

*An Introduction to*  
**Coastal Zone  
Economics**

Concepts, Methods, and Case Studies

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*Steven F. Edwards*



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*An Introduction to*  
**COASTAL ZONE ECONOMICS:**  
**CONCEPTS, METHODS, AND CASE STUDIES**

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## **An Introduction to Coastal Zone Economics**

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*To my parents  
with love and appreciation*

## Preface

If a reporter stopped you on the street and asked you to define economics and economic value, what would you say? Your responses would probably involve household and business finances and characteristics of the national economy such as prices, markets, and unemployment. At this level of inquiry, most responses would be correct in a general way. However, if the reporter pressed for precise definitions, we soon would find some fundamental disagreements between economists and non-economists. Among other things, we probably would have different definitions of costs and profits, of the relationship between price and value, and of whether markets are necessary for economic value to exist.

The purpose of this book is to promote the optimal use of coastal resources through an improved understanding of economics. The underlying premise is that economic analysis broadly construed, as opposed to narrowly confined to costs and markets, is a powerful tool for illuminating tradeoffs among conflicting allocations of scarce coastal resources. Its power rests in its simplicity and broad scope. That is, much of economic thought is reducible to a few concepts which can be applied to a wide range of problems. Although there is no field of study called "coastal zone economics" per se, the concepts that we need are available from the literatures of microeconomics, welfare economics, public finance, and environmental and resource economics.

Although the subject matter is economics, the book is written primarily for non-economists and for students enrolled in marine resource management courses. Policy makers, planners, other professionals, and concerned citizens encounter resource allocation issues daily; however, most people are not prepared to assess fully the economic content or impli-

cations of these issues. Alleged economic arguments invoked by those who are pro- or anti-economic growth are nearly always incomplete and often mistaken and misused. The reader should expect to learn enough about economics to evaluate critically such arguments. You are invited to approach the book with an open mind and to consider the time that you spend to be an effort to learn a new language that happens to use English words.

The tone of the book is intended to be objective. The emphasis that economics places on the efficient uses of scarce resources requires an awareness of all benefits—so-called non-market benefits as well as consumer satisfaction and economic profit. Although non-market benefits such as for clean water or for access to public beaches are not fully or even partially revealed in commercial markets in many cases, they have economic content nonetheless. The discussion of these benefits is necessary for a complete understanding of economics and should not be construed as a preservation bias.

Lest you are shying away from reading further, let me remind you that the book is a selective introduction to economics that focuses on coastal resources. It is not a handbook that details quantitative, analytical methods in cookbook fashion. It is a primer that should be read comfortably. Advanced concepts which are relevant to the discourse are presented in non-technical ways. The only mathematical talents which one needs are a familiarity with algebra and an ability to follow simple graphs.

My hopes are that the concepts and methods are presented clearly and that they become useful when forming coastal resource policies. Any comments about the success or failure of these hopes are welcomed.

The chapters are arranged as follows. The four chapters in Part One introduce the reader to important economic concepts and methods. Chapter 1 argues for more frequent and wider applications of economic analysis to coastal resource use problems, thereby justifying the need for the book. Chapter 2 defines and illustrates several basic economic concepts using the coastal resource, shrimp, as a pedagogical aid. Commonly used methods for the analysis of resource use are introduced in Chapter 3. These concepts and methods are inculcated in Chapter 4 where ten stereotypic arguments are critiqued.

Part Two contains six chapters covering economic case studies of Galapagos Islands tourism, relative sea level rise in Bangladesh, beach erosion, water quality in coastal lagoons, potable groundwater, and traditional economic growth. These chapters both demonstrate the application

of economic analysis to coastal resource management problems and illustrate the use of several methods discussed in Part One. Chapter 11 contains parting remarks.

I am indebted to several organizations and individuals for assistance. Generous financial support was provided by the J. N. Pew Jr. Charitable Trust and the Woods Hole Oceanographic Institution's Marine Policy Center. The Department of Commerce, National Oceanic and Atmospheric Administration, National Sea Grant College Program provided additional seed money for the preparation of a precursor to this book. Dr. K. O. Emery, Scientist Emeritus in the Geology and Geophysics Department of the Woods Hole Oceanographic Institution, deserves special thanks for helping me make this book come to fruition. Dr. David Storey in the Department of Agricultural and Resource Economics, University of Massachusetts, read and provided constructive comments on the earlier draft, as did Judith Fenwick, Donna Edwards, and Elaine Edwards. Projections of future relative sea level in Bangladesh were provided by geologists John Milliman and David Aubrey of the Woods Hole Oceanographic Institution. Finally, Ethel LeFave and Jane Zentz provided able secretarial support.

# Contents

<b>Preface</b> .....	ix
<b>Chapter 1 Economics: “It’s Everywhere; It’s Everywhere”</b> ..	1
Overview .....	2

## PART ONE: CONCEPTS AND METHODS

<b>Chapter 2 Basic Concepts</b> .....	7
What is Economic Value and How is it Measured? .....	7
Willingness-to-pay, Economic Demand, and Consumer Surplus .....	8
Marginal Cost and Economic Profit .....	16
A Few Comments About Markets .....	20
Personal Discounting .....	23
Economics Costs are Opportunity Costs .....	26
Economics of Unpriced Resources .....	27
Non-exclusive Resources and Externalities .....	28
An Expanded Value Typology .....	32
“Shadow” Value .....	35
<b>Chapter 3 Basic Methods</b> .....	37
Descriptive Methods .....	37
Market Methods .....	37
Market-related Methods .....	41
Non-market Methods .....	44
Comparative Methods .....	46



Benefit-cost Analysis .....	47
Social Discounting .....	49
Sunk Costs, Transfer Payments, and Double Counting .....	50
Direct and Indirect Effects and Related Concepts .....	52
The “Art” of Benefit-cost Analysis .....	55
<b>Chapter 4 “Thinking Economically” .....</b>	<b>59</b>
 <b>PART TWO: CASE STUDIES</b>	
<b>Chapter 5 Demand for Galápagos Tourism: A Case Study ...</b>	<b>81</b>
Background .....	81
The Study .....	82
Results .....	84
Concluding Remarks .....	86
<b>Chapter 6 Potential Economic Effects of Relative Sea Level Rise on Bangladesh’s Economy: A Case Study ....</b>	<b>87</b>
Background .....	87
The Study .....	88
Results .....	90
Concluding Remarks .....	94
<b>Chapter 7 Household Demand for Local Public Beaches: A Case Study .....</b>	<b>97</b>
Background .....	97
The Study .....	98
Results .....	101
Concluding Remarks .....	103
<b>Chapter 8 Protecting Water Quality in Coastal Lagoons for Recreation: A Case Study .....</b>	<b>105</b>
Background .....	105
The Study .....	105
Results .....	106
Losses to Owners of Undeveloped Land .....	106
Recreational Benefits .....	108

Net Present Value of Selected Impacts .....	109
Postmortem .....	110
<b>Chapter 9 Willingness-to-Pay for Potable Groundwater:</b>	
<b>A Case Study</b> .....	113
Background .....	113
The Study .....	115
Results .....	115
Concluding Results .....	119
<b>Chapter 10 A Benefit-cost Analysis of Simulated Development</b>	
<b>on Cape Cod, Massachusetts</b> .....	121
Background .....	121
Framework .....	123
Results .....	127
Concluding Remarks .....	128
<b>Chapter 11 Parting Remarks</b> .....	129
<b>References</b> .....	131
<b>Index</b> .....	133
<b>About the Author</b> .....	135

## Chapter 1

### Economics: “It’s Everywhere; It’s Everywhere”

Man has occupied the world’s coastal zone for centuries. Historically, entire economies prospered from industries linked to trade and renewable resources such as fisheries. Nowadays coastal economies are more diverse, including tourism and the extraction of oil and other non-renewable resources. The labor force in these sectors still comprises much of the demand for construction, food, clothing, transportation, and recreation. In turn, these industries employ even more people. There is little doubt that land, fish stocks, oil, sand and gravel, and other coastal resources will continue to be utilized to promote economic growth.

People are drawn to the sea by its environs as well as employment opportunities, however. Swimming, boating, recreational fishing, wild-life photography, and simply gazing at the ocean are just a few of our valued pastimes. Higher per capita incomes, greater amounts of leisure time, and increased mobility should continue to facilitate the pursuit of these interests well into the future. Unfortunately, their value to coastal populations is not fully or, in some cases, even partially revealed in traditional markets.

At one time, the world’s coastal zone accommodated all interests in its resources—even mutually exclusive uses. Times have changed. The diverse needs and wants of a large and rapidly growing coastal population are now severely limited in many parts of the world by the fixed supply of coastal resources, by the limited capacity of natural ecosystems to assimilate man’s impacts, and by legal systems of property rights that favor private ownership. Often conflict arises directly between two well functioning markets. For example, condominiums are displacing private marinas along much of the shoreline in the United States. In other cases, however, markets do not reflect the full effects of their activities. For example, pollution of estuaries with sewage and industrial wastes affects the productivity of commercial and recreational fishermen because the

pollution reduces the growth and availability of fish and shellfish stocks. Other global examples of “externalities” include sewage pollution of coastal aquifers and crowding of recreational sites.

In still other cases, an inability to exclude people from a coastal resource or its benefits precludes the establishment of private markets. Non-exclusivity characterizes public beaches and access to them, as well as the many benefits that salt marshes and mangroves provide mankind, including storm protection, waste assimilation, and opportunities for bird watching. These resources tend to be developed without specific knowledge of the public benefits that are foregone.

In addition to competition for coastal resources, there are conflicts between the wills of mankind and “Mother Nature.” Coastal storms, shoreline erosion, and changes in relative sea level are persistent threats to coastal properties, beaches, and groundwater quality. These threats exacerbate the use conflicts.

## **Overview**

Whether by default or by design, our institutions allocate coastal resources among commercial and non-market uses. At the risk of oversimplifying an undoubtedly complex decision-making process, one can say that governments, conservation organizations, and citizen groups modify the directives of markets so as to account for non-market values. The underlying premise of this book is that economic analysis broadly construed, as opposed to narrowly confined to costs and markets, can play a valuable role in this decision-making process by illuminating tradeoffs among conflicting allocations of scarce coastal resources. That is, economics is ideally (but not necessarily uniquely) suited for assessing the outcomes and impacts of allocating resources among market and non-market uses.

This book tries to promote the efficient use of the coastal resources throughout the world by introducing applied economics to resource planners, government officials, lawyers, scientists, engineers, students, and concerned citizens. Although admittedly there is no field of study called “coastal zone economics,” the concepts and methods that we need are available from the literatures of microeconomics, welfare economics, public finance, and environmental and resource economics. Chapters 2 and 3

describe concepts and methods which are necessary for a solid foundation in economics and explain why and how economic analysis can be used to assess a wide range of interests, including non-market values. In turn, the concepts and methods are inculcated and extended throughout the remainder of the book. Chapter 4 critiques ten familiar stereotypic arguments about economic growth. In addition, the six chapters in Part Two use case studies to illustrate in concrete ways how economic analysis can be used to assess coastal resource management issues. These case studies cover Galapagos Islands tourism (Chapter 5), relative sea level rise in Bangladesh (Chapter 6), beach erosion (Chapter 7), water quality in coastal lagoons (Chapter 8), potable groundwater (Chapter 9), and traditional economic growth on Cape Cod, Massachusetts (Chapter 10). Chapter 11 is a final pitch for using economics to study the value of coastal resources.



**PART ONE: CONCEPTS AND METHODS**





## **Chapter 2**

### **Basic Concepts**

Most economic concepts are easy to understand. Indeed, “thinking economically” is a logical process that often appeals to common sense. In this chapter, several basic concepts are defined and illustrated graphically. In addition, the foundation for economic valuations is described. As you will see, neither markets, prices, consumption, nor use is a requirement for an economic analysis of resource value.

#### **What is Economic Value and How is it Measured?**

Most of the book is devoted to answering questions about economic value and how it is measured. We begin with a definition of economics that suits our purposes:

Economics is a study of how people allocate scarce resources among things that provide benefits.

While other scientists such as chemists, biologists, and ecologists study the “behavior” of molecules, organisms, and natural ecosystems, economists study the behavior of people. In particular, economists are specifically preoccupied with behavior that allocates resources. Individuals allocate personal income and time over things that give them satisfaction. Groups of people control larger resources such as offshore oil deposits and beaches. Regardless of the size of the resources being studied, however, economics is a behavioral science.

The key words in our deceptively simple definition of economics are “allocate,” “scarce,” and “benefits.” Allocation involves choices based on goals, or objectives. Scarcity implies that there are not enough resources to satisfy the objectives completely. Few of us have sufficient