the project. In addition, with higher discount rates the present value of future benefits is even lower.

5.5 THE SOCIAL DISCOUNT RATE FOR COASTAL RECREATION PROJECTS

When evaluating government project investments, the decision maker should determine the value of future net benefits in terms of the public's foregone present consumption. This foregone present consumption represents the tax revenues and bond revenues that are used to finance

the investment. Although future generations will benefit from public investment as long as the total undiscounted net benefits are greater than zero, the well-being of both present and future generations will not be maximized unless the loss of present consumption by taxpayers and bondholders is taken into account.

There is no clear cut method to follow in determining the social discount rate for recreation projects. This issue has generated a great deal of controversy among both economists and recreation planners and no consensus of opinion has emerged.[62] While no single rate can be accepted as the appropriate discounting criteria, some understanding of the factors that should be considered in choosing a rate is helpful.

The scope of the project and the governmental agency responsible for oversight is a key factor. Projects carried out by Federal agencies must use discount rates specified by the Water Resources Council or the Office of Management and Budget.[63] These rates are changed periodically and may not be the same but use of the prescribed rate is mandatory and the analyst has no discretion.

Recreation projects carried out by state or local governments should be evaluated at a discount rate that reflects the costs of borrowing money for that level of government.[64] For example, a state

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[62]A good summary of the key points in this controversy is provided in Sassone, P.G. and W.A. Schaffer, Cost-Benefit Analysis: A Handbook, New York: Academic Press (1978), pp. 105-121.

[63]Most recreation projects would use discount rates determined by the Water Resources Council.

[64]This implies that the costs of borrowing money is an adequate measure of the social time preference rate.

agency should use a discount rate equal to the current yield[65] on long term state bonds. Similarly, a municipality should use the current yield on the municipality's debt obligations or the yield on state bonds if the municipality has no outstanding debt. Where more than one type of bond exists, a general obligation bond yield is most appropriate since this rate is not indicative of the risk associated with a particular activity such as may be the case with revenue bonds. In states where only revenue bonds are used, the bond yield selected should apply to a project that has a comparable degree of risk with the risk of the recreation project under consideration.

As previously illustrated, the level of the discount rate can have a significant effect on the present value of a recreation project's net benefits. Instead of trying to pick one correct social discount rate, an alternative would be to use several values to test the sensitivity of the net benefits. For example, discount rates of 8, 10, and 12 percent could be used to see if the net present value of the project is altered appreciably. If the only discount rate that results in a positive present value is 8 percent, this indicates that the project is only a marginal investment for the community. On the other hand, if the project produced positive net benefits even when discounted at 12 percent, then the project is a clear winner. When there is some uncertainty about the appropriate discount rate to use, a prudent course of action is to use a range of alternative rates.

One issue that cannot be avoided in this discussion is whether a discount rate should be used at all in recreation project evaluation. Some would argue that recreation projects are long-lived investments that benefit many generations of users. The discounting process gives

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[65]The current yield is defined as the bond's coupon rate expressed in dollars, divided by the bond's price. This measure reflects conditions in the current financial market rather than those that existed when the bond was issued.

less and less value to benefits and costs received further in the future. As a result, future generations are, in effect, given little consideration in a discounted benefit-cost evaluation even though the project lifetime is long enough to include benefits and costs expected many years in the future. This effect will be more pronounced for projects which would incur major costs in the early years of the project but have benefits that occur principally in later years.

Those who argue in favor of discounting point out that present taxpayers must bear the burden of recreation investment decisions. If their preferences between present and future consumption are not considered, then the present taxpayers may bear costs that outweigh the benefits they receive.

Again there is no simple resolution for this conflict. However, one point should be made clear. A recreation project should not be justified on the basis of ambiguous claims about potential future benefits. A responsible economic analysis should attempt to clearly identify and quantify as many benefits and costs as possible. The decision of whether the discounting procedure should be applied will depend on which criterion is used by the decision making authority.[66] The objective of economic analysis is to clarify the tradeoffs inherent in any recreation investment decision. Asserting that recreation benefits are too intangible to measure and that discounting discriminates against future generations may be a valid argument, but this line of reasoning cannot offer any insights into the sacrifices that present generations might incur to receive the benefits of a recreation investment.

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[66]A complete discussion of alternative decision criteria follows in the next sections.

5.6 INVESTMENT CRITERIA

A number of different criteria can be used to determine whether a single project or which among several projects would be a feasible public investment. The appropriate criterion to use depends on the amount of information about the benefits and cost of a project(s), the budget available for the project(s), and whether the decision makers decide that a discounting process is proper for the project(s) under consideration. In this section we will consider investment criteria for projects with good information about benefits and costs and for which the discounting process is suitable. These include net present value, the benefit-cost ratio, and the internal rate of return. In the following section, alternative criteria for projects with limited information and for which discounting is not suitable are considered.

Net Present Value

The net present value (NPV) criterion is based on a discounting process in which the benefits and costs over the life of a project are reduced to a single number. For public recreation projects, the social discount rate would be used since this rate reflects the preferences of the public in their choice of present versus future consumption. The NPV formula is:

$$NPV = \sum_{i=1}^{n} (B_i - C_i)/(1 + r)^i$$

where B_i are the benefits received in the i^{th} year, C_i are the costs in the i^{th} year, and r is the social discount rate.[67] In some cases where only costs are incurred during the first year of the project, the first term on the right hand side would be $-C_0$ and no discount would be applied (see the example in Section 5.4).

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[67] A table of discount factors for different rates and project lifetimes is available in the appendix to this chapter.

As discussed in the previous section, the NPV criterion allows projects to be ranked according to their net value over the lifetime of the project. As long as the NPV is greater than zero, a project will result in a net benefit for the public but projects which yield the highest NPV are preferred.

Benefit-Cost Ratio

An alternative criterion which also uses the social discount rate is the benefit-cost ratio (B/C). The formula for the B/C ratio is:

$$B/C = \frac{\sum_{i=1}^{n} B_i/(1 + r)^i}{\sum_{i=1}^{n} C_i/(1 + r)^i}$$

where the symbols have the same meaning as above in the NPV formula. Under this criterion, a feasible project would result in a ratio of discounted benefits to discounted costs greater than 1.0.

Where only a single recreation project is being considered that is within the available budget, either the B/C ratio or the NPV criterion will give the same result about the feasibility of the project. However, if more than one project is being considered, then the B/C ratio and the NPV criterion may yield different rankings for the projects.[68] Two general rules of thumb apply here: 1) If two different projects are being considered and both are within the available budget, then the NPV criterion is better because it will select the project which produces the greater net benefits for society; 2) If the choice involves more than two projects which total more than the available budget, then those

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[68]A more detailed discussion and illustration of this problem is provided in Chapter 2 of Sassone, P.G. and W.A. Schaffer, Cost-Benefit Analysis: A Handbook, New York: Academic Press, 1978.

projects with the highest B/C ratio should be implemented until the budget is exhausted. This will result in the highest return to society for the available budget.

The Internal Rate of Return

One problem with both the NPV and B/C criteria is that the social discount rate must be selected. One way to circumvent this problem is to calculate the internal rate of return (IRR) for a recreation project. The IRR is defined as that discount rate which equates the initial cost with the sum of the future discounted net benefits. The internal rate of return, d, is determined implicitly by the formula:

$$C_0 = \sum_{i=1}^{n} (B_i - C_i)/(1 + d)^i$$

where C_0 is the project's initial cost and the other symbols are as previously defined. The IRR is typically calculated through trial and error. Different discount rates[69] are used until the correct rate which equates costs with benefits is found. Computer programs have been developed to simplify this task.

Once the IRR is determined, the result is compared with some minimum acceptable rate of return set by the decision maker. As long as the IRR is greater than the minimum rate, the project is acceptable. Even though the problem of choosing a discount rate is avoided, the issue of selecting a minimum acceptable rate of return remains.

Usually the internal rate of return and the net present value criteria will lead to the same investment decision. However, there are certain investments which will cause the decision maker to choose the wrong investment if one or the other is used. Both the internal rate of

[69]See the appendix to this chapter for a table of discount factors for different discount rates and project lifetimes.

return and the net present value should be used with an understanding of the type of investments under consideration and the pattern of cash flow.

In the case of projects which have negative net benefits interspersed with positive net benefits over the life of a project,[70] the IRR procedure may not yield a unique solution. In fact, the solutions may give widely conflicting results about the feasibility of the project.[71] In this situation, the IRR is not a valid investment criterion.

In addition, if the NPV and IRR are used for projects that have large differences in the stream of net benefits over the lives of the projects, the results of the NPV and IRR will differ. For example, consider two projects which both have an initial cost of $3,000. Project A has net benefits of $1,000 per year for the first ten years of the project and then zero net benefits for the next ten years. Project B has zero net benefits during the first ten years and annual net benefits of $2,000 for the second ten years. The NPV for the two projects at discount rates of 5, 7, and 10 percent and the IRRs for the two projects are presented in Table 7. An ambiguous result emerges. With a social discount rate of 7 percent or less, the NPV criterion indicates that Project B is preferred. However, at a rate of 10 percent, or with the IRR criterion, Project A is preferred. If the appropriate social discount rate is 10 percent, there is no ambiguity in the two investment criteria. The ambiguity would result if the appropriate social discount rate were 7 percent or less. In this situation there is no simple rule for deciding whether to use the NPV or IRR criterion.

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[70]An example of this phenomenon could be a beach restoration project in which periodic pumping of sand to maintain the beach could cause negative net benefits in certain years.

[71]For an illustration of multiple IRRs, see Herfindahl, O.C. and A.V. Kneese, Economic Theory of Natural Resources, Columbus, Ohio: C.E. Merrill Publishing Co., 1974, pp. 198-199.

Table 7: Comparison of Net Present Value at Different Discount Rates for Two Projects

Discount Rate	Net Present Value		Decision
	Project A	Project B	
5%	$4,722	$6,480	Choose B
7%	4,024	4,141	Choose B
10%	3,115	1,738	Choose A
Internal Rate of Return	30.5%	13.8%	Choose A

A Comparison of Net Present Value, Benefit-Cost Ratio, and Internal Rate of Return Criteria

As we have seen, each of the investment criteria discussed thus far has some limitations. Most professional economists, however, prefer the net present value criterion because of its general applicability and ease of interpretation. When only a single project is being considered, the NPV and B/C criteria will give comparable results if the same social discount rate is used in both calculations. Also, the IRR criteria will give comparable results if the flow of net benefits is uniform over the life of the project. The only difficult choice is the proper social discount rate to use in the NPV or B/C calculations, or the minimum acceptable rate of return if the IRR criteria is used. The most straightforward approach would be to use NPV with a discount rate based on municipal bond obligations since this reduces the subjectivity of choosing a minimum acceptable return.

The real difficulty in selecting either the NPV, B/C or IRR criteria occurs in the frequently encountered setting where several projects are competing for a limited budget. In this situation, the B/C criteria has some definite advantages since it permits projects to be ranked in order of importance. A similar ranking can be done with NPV criteria but the ranking may differ from that of the B/C criteria. In most cases the B/C ranking will lead to a superior project selection than the NPV ranking. It is often useful though to compute both rankings for comparison purposes; the extra work necessary to do this is trivial since the same data are used in both calculations.

The major argument against the IRR is the uncertainty about interpretation of the calculations. The possibility of multiple IRRs limits the applicability of this criterion and inhibits any meaningful ranking of alternative projects. Someone must decide what is an acceptable minimum rate of return in order to make the IRR criterion operative. Most economists would suggest that a social discount rate is the proper minimum return for public recreation projects but once this is determined it is much easier to use the discount rate directly in the NPV calculation than to carry out the IRR calculation.

5.7 ALTERNATIVE INVESTMENT CRITERIA

Payback Period

Quite often those responsible for public recreation policy decide that a discounting process is not proper for the projects being considered or there is not enough information about the long term benefits and costs to make the discounting process meaningful. In these situations either the NPV or B/C criteria are relatively useless but there is still a need to use the benefit and cost data that are available in a consistent manner so that alternative investment proposals can be compared. One of the simplest and most widely accepted of these alternative investment criteria is the payback period.

The payback period is the time required for an investment to return the initial outlays in the form of net benefits to users. Suppose a local government wants to construct a fishing pier. The cost of construction is $100,000. The expected annual net benefit from public use of the pier is $10,000. The payback period is:

$$\text{Payback Period} = \frac{\text{Initial Cost}}{\text{Annual Net Benefits}} = \frac{\$100,000}{\$10,000} = 10 \text{ years}$$

In ten years, the sum of the net benefits acquired from the opportunity to fish on the pier will equal the cost of the pier.

How does one determine whether or not ten years is an acceptable period to wait for the benefits to equal the cost of the pier? Since this method does not explicitly consider the time preference rate of the public, the choice of an appropriate payback period must be made by some decision maker who represents the public interest.

Cost-Effectiveness

In evaluating recreation proposals it is not always possible or practical to fully identify the economic benefits of a facility. Important intangible effects such as reduced juvenile delinquency may be associated with the project or the planning group evaluating the proposal may not have a budget large enough to conduct a survey to measure the economic benefits. In these situations an alternative approach is to identify the effects of the project (benefits) in physical terms while measuring the costs in dollar terms. A comparison of alternative projects which use the same physical unit for benefits received would reveal which project provided the most benefits per unit of cost or, alternatively, the least cost per unit of benefit. Since cost-effectiveness does not use a discounting process, this investment criterion is only useful for selecting among competing projects that would accomplish the same objective. An example will illustrate the use of this approach.

Suppose three recreation facilities have been proposed and the objective is to provide the least costly recreation facility per person per day. Although there may be one project which would be the lowest total cost alternative, it may not attract many visitors. The cost per person using the lowest total cost facility may be higher than if another more costly facility attracting many people is provided instead. In this example, each visitor to a facility represents one unit of benefit and one day is the unit by which costs and benefits are measured. The average number of visitors per day, the average cost of providing and maintaining each facility per day, and the cost-effectiveness (cost per visitor per day) for each of three proposed facilities are presented in Table 8. Park A is clearly the lowest total cost alternative at $1,200 per day, but Park B is the most cost-effective facility because it would have the lowest cost per visitor per day. Park C attracts the most visitors but it is the least cost-effective of the three parks.

Table 8: Cost-Effectiveness Analysis for Three Coastal Recreation Facilities

Facility	Visitors Per Day	Cost Per Day	Cost-Effectiveness (Cost Per Visitor Per Day)
Park A (beach with minimum facilities)	3,000	$1,200	$.40
Park B (beach with fishing pier and boat rentals)	5,000	$1,750	$.35
Park C (same as B but with picnic and camp facilities)	6,000	$3,000	$.50

This example illustrates the use of cost-effectiveness in evaluating alternative projects when the benefits are not measured in monetary terms. However, only projects with similar or identical goals can be measured and a common measure of effectiveness must be used to assess the degree of effectiveness per dollar of cost. Therefore, the cost-effectiveness results cannot be compared with other projects whose effectiveness is measured differently.

Cost-Utility

Cost-utility analysis is a way to incorporate subjective information into an evaluation of project feasibility. Cost-utility is the cost per unit of satisfaction or "utility" received from benefits when they are not expressed in monetary terms and the decision maker is not certain that the benefits actually will occur.

Utility reflects the degree of satisfaction which will be received by individuals from a project's benefits. Even though "satisfaction" cannot accurately be measured on a monetary scale, it is still possible to reflect the relative desirability of two or more benefits on a scale of, say, one to ten. If the utility of a day of scuba diving is seven to an individual and a day of fishing gives him a utility of five, we can see that this individual values scuba diving more highly than fishing. We can also see that he has some regard for fishing since he assigned it a positive value. To see how a cost-utility analysis can be used, let's consider the following example.

A local planning group wants to increase local sport fish populations to encourage fishing enthusiasts to vacation in the region. They believe this will enhance the popularity of the coastal area as a vacation resort and increase tourism in the area. Two proposals are being evaluated. The first is to stock nearby reefs with fish. The second is to allow more freshwater to flow into a local bay to keep the bay from reaching seawater salt concentrations. As a result, more baitfish would spawn in the bay. Local biologists believe an increase in baitfish populations would cause an increase in sportfishing opportunities.

The objective of the planning group is to increase the sportfish population in the region. The desirability of each plan depends on how much and how soon the fish population will increase. The planners would like to see the population increase at least 20 percent and, from investigation, they feel that it is possible for both plans to accomplish this. They also want the 20 percent increase to occur within one year. They determine that it is possible for this to be achieved with either plan. The 20 percent increase and the ability for this to occur within one year are steps in achieving the objective. They assign a relative utility to each outcome, the 20 percent increase and the one year waiting period. In this example, the utility of increasing fish populations by 20 percent is eight and that for the one year waiting period is five on a scale of one to ten. This reflects their subjective opinion that the 20 percent or more increase is more important than the waiting period.

From available research data and professional analysis a probability is assigned to each factor in each plan. A probability is a measure of the likelihood that an event will occur. For instance, the hypothetical probability that fish stocking will increase fish populations by at least 20 percent is .45. This means that if the reefs were stocked an infinite number of times and each stocking had no effect on the outcome of the following stocking, 45 percent of those stockings would increase the population by at least 20 percent. Probability assessments are subjective. Planners should use all kinds of information and make judgments in the use of that information to formulate a probability.

Cost-utility is calculated by first finding the expected utility of each plan. The probability an outcome will occur is multiplied by the utility which will be received if the outcome actually occurs. The products of all the outcomes of the plan are summed together and called the expected utility (EU). This is the utility or satisfaction one can expect to receive from the plan given that the probability of each

outcome is correct. In other words, expected utility quantifies the value of that plan in terms of the probability of each outcome and the satisfaction or utility which will be received from each outcome if it does occur. The expected utility is then divided into the cost of implementing the plan to get the cost per unit of expected utility.

For this example the results of the cost-utility analysis for each proposal are presented in Table 9. Although the expected utility of Proposal B is greater than that of Proposal A (9.7 compared to 6.6), the cost of Proposal B is double that of A. If the planning group was not concerned with the cost of achieving the objective, then B would be more desirable. The costs, however, cannot be ignored and when a comparison is made on the basis of cost per unit of expected utility (line (7)), Proposal A is the lower cost alternative ($80,808 versus $84,656). The planning group could accept these results at face value or supplement additional information in choosing a final course of action.

Data requirements for cost-utility analysis are less stringent than other analyses and a large number of potential outcomes can be included in the determination of the best plan. For instance, we could have included in our analysis the utility of and probability that the increase in fish populations would last for at least three years. This addition might have produced different results. Uncertainty can be included in the analysis as well as subjectivity in dealing with benefits for which it is difficult to determine the monetary value. A major disadvantage is the subjectivity of the analysis which makes it difficult to compare the results of different evaluators.

Table 9: Cost-Utility Analysis for Two Proposals to Increase Local Sportfish Stocks

	Proposal A Fish Stocking	Proposal B Freshwater Inflow
(1) Probability of increasing sportfish by 20%	.45	.90
(2) Probability of increase occurring in one year	.60	.50
(3) Utility of increase in sportfish (1-10)	8	8
(4) Utility of increase within one year (1-10)	5	5
(5) Expected Utility EV = ((1) x (3)) + ((1) x (2) x (4))	4.95	9.45
(6) Cost of Proposal	$400,000	$800,000
(7) Cost-Utility (6) ÷ (5)	$80,808	$84,656

Concluding Remarks on Investment Criteria

This section has acquainted the reader with three additional criteria to choose among competing projects. These analyses can be useful when a budget constraint exists. If the decision process does not depend on the relative cost of each project, then these analyses provide no useful information. Since most government agencies do work within a budget, the use of cost-effectiveness or cost-utility allow planners to choose that project with the lowest cost per unit of effectiveness or utility.

The major shortcomings of these alternative criteria when compared with the net present value or benefit-cost ratio criteria are that dissimilar projects cannot be directly compared and the analysis will not tell us if a project's monetary benefits will exceed the costs. This can be a serious problem when the budget allocation process includes investment projects such as a new fire station or hospital in addition to coastal recreation projects. Both the net present value and benefit-cost ratio criteria provide comparative rankings of dissimilar projects.

When it is especially difficult to express a recreation project's benefits in monetary terms or when uncertainty exists whether the benefits will actually be realized, either a cost-effectiveness or a cost-utility analysis will increase the information about the merits of alternative recreation projects. In some cases this is the best a planner can hope for. In other cases where either a net present value or benefit-cost ratio ranking reveals little difference between projects, these alternative criteria provide a means of allowing subjective information to enter the decision process.

5.8 EQUITY AND INTERGENERATIONAL EFFECTS IN PROJECT SELECTION

Equity

In all of the above investment criteria equity, the distribution of the benefits and costs of a project over income groups, is not an explicit consideration. In fact, each of these criteria reflects the philosophy set forth in the first legislative dictum requiring benefit-cost analysis for federal water projects. The Flood Control Act of 1936 required agencies to determine whether "...the benefits to whomsoever they accrue exceed the costs."

This simple criterion unfortunately is not adequate for the modern arena of public investment decisions. Federal investment criteria have

been expanded to include an analysis of regional economic effects, the impact on environmental quality, and the impact on social well-being.[72] The problem, however, is that these additional criteria are oftentimes more difficult to quantify or describe than the project's direct economic benefits and costs. As a result, it is virtually impossible to make a direct comparison of the feasibility of a project, using a strict benefit-cost ratio, with the effect of the project on the distribution of income in the project areas.

The best that an economic analyst can do in these situations is to prepare a detailed assessment of the way the benefits and costs will be spread across both users and non-users of a recreation facility. The distribution of benefits and costs can indicate whether a project will be readily accepted by members of the community and how elected officials may respond to the interests of their constituents.[73] In the final analysis the decision whether to accept a project and its distributional consequences must be made on the judgment of the public authority responsible for that decision.

In many recreation programs, user fees have been established as a means of placing some of the financial responsibility on those who benefit directly from government recreation facilities. At least fifty percent of public parks and recreation facilities charge user fees and the extent to which government recreation agencies depend on fees is

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[72]Water Resources Council, Water and Related Land Resources: Establishment of Principles and Standards for Planning, Washington, D.C.: Federal Register 38 (No. 174), Part III, September 10 (1973).

[73]A more formal analysis and discussion of the role of distribution effects in projection selection is provided in Loehman, E.T., et al., "Distribution Analysis of Regional Benefits and Costs of Air Quality Control," Journal of Environmental Economics and Management 6 (1979): 222-243.

growing.[74] Due to increased demand for recreation, agencies depend on fees to at least partially support a greater range of recreation facilities and activities. In 1976, the Forest Service user fee system paid for forty percent of the total operation and maintenance costs at the fee charge areas.[75]

Despite the widespread use of public user fees, there is still some concern that it violates the tradition of free public recreation. Actually, there is no such thing as free recreation when applied to government investments. If recreation services are not paid for in part with user fees, then taxpayers must pay the entire cost of land acquisition, construction, operation, and maintenance through federal, state, and local tax dollars. User fees do not constitute double taxation for the person who pays user fees and taxes because user fees replace tax dollars in the financing of recreation facilities.

One challenge for the user fee system is to insure that no one is excluded from public recreation facilities because of the user fees. This does not negate the desirability of user fees since the only alternative to fees may be closure. Modified or waived fees for low income users is possible. However, other barriers besides fees already restrict some people from taking advantage of recreation opportunities. The rising cost of transportation is prohibitive to many low income people. User fees will not change the use of a recreation facility to those who already cannot afford to visit it. Although user fees are generally a small part of the total cost of recreation to the individual, fees add to the cost of recreation and are a deterrent to use by low income residents. To reduce the impact of user fees on low income residents, recreation agencies can reduce or waive fees without sacrificing revenues when a combination of methods are used.

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[74]U.S. Department of the Interior, Fees and Charges Handbook, Guidelines for Recreation and Heritage Conservation Agencies, Washington, D.C. (March 1979), p. 6.

[75]U.S. Forest Service, User Payment for Recreational Opportunities, Washington, D.C. (September 1979), p. 2.

Intergenerational Effects

An additional shortcoming of the investment criteria discussed above, and particularly those using a discounting process, is that the interests of future generations are likely to be misrepresented because of the impossibility of measuring their preferences about the use of coastal resources. When a coastal environment is committed to a recreation project, the project may alter this environment and exclude it from other desirable uses in the future. A project which is valuable to society over a period of time may lose its value in the future due to the desire for other uses of the land and the resources required by the project. Any future decisions to change a project will only be feasible if the higher valued resources incorporated into a project, such as coastal land, can be reclaimed and used for another purpose. An investment is irreversible if the resources used in the project cannot physically change in form to another desired state, such as its original condition, or reclamation is too expensive.

Coastal developments, such as parks and marinas, which may alter the natural environment of a coastline, may be viewed as desirable today, but society may not value these developments as highly in the future. Wilderness recreation and recreation in undeveloped areas has been increasing at the rate of approximately ten percent per year over the past several decades.[76] Add to this the continued alteration of undeveloped coastal land and we have a situation of rising values for natural coastal environments.

For example, a marina project could have irreversible effects on the surrounding natural environmert. Marina construction may require alteration of the existing shoreline to provide adequate water depth and storage capacity for boats. The dredging of sand offshore and the

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[76]Krutilla, J.V. and A.C. Fisher, The Economics of Natural Environments, Baltimore: Johns Hopkins Press (1975), pp. 46.

dumping of sediments on adjacent wetlands could affect the ecology and stability of the coastline. The suspension of fine sediment particles over wide areas offshore caused by dredging and filling in a particular area can kill coral, fish, and shellfish. The filling of sand over adjacent land areas could destroy marshland, mangrove trees, sea grasses and other shoreline resources which are essential to prevent erosion, filter sediments and pollutants, buffer storm surges, and provide protective habitats for economically valuable fish and shellfish.

When a recreation project is being considered for an undeveloped site, an analysis of the benefits or services that accrue to society from preserving the site (no development) should be made. These benefits can then be compared with the net benefits from the project. This "with and without test" allows the decision maker to at least consider the tradeoff which must be made in determining the feasibility of the project. It is not acceptable to apply the with and without test solely on the permitting decisions of enviromental regulation agencies. These agencies evaluate the feasibility of coastal resource use on biological or other physical criteria. The economic value may be considerably different than that established on other criteria.

As a final word on this subject, there is no substitute for careful analysis in which the expertise of several disciplines and the viewpoint of many public interest groups are considered. No single investment criteria can provide unambiguous decisions in all situations involving coastal resources. The wise use of these decision tools depends on a thorough understanding of their relative merits and limitations.

APPENDIX

DISCOUNT FACTORS FOR DIFFERENT DISCOUNT RATES

Discount Factor = $\frac{1}{(1 + r)^N}$ where r is the discount and N is the number of years in the future.

Example: What is the present value of an annual sum of $1,000 received for the next three years if the discount rate is 10%?

From the table for r = 10%, and N = 1, 2, 3, we find the discount factors: .9091, .8265, and .7513. We calculate the present value by multiplying the discount factor times the annual sum received.

Present Value = ($1,000 x .9091) + ($1,000 x .8265)
+ ($1,000 x .7513)

= $2486.90.

Year (N)	Discount Rate 4%	6%	8%	10%	12%
1	.9615	.9434	.9260	.9091	.8928
2	.9245	.8900	.8573	.8264	.7972
3	.8890	.8396	.7938	.7513	.7118
4	.8548	.7921	.7350	.6830	.6355
5	.8219	.7473	.6806	.6209	.5674
6	.7900	.7050	.6302	.5655	.5066
7	.7600	.6651	.5835	.5132	.4523
8	.7307	.6274	.5403	.4665	.4039
9	.7026	.5919	.5002	.4241	.3606
10	.6756	.5584	.4632	.3855	.3220
11	.6496	.5268	.4289	.3505	.2875
12	.6246	.4970	.3970	.3186	.2567
13	.6010	.4688	.3677	.2896	.2292
14	.5775	.4423	.3405	.2633	.2046
15	.5553	.4173	.3153	.2394	.1827
16	.5339	.3936	.2919	.2176	.1631
17	.5134	.3714	.2703	.1978	.1456
18	.4936	.3503	.2502	.1799	.1300
19	.4746	.3305	.2317	.1635	.1161
20	.4564	.3118	.2145	.1486	.1037
21	.4388	.2942	.1987	.1351	.0926
22	.4220	.2775	.1839	.1228	.0826
23	.4057	.2618	.1703	.1117	.0738
24	.3901	.2470	.1577	.1015	.0659
25	.3751	.2330	.1460	.0933	.0588
26	.3607	.2198	.1352	.0839	.0525
27	.3468	.2074	.1252	.0763	.0469
28	.3335	.1956	.1159	.0693	.0419
29	.3207	.1846	.1073	.0630	.0374
30	.3083	.1741	.0994	.0573	.0334
31	.2965	.1643	.0920	.0521	.0298
32	.2851	.1550	.0852	.0474	.0266
33	.2741	.1462	.0789	.0431	.0238
34	.2636	.1379	.0730	.0391	.0212
35	.2534	.1301	.0676	.0356	.0189
36	.2437	.1227	.0626	.0343	.0169
37	.2330	.1158	.0580	.0294	.0151
38	.2253	.1092	.0537	.0267	.0135
39	.2166	.1031	.0497	.0243	.0120
40	.2083	.0972	.0460	.0221	.0107

Source: Gittinger, J.P. Compounding and Discounting Tables for Project Evaluation. Baltimore, MD: Johns Hopkins University Press (1973), pp. 5-25.

CHAPTER 6

CONCLUDING REMARKS

The use of economic analysis and in particular benefit-cost analysis has grown in respectability and popularity in recent years. Recreation planning has been an area traditionally considered outside the realm of economics; but, advances in analytical techniques for recreation demand and increasing concern for the efficient use of public funds have enhanced the argument for including economic analysis in resource management decisions. The popularity of coastal recreation due to a growing population and increased tourism requires that objective estimates of coastal recreation demand and value are available so that resource managers can efficiently allocate public funds.

The purpose of this handbook is to provide persons who are involved in coastal recreation resource decisions with an understanding of the fundamentals of economic analysis and an overview of recent advances in recreation economics research as it applies to coastal recreation. The topics covered are designed to provide coastal resource managers with a handy reference source for both the theory and practice of recreation economics and references have been provided throughout to give the interested reader a guide to the literature in this rapidly growing area.

The reader should be aware that the emphasis on economic values in this handbook does not imply that economic factors are the only considerations in coastal resource management. Economic analysis is only an aid in decision making that can clarify some of the trade-offs in resource use decisions. Important factors such as esthetic value and social well-being are inextricably intertwined in coastal resource use and these factors are not easily defined either quantitatively or qualitatively. Economic analysis cannot substitute for an intelligent

appraisal of the significance of these factors in the public decision making process.

The use of economic analysis in recreation planning is not easy and the uninitiated may feel that the process is not worth the trouble. It is this author's opinion that the use of the principles and methods explained in this handbook can provide important insights about the proper use of our precious coastal resources. Hopefully users of this handbook will agree that the benefits of implementing these methods outweigh the costs.

References

1] Anderson, F.J. and N.C. Bonsor. "Allocation, Congestion and the Valuation of Recreational Resources." Land Economics Vol. 50, February 1974.

2] Archer, B.H. "The Uses and Abuses of Multipliers." Planning for Tourism Development, edited by C. Gearing. New York: Praeger. 1976

3] Barnett, H. and C. Morse. Scarcity and Growth: The Economics of Natural Resources Availability. Baltimore: Johns Hopkins Press. 1963.

4] Brookshire, D.S., B.C. Ives and W.D. Schulze. "The Valuation of Aesthetic Preferences." Journal of Environmental Economics and Management Vol. 3, No. 4, 1976: 325-346.

5] Burt, O.R. and D. Brewer. "Estimation of Net Social Benefits from Outdoor Recreation." Econometrica Vol. 39, No. 5, 1971: 813-827.

6] Cesario, F.J. and J.L. Knetsch. "A Recreation Site Demand and Benefit Estimation Model." Regional Studies Vol. 10, 1976: 97-104.

7] Cicchetti, C.J., A.C. Fisher and V.K. Smith. "An Econometric Evaluation of a Generalized Consumer Surplus Measure: The Mineral King Controversy." Econometrica Vol. 44, 1976: 1259-1276.

8] Clawson, M. and J.L. Knetsch. Economics of Outdoor Recreation. Johns Hopkins University Press. 1966.

9] Currie, J.M., J.A. Murphy and A. Schmitz. "The Concept of Economic Surplus and Its Use in Economic Analysis." Economic Journal 81 (1971): 741-799.

10] Davidson, L.S. and N.A. Schaffer. "A Discussion of Methods Employed in Analyzing the Impact of Short-Term Entertainment Events." Journal of Travel Research Vol. 18, No. 3, Winter 1980: 12-16.

11] Freeman, M.H. The Benefits of Environmental Improvements. Baltimore: Johns Hopkins Univiversity Press. 1977.

12] Gibbs, K.C. "Evaluation of Outdoor Recreational Resources: A Note." Land Economics Vol. 50, No. 3, August 1974: 309-11.

13] Gittinger, J.P. Compounding and Discounting Tables for Project Evaluation. Baltimore, MD: Johns Hopkins University Press. 1973.

14] Gordon, I.M. and J.L. Knetsch. "Consumer's Surplus Measures and the Evaluation of Resources." Land Economics 55, February 1979: 1-10.

15] Hanni, E. and E.H. Mathews. "Benefit Cost Study of Pinellas County Artificial Reefs." Florida Technical Paper No. 1, May 1977.

16] Herfindahl, O.C. and A.V. Kneese. Economic Theory of Natural Resources. Columbus, Ohio: C.E. Merrill Publishing Co. 1974.

17] Jennings, T.A. "A General Methodology for Analyzing Demand for Outdoor Recreation with an Application to Camping in Florida State Parks." Ph.D. dissertation, Department of Food and Resource Economics, University of Florida, Gainesville. March 1975.

18] Knetsch, J.L. Outdoor Recreation and Water Resources Planning. Washington, D.C. American Geophysical Union, Water Resources Monograph No. 3, 1974, p. 3.

19] Knetsch, J.L., R.E. Brown and W.J. Hansen. "Estimating Expected Use and Value of Recreation Sites." Planning for Tourism Development, edited by C. Gearing, W. Swart and T. Var. New York: Praeger. 1976.

20] Knetsch, J.L. and F.J. Cesario. "Some Problems in Estimating the Demand for Outdoor Recreation: Comment." American Journal of Agricultural Economics Vol. 50, February 1974: 51-57.

21] Krutilla, J.V. and A.C. Fisher. The Economics of Natural Environments. Baltimore: Johns Hopkins Press. 1975.

22] Loehman, E.T., et al. "Distribution Analysis of Regional Benefits and Costs of Air Quality Control." Journal of Environmental Economics and Management 6 (1979): 222-243.

23] Lucas, R.P. and J.L. Oltman. "Survey Sampling Wilderness Visitors." Journal of Leisure Research Vol. 3, No. 1, 1971: 28-42.

24] Lynne, G.D., F. Prochaska and P. Convey. "The Economic Value of March." Journal of Economics and Environmental Management Vol. 8, No. 1, June 1981.

25] Manus, A.T. and J.J. Mertens. "Recreational Planning and Decision Making in the Coastal Zone: A Cast Study of Mustang Island State Park." Coastal Zone Management Journal Vol. 5, No. ½, 1979: 35-59.

26] McConnel, K.E. "Congestion and Willingness to Pay: A Study of Beach Use." Land Economics Vol. 53, No. 2, May 1979: 185-195.

27] Mishan, E.J. Cost-Benefit Analysis. New York: Praeger. 1976.

28] Pearse, P.H. "A New Approach to the Evaluation of Non-Priced Recreational Resources." Land Economics Vol. 44, No. 1, February 1968: 87-99.

29] Randall, A. Resource Economics. Columbus, Ohio: Grid Publishing. 1981. pp. 297-299.

30] Randall, A. and J.R. Stall. "Consumer's Surplus in Commodity Space." American Economic Review 70 (1980): 449-455.

31] Randall, H., B. Ives and C. Eastman. "Bidding Games for Valuation of Aesthetic Environmental Improvements." Journal of Environmental Economics and Management Vol. 1, No. 2 (1974): 132-149.

32] Ravenscraft, P.J. and J.F. Dwyer. Reflecting Site Attractiveness in Travel Cost-Based Models for Recreational Benefit Estimation, Report No. 78-6, Department of Forestry, University of Illinois at Urbana-Champaign. 1978.

33] Sassone, P.G. and W.A. Schaffer. Cost-Benefit Analysis: A Handbook. New York: Academic Press. 1978.

34] Schuman, H. and M.P. Johnson. "Attitudes and Behavior." Annual Review of Sociology 2 (1976): 161-207.

35] Selltiz, C., L.S. Wrightsman and S.W. Cook. Research Methods in Social Relations. New York: Holt, Rhinehart and Winston. 1976.

36] Shelby, B. "Crowding Models for Backcountry Recreation." Land Economics Vol. 56, February 1980: 43-55.

37] Sinden, J.A. "A Utility Approach to the Valuation of Recreation and Aesthetic Experiences." American Journal of Agricultural Economics, February 1974: 61-72.

38] Sinden, J.A. and A.C. Worrell. Unpriced Values - Decisions Without Market Prices. New York: J. Wiley and Sons. 1979.

39] Smith, V.K. and R.J. Kopp. "The Spatial Limits of the Travel Cost Recreational Demand Model." Land Economics Vol. 56, No. 1, February 1980: 64-72.

40] Smith, R.W., et al. An Economic Valuation of Recreational Clamming in Massachusetts. Research Bulletin No. 654, College of Food and Natural Resources, University of Massachusetts at Amherst, April 1978.

41] Stoevener, H.H. and W.G. Brown. "Analytical Issues in Demand Analysis for Outdoor Recreation." Journal of Farm Economics 49, No. 5, 1967: 1295-1304.

42] Thomson, R.B. 1980 Florida Statistical Abstract. Bureau of Economic and Business Research, University of Florida. 1980.

43] U.S. Department of the Interior. Fees and Charges Handbook, Guidelines for Recreation and Heritage Conservation Agencies. Washington, D.C. March, 1979.

44] U.S. Forest Service. User Payment for Recreational Opportunities. Washington, D.C. September, 1979.

45] Warwick, D.P. and C.A. Lininger. The Sample Survey: Theory and Practice. New York: McGraw-Hill. 1975.

46] Wheelwright, S.C. and Makridakis, S. Forecasting Methods for Management, 3rd Edition. New York: Wiley and Sons. 1980.

47] Wilkinson, P.F. "The Use of Models in Predicting the Consumption of Outdoor Recreation." Journal of Leisure Research Vol. 5, No. 3 (1973): 34-47.

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