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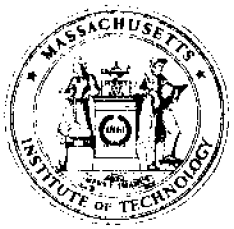
TEACHING COASTAL ZONE MANAGEMENT: AN INTRODUCTORY SUBJECT

by

Dennis W. Ducsik



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TEACHING COASTAL ZONE MANAGEMENT: AN INTRODUCTORY COURSE SYLLABUS

by

Dennis W. Ducsik
Instructor of Civil Engineering

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY
CAMBRIDGE. MASS. 02139

SEA GRANT PROGRAM

ADMINISTRATIVE STATEMENT

The purpose of this report is to document the experience of developing and teaching a graduate-level subject in coastal zone management at M.I.T. during the 1973-1974 academic year. The proximate objective of the subject is to introduce students with a variety of backgrounds to the wide range of problems and policy issues surrounding human use of the land-sea interface. While this report is not intended as a definitive text on the topic of coastal zone management, it is felt that the scope of presentation and depth of treatment are sufficient to provide a comprehensive and useful handbook for the teaching of an introductory subject in this new area of environment-related studies.

Funds for this subject development and initial presentation came in part from the NOAA Office of Sea Grant, U.S. Department of Commerce, Grant No. NG43-72, and from the Massachusetts Institute of Technology.

Ira Dyer
Director

September 1974

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INTRODUCTION

Beginning with the report of the Commission on Marine Science, Engineering and Resources in 1969* and continuing with the enactment of the Coastal Zone Management Act of 1972,** federal activities have been highlighting the need for enhanced public management of the Nation's coastal resources. The Congress has found that the increasing and competing demands placed upon the lands and waters of coastal regions, as occasioned by population growth and intensive development, have often resulted in and pose a continuing threat of the loss of living marine resources, wildlife, and nutrient-rich areas; of permanent and adverse changes to ecological and physical systems; and of severe limitations on the availability and accessibility of open spaces and other opportunities for public enjoyment that coastal areas are uniquely suited to provide. Consequently, the Congress has declared it a national policy to achieve wise use of the land and waters of the coastal zone, giving full consideration to ecological, cultural, historic and esthetic values as well as to needs for economic development. Furthermore, it is widely recognized that the key to more effective use of such resources is to encourage the states to develop management programs for the coastal zone, including methods and processes for making land and water use decisions of more than local significance.

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*Our Nation and the Sea: A Plan for National Action, Report of the Commission on Marine Science, Engineering and Resources, U.S. Government Printing Office, Washington DC. (January, 1969). This Commission was chaired by Julius A. Stratton, former M.I.T. president, and is widely referred to as the Stratton Commission.

** Public Law No. 92-583; 86 Stat. 1280.

As a result, most coastal states have either enacted some form of shorelands management legislation or are in the process of developing coastal management programs. And concern for the future of the coastal zone is also very much in evidence at the local level, where elected officials, conservation commissions, and citizen activist groups often engage in efforts to foster enlightened coastal resource utilization.

This flurry of activity at all levels reflects a widespread desire to develop improved approaches for dealing with the social and environmental impacts surrounding the allocation of coastal resources. These impacts --which are often intangible and unquantifiable on the one hand and transcend jurisdictional bounderies on the other -- give rise to the "dilemma" of the coastal zone, i.e., the conflict between conservation and development, which epitomizes the complex interaction between the activities of modern industrial man and the resources of his natural environment.

The issue of balanced use of coastal resources is on the very frontier of environmental management. Historically, our institutions and agents of social control in the coastal zone have engaged in incremental and fragmented decision-making, reacted sequentially to discrete pressures and perceptions of crises, and failed to probe both the substantive basis for actions or programs and the assumptions which underlie them. Coherent schemes for rational resource management have continued to elude us, as we remain faced with the question of <u>how</u> to make decisions regarding the preservation and utilization of coastal resources in a way that is responsive to public needs and representative of diverse social values. This question has a complex structure of economic, technical, legal, political and socio-cultural dimensions,

and it is important that the universities, among others, rise to meet the challenge it presents.

For a number of years prior to the 1973-1974 academic year, members of the MIT faculty (particularly in the Departments of Civil Engineering and Ocean Engineering) had been actively involved in research efforts related to environmental resource use in coastal areas. Though primarily technological in orientation, such involvement gave rise to an appreciation for the ecological, political, legal and socio-economic aspects of marine-related policy as well. At that time, however, the effort to broaden the perspectives in connection with the study of the coastal environment had not yet reached the level of the student body on anything other than a project-oriented basis, and there was no means by which students could formally explore the complex coastal resource management area within a coherent, interdisciplinary framework. While pertinent information sources and expertise were abundant at MIT and in the Greater Boston area (e.g. law libraries, government agencies, environmental advocacy groups, etc.), the perspectives and insights of the respective professions in relation to coastal issues were never integrated in the educational sense except on a student's own iniative and in the face of many administrative inconveniences. This situation was seen to hinder the development of knowledge and careers in a field where professionals with balanced, interdisciplinary capabilities are increasingly needed. It was realized that if M.I.T. was to continue to play a leading role in the coastal affairs of the New England region and the Nation, it should begin to provide the necessary opportunities for career development in this emerging area of environmental management.

Thus, the time was ripe for the development of an initial subject offering in coastal zone management, the first of its kind in the Boston metropolitan academic community.

In the fall of 1972, the author developed a proposal for the development and teaching of a graduate-level subject in management and planning in the coastal zone, to be offered jointly by the Departments of Civil Engineering, Ocean Engineering, Architecture,and Urban Studies and Planning. The proposal was accepted by these departments and funded through the M.I.T. Sea Grant Program in the form of the Planning for Coastal Utilization Project. During the fall of 1973, materials were gathered, lectures were prepared, arrangements for guest speakers were made,and a subject outline and schedule was developed. In order to publicize the offering as widely as possible, it was listed in the M.I.T. subject catalog as a joint subject, and a poster was distributed widely both within M.I.T. and at the Woods Hole Oceanographic Institution and the Harvard Graduate School of Design. In the spring of 1974, the subject was taught on a bi-weekly basis to approximately 40 students, of which roughly 25 were from M.I.T. and 15 from Harvard. This large non-M.I.T. enrollment is indicative of the fact that the subject is unique to the region's academic community, while interest in the subject matter is growing steadily. This was further reflected in the desire of a number of planners and other professionals in marine-related areas to sit in on the class and/or acquire the reading materials. Ultimately, some 30 students received graduate credit for the subject,having prepared a mid-term and a final paper and

given a short oral presentation. The subject was favorably received by these students as indicated by a Civil Engineering feedback questionnaire, and it will be continued by the four participating departments on a regular basis.

The proximate objective of the subject is to introduce students with a variety of backgrounds to the wide range of policy issues surrounding human use of the land-sea interface. The primary emphasis is on the allocation of shorelands, where the range of competing uses is the greatest and the possibilities for conflict most pronounced. Discussions focus on a spectrum of topics, including the physical and ecological processes characteristic of shoreland areas; the catalog of human activities placing demands on the coastal resource base; the incidence and magnitude of adverse affects on ecological and amenity values; the institutional setting of coastal decision making; recent legislative developments; and special problem areas and critical policy issues. The texts most frequently drawn from and thereby recommended for purchase are:

1. Ketchum, ed., The Water's Edge, MIT Press (1972)
2. Ducsik, Shoreline for the Public, MIT Press (1974)

In addition, it is useful for students to develop a familiarity with the Stratton Commission report previously cited.

The purpose of the remainder of this report is to document the subject development and teaching experience and to lay out the substantive format that was followed during the term. As an aid to its continued offering at M.I.T. and to the development of similar offerings at other universities, the materials are organized into 25 sessions, each of which corresponds to

roughly a one and one-half hour class discussion. Each session is in turn divided into four parts comprising a short statement of purpose, a listing of reading assignments and other suggested references, and a discussion summary/outline. In some cases, the materials covered in class are presented in detail, while in others only a topical outline is given. Finally, the appendix contains information relative to the class which attended the subject during the spring of 1974, including a student roster and titles of student papers.

In closing, it should be noted that this report is not intended as a definitive text on the topic of coastal zone management. All the details of the respective discussions are not always included, as the proximate objective has been to give only the flavor of the issues presented and the questions considered. Further, a number of more sophisticated and specialized topics have only been dealt with briefly since they are well beyond the scope of an initial offering. On the other hand, it is felt that the depth of treatment is sufficient to provide a comprehensive and useful handbook for the teaching of an introductory subject in coastal zone management.

PART ONE: THE DIMENSIONS OF COASTAL ZONE MANAGEMENT

SESSION 1: A Conceptual Framework for Coastal Resource Management

Purpose:

To develop a generalized model of the relationship between the coastal resource base and the social control system that determines its allocation and use. This model underlies the thematic organization of the subject, and is useful in demonstrating the interconnectedness of the many aspects of any complex resource management issue.

Discussion Summary/Outline:

The model to be developed is characterized by mutual interactions among a number of components in a dynamic system. Three symbols are used in the model and are defined as follows:

A box represents the "status" or current "level" or "state" of a particular system component. This status changes over time as a function of the status of other components in the system.

An arrow represents a flow of influence (or information, a form of influence) between system components. These flows determine the relationship between system components, i.e., how the "status" of one affects the "status" of others.

A "valve" represents a point at which control is exercised over the flow of influence or information between components. The operation of valves is determined by the status of the system components which represent decision-makers.

There are six generalized components which make up the coastal zone management model, including:

1. The resources of the coastal zone, both water- and land-based;

2. The uses to which those resources are devoted (including non-use or conservation);

3. The effects on societal well-being that are associated with the pattern of utilization of the resource base;

4. The affected interests in society who respond to a given pattern of resource use and its associated effects on individual and collective values;

5. The decision-makers who influence or control the relationships among all other components of the system.

6. The organizational setting which generates economic, legal, political and other forces that constrain, determine or otherwise influence the activities of decision-makers.

The flows of influence and information among these components and the points of control that regulate these flows are shown schematically in Figure 1. The circled numbers on the diagram are keyed to the following discussion:

(1.) The status of the resource in question (i.e., its type, condition, availability or other relevant characteristics) influences the status of its potential utilization. An estarine area with poor mixing qualities, for example, may not be suitable as a site for a nuclear power plant with a once-through cooling system.

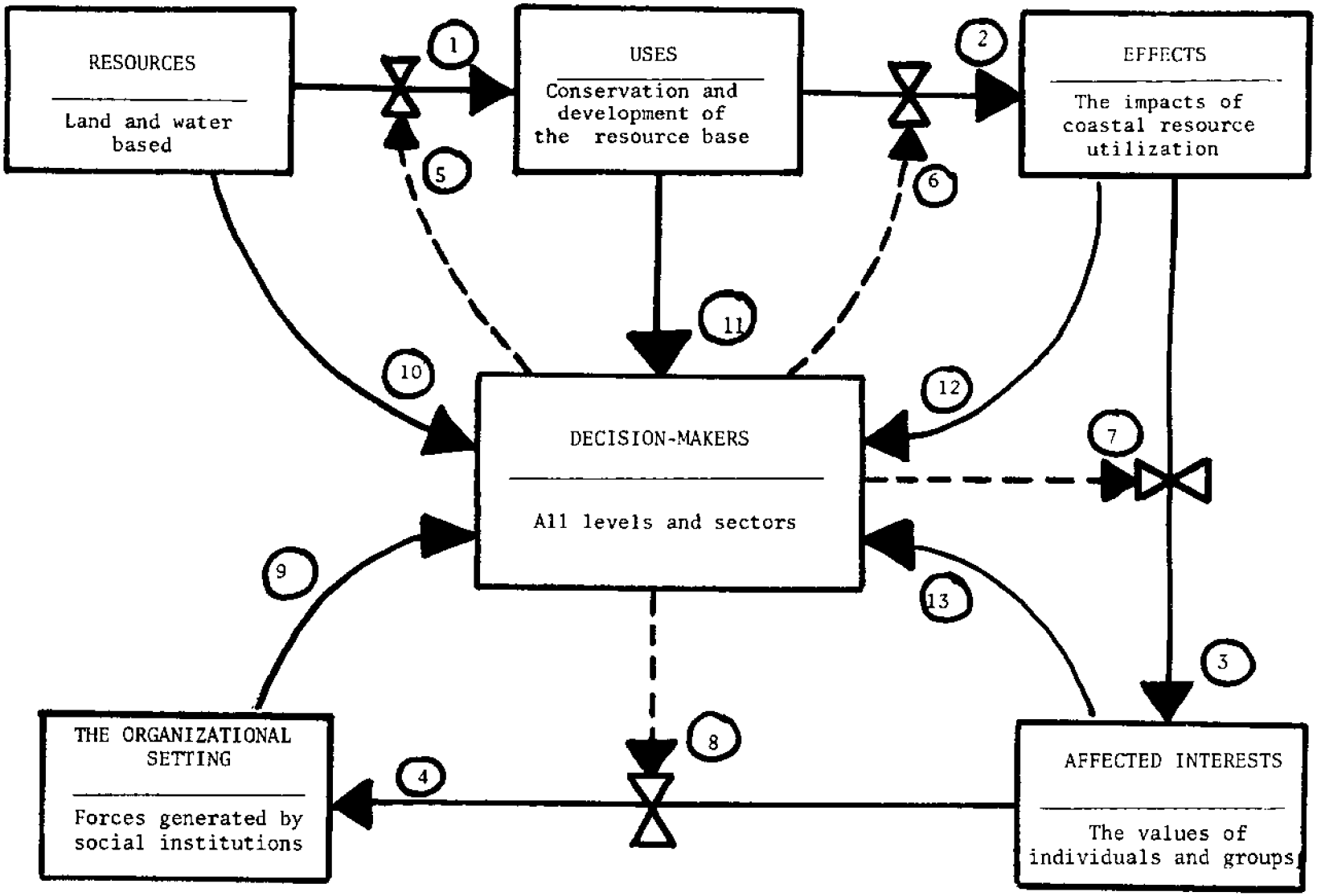

FIGURE 1: A Conceptual Framework for Coastal Resource Management

2. For a given use or pattern of coastal utilization, there will be a variety of environmental, economic or other social effects, both positive and negative, intended and unintended. A multiple-use construction project which is built on filled-in salt marshes may increase the tax base of a coastal community and provide increased recreational opportunities for its residents, but may also result in a loss in living marine resources that are valuable to the coastal ecosystem of the region.

3. Potential and actual effects, as they are perceived, affect the interests of various individuals and groups in society in both positive and negative ways. The viewer of march wildlife will suffer from the aforementioned project, while the resident of a new shorefront home will benefit.

4. The status of affected interests influences the forces which comprise the organizational setting for decision-making. Concerned citizens may convince government officials to enact protective legislation, or may authorize a bond issue to finance the purchase of public beach areas. In general, values are aggregated over time and underlie the institutions that society employs to order its affairs and guide decision-making.

5. Decision-makers (e.g. private developer, local zoning board, state coastal zone management agency, etc.) affect the relationship between the resource base and its utilization through the respective means at their disposal. A zoning board may determine a pattern of desired use that is consistent with a town plan; a developer may decide to invest in a shoreland area zoned for commercial purposes; and a state regulatory agency may impose conditions on the proposed development which would minimize or avoid certain environmental impacts.

6. Decision-makers also influence the incidence and magnitude of effects that are associated with a given coastal resource use. The courts, for example, may be called upon to abate pollution of navigable waters, or to preserve access to shoreline areas historically open for recreational use to the public at large.

7. Decision-makers also affect the interaction between effects and the values of individuals and groups by shaping society's perception of those effects. The media, for example, may focus attention on areas of critical environmental concern in the coastal zone, as may the League of Women Voters or the Sierra Club or some other concerned citizens group through their educational or lobbying efforts.

8. Decision-makers also exert a significant measure of control over the influence that affected interests have in shaping the organizational setting. An example here would be the enactment by a state legislature of a coastal zone management program which determines the ground rules under which all future shoreland development decisions are to be made.

9. The status of his organizational setting is probably the most important factor influencing a given decision-maker, for whom the forces of "reality" are most acute. These are the economic, political, legal or other "givens" which are usually the most clearly defined elements of the decision-making process. A developer needs adequate financing and must comply with the law; a government official must respond to the needs and values of his constituents. Every decision-maker operates within a framework with legal, economic and political dimensions.

10. 11. 12. Decision-makers are also influenced by the status of the resource base, its utilization, and the effects of that utilization. This influence is generally of an informational nature, and reflects considerations as to the desirability, feasibility, and equity associated with a given use or pattern of use of coastal resources. Data assessing the status of these three components would be found, for example, in an Environmental Impact Statement prepared by a federal agency for a particular coastal project.

13. Affected interests, both individual and collective, can exert direct pressures on decisions when articulated in contexts that may be formal (court proceedings, public hearings, elections, etc.) or informal (personal contacts, demonstrations, opinion polls, etc.). An example of this flow of influence is the case of the proposed oil refinery at Durham Point, New Hampshire, which was abandoned by the developer on the basis of an unofficial town vote.

At this point, we should observe that the model developed above is intended as a descriptive tool, an aid to comprehending the many and interrelated forces that work to determine the allocation and use of a given resource or resource base. For this reason, the model is highly aggregated and emphasizes, in a broad way, only the most salient features of the complex resource management system. The most important characteristic of the model is the identification of the primary system components and the specification of the nature of their interaction. The components are purposefully generalized (as each will represent different things in different situations) so as to highlight the feedback nature of their interrelationships. For example, decision-makers, in a variety of sectors and roles, exert controls over the flows of influence among the various components, but of equal significance is the fact that the decisions are also influenced by the status of the components themselves, either directly or indirectly. The individual or collective actions of decision-makers at any one point in time, then, will help shape the decision-making environment they face in the future.

We should note here that the model could be developed in much greater detail to describe a specific coastal decision-making situation. Such a lower level of aggregation would identify a number of other loops (e.g. certain decision-makers might control the flow of assessment data to other decision-makers) and exogenous forces (the status of the resource base may be influenced by technological change; the status of affected interests may be influenced by education and cultural background; etc.). An exercise of this sort could provide useful insights

into the nature of the decision process surrounding a particular case study. In the present context, however, it is appropriate to use the model in its more general form, for it adequately represents all the dimensions of coastal zone management that should be dealt with in a broad introductory subject. In the remaining sections of Part One of this report, the various elements represented in the model are developed in greater detail. Sessions 2 through 6 deal with the ecological, physical, and esthetic features of the resource base; Sessions 7 and 8 illustrate the scope and extent of coastal uses and their effects on various interests; and Sessions 9 through 16 cover the organizational setting for decision-making. In Part Two of the report, attention will be focused on a number of issues critical to the future of coastal zone management that are identified in the course of development of the model.

SESSION 2: Overview of the Physical Aspects of the Land-Water Edge

Purpose:

To acquaint the student broadly with the history and dynamics of physical processes that characterize the coastal shoreline.

Reading Assignment:

1. Shephard and Wanless, Our Changing Coastlines, McGraw-Hill (1971)--read Chapters 1 and 2, browse remainder
2. J. Hoyt, Field Guide to Beaches, ESCP Series, Houghton Mifflin Co.
3. C.P. Idyll, Abyss, (1964), selections from Chapters 2 and 4.

Other References:

1. Bascom, Waves and Beaches, Doubleday, Inc. (1964)
2. C.A.M. King, Beaches and Coasts, Edward Arnold Ltd. (2nd ed., 1972)
3. E.C.F. Bird, Coasts, The M.I.T. Press (1969)
4. Ippen, Estuary and Coastline Hydrodynamics, McGraw-Hill (1966)
5. V.P. Zenkovich, Processes of Coastal Development, John Wiley & Son (1967)
6. J. Hay and P. Farb, The Atlantic Shore, Harper & Row (1966)
7. B.B. Chamberlain, These Fragile Outposts, National History Press (1964)

Discussion Summary/Outline:

The materials to be covered in this session can be divided into three categories:

1. coastal evolution and classification, including historical data on coastal change, accretion and erosion, geographical distribution of types of coast in the United States, etc.
2. beaches (including beach material and its movement),

dunes, barrier islands, profiles and other features

3. coastal hydrodynamics, including waves in deep and shallow water, and the effects of winds, tides, currents, etc.

During the 1973-1974 academic year, the first topic was covered in reading assignments; the second was dealt with through reading and the showing of the film, Beach: The River of Sand (Encyclopedia Britannica Films, Inc., Chicago, Ill.); and the third was addressed in a guest lecture by Prof. Ole Madsen of the Water Resources Division of the M.I.T. Department of Civil Engineering. A topical outline of Prof. Madsen's talk follows.

A. Ideal Waves

1. Definitions

* water particles move "slowly" in closed orbits
* wave form moves "fast" without change
* crest, trough
* mathematical symbols and some fundamental equations regarding short waves (deep water), long waves (shallow water), surface profile, and wave shoaling

2. Wave energy

* potential and kinetic; average per unit surface area and flux per unit width; group velocity
* power dissipated at shore is considerable

3. breaking

   * limiting wave heights in deep and shallow water

4. wave refraction

   * analysis shows that wave becomes more normal to shore with decreasing depth
   * underwater mound results in concentration of energy -- bottom contour important
   * headland experiences decreased wave action
   * for obliquely incident waves on a plane beach long shore currents depend on wave height and angle of incidence at breaking; shoaling zone, breaking zone, surf zone

5. wave diffraction

   * effects of a breakwater

6. wave reflection

   * effects of a barrier

B. Real Waves and Tides

1. measurements

   * resistance, step resistance (through surface)
   * vertical accelerometer (floats)
   * pressure transducer (subsurface)
   * statistical approach
   * frequency spectrum

2. wave generation by wind

   * factors influencing waves
   * dimensional analysis
   * empirical relationships obtained using visual observations

3. waves from deep to shallow water

   * shoaling, refraction, dissipation
   * frictional attenuation may be very important

4. swells

   * storm waves; long waves first
   * different frequencies present

5. tides

   * use of tide gage: tide frequencies known--
     analyze signal and find best fit to values of amplitudes
   * tide predictions: U.S. Department of Commerce,
     National Oceanic and Atmospheric Administration
     (NOAA) prepares tide tables
   * tides in deep water: semi-diurnal (124 hours)--
     one foot amplitudes
   * magnification through shoaling -- tidal range
     of the order of four feet
   * energy concentrates due to smaller depth; funnel
     effect in estuaries
   * resonance in Bay of Fundy

6. storm tides

   * surge, wind set-up
   * induces currents; increase in water level
   * surges can be up to 20 feet or above

7. breakwater design and protection

   * necessary weight of armor stones derived

8. longshore sand transport

   * wave direction changes; net transport on the
     order of 100,000 cubic yards per year likely

9. shore protection

   * erosion and deposition
   * groins

SESSION 3: The Physical Dimension, Continued

Purpose:

To further explore with the students a particular topical area related to the physical aspects of the land-sea interface.

Reading Assignments

1. I. McHarg. Desigh with Nature, Natural History Press (1969) -- read chapter entitled "Sea and Survival"

2. J. Hay and P. Farb, The Atlantic Shore, Harper & Row (1966) -- read chapter 12, "The Shore in Human Hands."

3. Wesley Marx, The Frail Ocean (1967) -- see Chapter 3 "In Pursuit of Beaches"

Other References:

1. U.S. Army Corps of Engineers, Shore Protection Program (1970) and Shore Protection Guidelines (1971)

2. U.S. Army Corps of Engineers, Report on the National Shoreline Study, (August 1971)

Discussion Summary/Outline

This session is intended to allow for a more in-depth analysis of topics covered generally in the previous session, or to explore a related issue of current interest but not previously developed. During the 1973-1974 academic year, the topic for consideration was the effects of human presence on the physical aspects of the coastal zone. An additional objective was to acquaint the students with the activities of the federal agency that is constantly involved with such issues. Consequently, Mr. Cecil E. Wentworth, Chief of the Beach Erosion Section, New England Division of the U.S. Army Corps of Engineers, was invited to address the class. Mr. Wentworth prepared the following lecture, which was illustrated by a collection of slides of various beach areas in New England.

Beach Erosion Control - Coastal Zone Management *

It is a pleasure to be here with you today and discuss shorefront erosion and coastal zone management. The intent of my input here today is to broadly talk about the shorefront, touching a little on erosion processes, shorefront development and particularly some of the difficulties involved in properly managing a shorefront in a manner to minimize conflicts with the natural environment. I also would like to discuss very briefly the role of the Corps of Engineers in its beach erosion program.

The Corps of Engineers has been authorized to make beach erosion control studies since 1930. Then the Corps could make cooperative studies on an equal cost sharing basis with states to determine suitable methods of constructing suitable beach erosion control improvements but could not share in the cost of construction of recommended projects. In 1946, the law was modified to allow the Corps to participate in up to one third of the cost of construction of economically feasible beach erosion control projects protecting a publicly-owned shorefront. The law has been broadened since to allow the Corps to make beach erosion control studies at no cost to the states and municipalities for publicly-owned shores and to generally participate in up to fifty percent of the cost of construction of economically feasible projects, and up to seventy percent of the cost for improvements protecting public park areas that meet certain Federal criteria. For projects with a Federal cost of construction not exceeding $1,000,000, studies can be made pursuant to the Corps' continuing section 103 Small Beach Erosion Control Authority, without the need of time consuming Federal legislation. Projects with Federal cost exceeding this

* Presented by: Cecil E. Wentworth, Chief, Beach Erosion Section New England Division, U.S. Army Corps Engineers, February 26, 1974.

amount must be authorized by Congress.

The problems of coastal development along most of the shorefront are related not only physically to serious storms and wave produced erosion processes, but also most importantly to an ever increasing shorefront development to satisfy the needs of a rapidly growing population.

In geological history, in advance of developing human habitation along the coast, the ocean-produced dynamic processes generally remained in a balance of erosion and accretion. Barrier beaches fronting healthy grassy marshes grew at the expense of eroding bluffs; extensive dunes were built by a combination of storm-driven waves and wind-blown processes, providing a substantial degree of protection to lowlying inland areas from flood tides and wave action. Offshore islands formed,sometimes connected as tombolos to the mainland,and in a very practical sense there was a healthy balance of the overall environmental coastal system.

This balance has been interrupted in a large part as man developed the shorefront for his increasing needs. Major coastal harbors and cities have grown through history. Permanent and seasonal housing have been constructed along and close to the shorefront. As a result of an ever increasing demand for private and pulic recreational saltwater bathing and boating facilities, many such developments have sprung up, resulting in a major portion of the shorefront being developed. During much of the period of the major shorefront construction program, little was known about storm driven wave and flood tide processes, and certainly little or no control on building was practiced by state or municipal governments. Unfortunately, construciion on such sensitive areas as tidal marshland, on alongshore dunes, close to high bluffs, etc., was undertaken with the unfortunate result that buildings were soon threaten-

ed or destroyed through tidal flooding, storm-driven wave action or a combination thereof. This then required major construction of protective improvements, such as massive seawalls, stone revetments, and as time went on more sophisticated structures such as numerous groin structures, jetties at inlets, and massive offshore breakwaters. With much of the shorefront now being protected, this has greatly reduced the supply of sand that formerly nourished downdrift beaches through littoral transport. Consequently, many beaches that historically formed wide protective beach berms are now greatly reduced in dimension or in some places now non-existent.

We are, therefore, faced today with the problem of establishing a proper shorefront management program to not only meet the needs of the shorefront population, but at the same time to carefully "tune in" to a coastal environment that has been greatly modified by man. In considering the proper approach to managing the shorefront it is of major importance that the planner have a basic knowledge of shorefront processes and realize that to meet the variety of needs for a coastal area that certain trade-offs must be made. I would like to briefly touch upon, if I may, some points of interest relating to the New England shorefront.

The coastal erosion problems of New England are diversified and complex, due in part to the varied geological structure of the land masses involved. These geological structures vary from the rocky and rugged downeast coast of Maine to the more sensitive and readily erodible glacial terminal moraine shores of Cape Cod and the outer island complex consisting of the Elizabeth Islands, Martha's Vineyard and Nantucket Island.

The coastal erosion problems of New England are compounded by the number and types of storms experienced and the varying tides. These storms include hurricanes and extra-tropical storms. The coastal areas north of

Cape Cod experience frequent serious wave attack as a result of northeast storms which often last through several high tides, while the area south of Cape Cod, including the outer islands and the northern extremity of Long Island Sound, receive frequent damage from southerly storms and less frequently by hurricanes. The tidal range along New England varies from 18 feet above mean low water at Eastport, Maine, near the Canadian border to 3 feet along much of the Rhode Island and Connecticut coast. Thus, the natural beaches along the New England coast are tailored to the effects of the varying storms and tides acting upon the geological land mass structures. Along much of the coast, particularly in Maine and New Hampshire, there are numerous attractive pocket beaches located within crescent-shaped sectors formed between rocky headlands. To the south, along the Massachusetts, Rhode Island and Connecticut coasts and the outer island complex, barrier type beaches and dunes fronting tidal marshland or salt water ponds, tombolos, trailing spits, and bars become more prevalent. High erodible bluffs continue for miles in some sectors such as along the easterly shore of Cape Cod.

With increasing demands for beach area for saltwater bathing, needs are becoming urgent in New England for preserving and enlarging the existing beaches and for providing additional beaches. Much of the shore having good usable beach area is privately owned, thus restricting the further development of public use beach. The National Shoreline Study, a coastal inventory study completed by the Corps of Engineers in 1971, determined that only nine percent of the entire shoreline, excluding Alaska, is open to public recreational use, with seventy percent in private ownership.

The coastal engineer today must carefully consider the alternatives available in a coastal zone management program. Generally speaking, the alternatives for controlling erosion along an area range from the "do no-

thing" approach; to some form of structural measure or system of structural measures, federally-funded, usually in cooperation with the state and local interests; or finally to shorefront management techniques.

Types of structural measures that could be considered are generally as follows:

(1) Artificial Fill and Nourishment. It is often economical to allow erosion to persist and to restore and subsequently nourish a beach with sand from other sources. This method is especially desirable when sand of suitable characteristics may be obtained from nearby bays and inlets, or inland borrow areas without damage to the ecology of the area. The development of economical methods of dredging sand from deep water offshore and placing it on the beaches may result in reduced costs; research is needed.

(2) Groins. Groins are structures constructed generally perpendicular to the shoreline across the beach, and into the water. Used individually or in a series, they interrupt the sand moving into the sea and widen the beach at the location. Only when large amounts of sand are in transit is this method effective. The accelerated erosion downdrift which usually results from groins is minimized when sand is artifically added to the system.

(3) Seawalls. Seawalls are massive rigid structures constructed parallel to the beach line to withstand and reflect wave energy. Seawalls, by preventing erosion of areas that added sand to the supply in motion, may accelerate erosion of the fronting beach and nearby area.

(4) Revetments. Revetments are blankets of non-erodible material placed on a bank or a bluff or escarpment to prevent erosion. Stone or concrete blocks are commonly used. In function, revetments are similar

to seawalls except they are more flexible, generally of lighter construction and less costly.

(5) Breakwaters. Breakwaters for shore protection are usually massive stone structures located in the sea parallel to the shore; they interrupt the wave before it reaches the shore. This interruption of wave action causes a calm landward of the breakwater which slows the alongshore currents and causes sand to impound behind the structure. This impoundment is at the expense of downdrift beaches and their erosion follows.

(6) Other methods. Sand fences are effective protection for beaches and dunes behind the shoreline. The ridges or dunes formed by the fence prevent storm waves from overruning a low beach, barrier beach or spit. Vegetation serves a similar purpose in stabilizing dunes or beach areas which are not intensively used for recreation. Vegetation also is effective in reducing erosion of shoreline in bays or estuaries. From the standpoint of structural methods of improvement and disregarding the economic requirements of a dollar return for a dollar spent,and also disregarding the requirement of protecting a publicly-owned shorefront only as required for a Federally-shared improvement, there are situations which make erosion control improvements economically not feasible and frequently environmentally seriously undesirable.

The most practical and also economically feasible type of improvement is the restoration of a pocket type beach usually contained within rocky headlands and also in great demand for recreational use. Hampton Beach, New Hampshire might be considered as a good example of this type of beach construction. This beach area originally existed as a wide barrier beach fronting a tidal inland marsh. It has slowly eroded and narrowed particularly since construction of massive seawalls protecting the coastal high-

way bordering the beach. The Corps of Engineers pumped sand from the Hampton River inlet in 1955 to form a wide sandy beach of suitable material to an elevation to cause waves to break seaward of the backlying seawalls. Thus, the reflection force of waves that ordinarily break on a seawall was either eliminated during most storms or greatly reduced by the reduction in the size of a wave that might reach the wall during an infrequent, rare type of storm.

Contrasting to the pocket or contained type of beach is a situation where a continuous shorefront of erodible beach fronts a variety of natural backshore formations such as dunes, embankments and bluffs extending for miles (usually formed of material sensitive to rapid erosion, sometimes a glacial formation). Such areas in New England are Plum Island, the Manomet bluff area south of Boston, the easterly shores of Cape Cod, south shore of Martha's Vineyard, and the south and easterly shores of Nantucket Island.

The difficulty of protecting an isolated sector of a continuous shorefront becomes very complex. If the sector is protected by use of a solid structural material either as alongshore revetment or groin structures at its extremities, it will soon be flanked at either extremity as the unprotected shore recedes. The projecting improvement then can act to interrupt littoral material and will accelerate downdrift erosion. Thus it can be seen that the primary alternatives are (1) do nothing - let the shorefront erode unimpeded; (2) provide a minimum of dune restoration and vegetation work; (3) provide a beach erosion control improvement for the entire sector as a unit. The latter plan, probably at great cost, would usually be a beach restoration measure, consisting of direct placement of beach fill with or without retention structures. Currently, there is no authority to allow the Federal government to expend funds generally

along a shorefront which is in private ownership. The private interests and state government, although protecting certain developed areas, cannot complete work on an extensive type of shorefront of this nature due to the great magnitude of cost. Consequently, at this time in New England, long stretches of shorefront such as the offshore islands and much of Cape Cod are continuing to recede through erosion at a rapid rate.

The Corps of Engineers is very cognizant of the problems involved in beach erosion control, both from the standpoint of the possible adverse effects on the environment and also on the basis of economics. This type of condition is particularly demonstrated by a serious erosion problem experienced at Gay Head Cliffs, Martha's Vineyard, Massachusetts, which was recently studied in a beach erosion survey report by the New England Division.

This study determined that any plan to protect the cliffs would not only be environmentally unacceptable but also economically unfeasible. As you no doubt know, these Cliffs, glacially formed, rise as a multi-colored formation of sand and clay to the highest elevation on the northwestern extremity of the island.

The study determined that erosion was caused by a combination of factors, including rapid surface run-off during frequent rain storms, storm driven wave erosion, wind action, massive slumping and slides of the saturated upper slopes, continuous seepage of internal springs--all combining to contribute to the recession of the cliffs.

A combination of possible alternative erosion control measures ranging in cost from about $14,000,000 to $33,000,000 depending on the degree of protection provided, were determined to be economically not feasible. Also, compounding the problem was the fact that any near positive erosion control measure would result in the steep slopes becoming flattened,

vegetation then growing on the Cliff face, and the spectacular beauty (which is the major attraction of the Cliffs), then being completely obliterated. Thus, the best solution was to leave the Cliffs in a natural state ... a certain amount of erosion is necessary to maintaining their steep, sharp, colorful appearance ... but to confine the passage of numerous visitors to controlled routes, thus minimizing man-caused damage.

In certain situations, today, massive construction such as seawalls, revetments, bulkheads, etc. become mandatory. This usually applies to alongshore existing state highways, commercial development within harbor areas, and well established existing housing developments damaged by serious storms. This would not ordinarily involve new construction, but replacement or maintenance of the heavily damaged existing structures. Sometimes, the best and quite often the only answer is to move exposed buildings inland as the seaward shorefront erodes away. In such areas as the northerly developed area of Plum Island, Massachusetts, and Camp Ellis, adjacent to and north of the Saco River in Maine, cottages that were formerly constructed on dunes have either been destroyed or now have been moved inland to the maximum possible limit (now directly fronting a coastal road).

Shorefront management techniques to minimize erosion damages are more appropriate in many areas than providing protective measures. The National Shoreline Study, completed by the Corps of Engineers in 1971, considered that management techniques rather than structural appeared appropriate for about 85 percent of the shorefront undergoing significant erosion. Thus, a combination of protection and management-type measures may prove most economical and practical in many locations when detailed studies are made. A useful approach is to look at shore management as a process leading to preserving and enhancing the shore in the best interest of all

concerned. The principal steps of such a process (and they may be listed in different forms and sequences) are:

(1) Analyzing the shore history, erosion, development, damage and related factors.

(2) Evaluating present uses, effects of future demands, and shore requirements to satisfy demands.

(3) Setting objectives and goals from the National, state and local viewpoints.

(4) Comprehensive planning using alternative techniques and approaches responsive to public needs or desires.

(5) Predicting physical, biological, economical, and social effects on the basis of available information and required research.

(6) Decision-making by responsible local, state, and federal interests to develop practical plans.

(7) Developing programs to implement the plans by regulation, management, development, or other means.

In summary, construction of beach erosion control improvements in certain areas is an economical and practical solution and environmentally acceptable. The numerous beach erosion control-recreational use beaches constructed in the New England states in cooperation with the Federal government demonstrate this quite favorably. These beaches usually have the advantage of being limited in alongshore length, often contained within rocky headlands, and they usually have a natural ability to act as a beach. the only requirement being need of beach sand for intitial construction and periodic nourishment.

However, there are other areas where an extensive length of erodible shore extending for miles as narrow beaches fronting dunes, bluffs and

sometimes marshland become a very complex and expensive location for erosion control. Such areas as the easterly shores of Cape Cod (Cape Cod National Seashore), the offshore islands of Martha's Vineyard and Nantucket mentioned above, and in the South, Cape Hatteras and the outer banks of North Carolina all fall in the category of a complex condition for providing erosion control both from the environmental and economic standpoint. The National Park Service has recognized the difficulties and, in particular, the great expense of constructing beach erosion control measures in this type of environment.

It would seem unreasonable to believe that, in planning for future uses, such areas as Martha's Vineyard, Nantucket Island and the outer arm of Cape Cod (containing built-up municipalities and valuable shorefront homes) would be allowed to deteriorate to the point of a complete loss. On the other hand, extensive lengths of outer barrier islands or reefs such as the Cape Hatteras outer banks system measured in hundreds of miles might appear to be a different problem. Use of these uninhabited areas, developed as parks, would seem to invite construction of any required roads and facilities at acceptable distances inland to realize the necessary economic life-benefits of a project, leaving the seaward shorefront in a near natural state. Some dune restoration and vegetation work to retard the wave and wind-produced erosion would, however, always seem desirable.

With a continued research program on a means to economically move large volumes of sand from environmentally acceptable offshore areas, there may be a good possibility of large scale restoration of beach and dune frontage to protect an extensive suitable area such as Martha's Vineyard and Nantucket Island, in the long range. Also, consideration of constructing marsh areas utilizing dredged materials and with grass

lanting offers good long-term possibilities. The Corps of Engineers
ow has under contract such a research study investigating possible economic and
cceptible methods for disposal of dredged material.

I hope that this broad discussion on beach erosion control and shore-
ront management presents some "food for thought" in the field of
oastal zone management.

SESSION 4: Overview of Coastal Ecology

Purpose:

To introduce the students to the nature of life at the edge of the sea and the importance of shoreline resources to the marine ecosystem and food chain.

Reading Assignment:

1. C.N. Shuster, Jr., "The Nature of a Tidal Marsh," Information leaflet, Rhode Island State Department of Natural Resources (from the N.Y. State Conservationist, August-September, 1966)

2. C.P. Idyll, Abyss, (1964) - read selections from Chapter 5, "Meadows of the Sea"

3. W. Marx, The Frail Ocean (1967) - read Chapter 8, "Burial of an Estuary"

Other References:

1. R. Carson, The Edge of the Sea (1955)

2. John & Mildred Teal, The Life and Death of the Salt Marsh, Little, Brown & Co. (1969)

3. W.A. Niering, The Life of the Marsh, McGraw-Hill (1966)

4. W. Amos, The Life of the Seashore, McGraw-Hill (1966)

5. H. Odum, B. Copeland, E. McMahan. Coastal Ecological Systems of the United States, The Conservation Foundation (1974)

6. Marine Experiment Station, Univ. of Rhode Island Coastal and Offshore Environmental Inventory, Marine Publication Series No. 2, U.R.I. (1973)

Discussion Summary/Outline:

The land-sea interface plays an integral role in the largest, richest, most diverse and in many ways most interesting of all ecosystems -- the marine environment. This environment is very complex, being characterized by a mosaic of interwoven physical, chemical, biological and

other processes. In this session, we try to illustrate the "interconnectedness of things" with the broad outline that follows:

A. Start by looking at the processes that underlie the entire pattern of marine life, i.e. the energy budget or economy of the marine ecosystem as it relates to the food chain.

1. building blocks: water, CO_2, mineral nutrients (phosphates, nitrates) -- simple substances

2. photosynthesis takes place in phytoplankton, the single cell vegetable organisms that are the microscopic plant life of the sea.

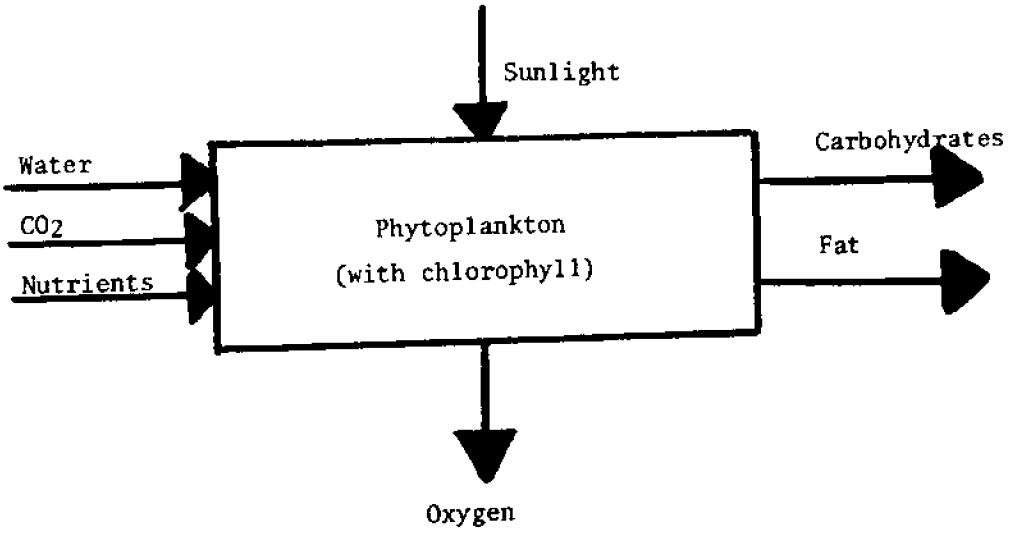

FIGURE 2: Energy Conversion through Photosynthesis

3. as shown in Figure 2, photosynthesis changes simple substances to complex organic compounds (carbohydrates and fats; the basic "stuff" of life), with energy stored in the form of chemical bonds between atoms. When phytoplankton are ingested, these bonds are broken and the food energy released.

4. marine photosynthesis accounts for 70% of the world total of released oxygen and 80-120 billion tons of

carbohydrates (as opposed to 40 billion tons on land).

5. food energy then progresses through the food chain in stages, from producers to primary consumers to second, third and fourth order consumers.

   * the ratio of primary producers to fourth order consumers is 10,000 to 1, i.e., it takes 10,000 lbs. of phytoplankton to produce the energy equivalent of 1 lb. of tuna.

   * the reverse is true for substances such as heavy metals that are not metabolized --hence, one part at the producer level accumulates to 10,000 parts at the 4th order consumer level.

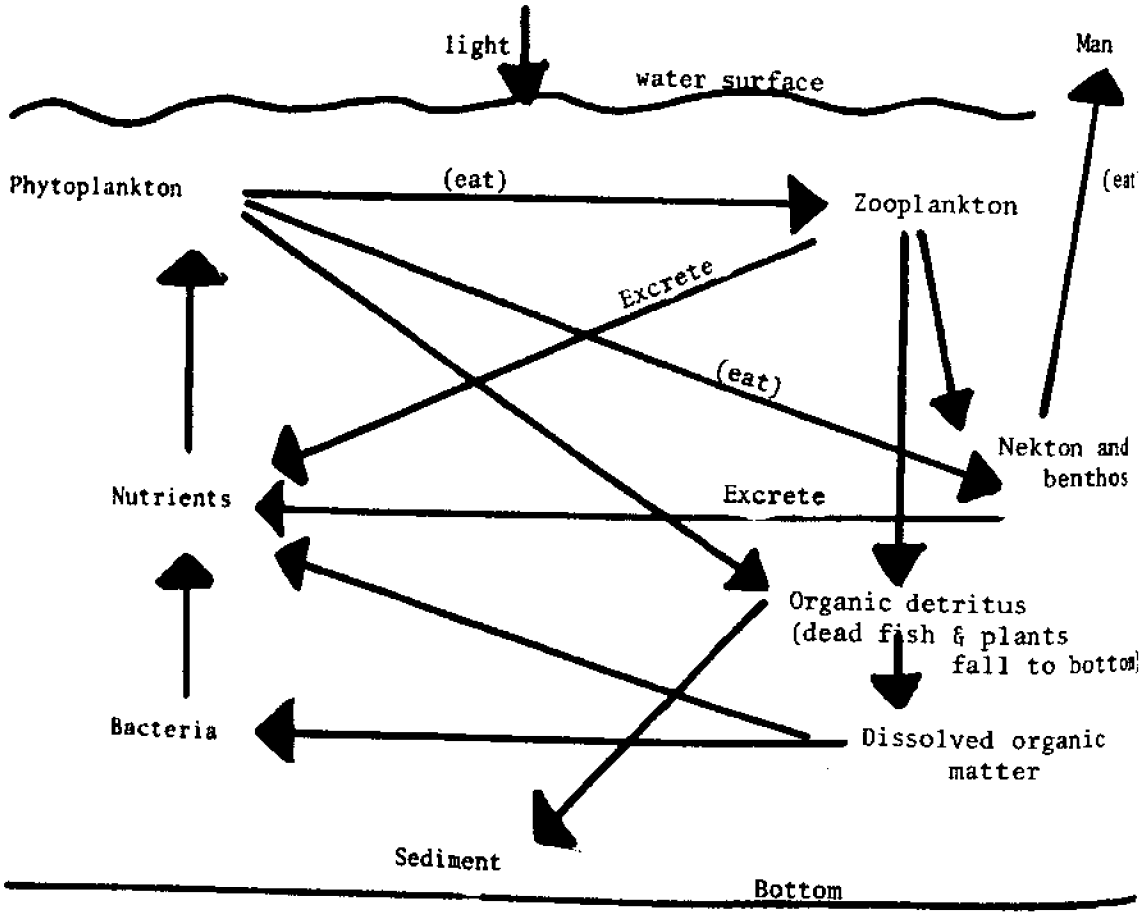

FIGURE 3: Food Chain of the Oceans

Source: T. Shafer, ed., New England and the Sea, Univ. of Rhode Island Marine Bulletin No. 11 (1973)

6. the food chain of the oceans is shown schematically in Figure 3. It should be noted that there is a certain equilibrium to this system that is often very susceptible to the disruptive effects of man's activities.

    * for example, nutrients are important to the system, but too many nutrients (as when phosphates from detergents are discharged from a waste water treatment facility) can lead to an overabundance of plant life, which results in an overabundance of decomposing organic matter, which in turn robs the system of vital oxygen. This is the process of eutrophication.

B. The resources at the water's edge are important to the vitality of the marine ecosystem, as it happens that the areas of greatest productivity are on or near shore.

1. because of the need for sunlight, food production takes place on the "skin" of the oceans, from about 100 feet up in murky waters and 300 feet up in clear water. Since the average ocean depth is over 12,500 feet, this is the upper 1% of the ocean's depth.

2. because of the need for nutrients, photosynthesis takes place most frequently in the relatively shallow waters of the continental shelf, where various replacement phenomena (winds, convection, opposing currents) cause an upwelling of bottom waters which brings nutrients to the surface.

    * in very deep waters, where vertical currents are slow, upwelling may take centuries. The continental shelf is 400 feet deep at its deepest, while the maximum depth of the abyss is 36,200 feet.

    * most marine life is thus concentrated in the coastal strips which comprise but 3% of the total ocean area.

3. another important factor in the high productivity of the coastal zone is the existence of the tidal marsh, which provides a very concentrated food source for marine life and which is often referred to as the "nurseries of the sea"

    * the salt marsh is inhabited by algae and a variety of grasses. The algae creates food by photosynthesis and the grasses have a network of roots and stems which collect nutrients abundant in sediments from river runoff, then release them gradually to the environment.

4. wetlands produce up to 10 tons of nutrients per acre per year, several times more food than an average wheat field.

   * on the East Coast, it is estimated that 2/3 of the commercial fish catch spends all or part of its life cycle in the marsh

   * wetlands are also important wintering areas for migratory waterfowl and serve as nesting and brood-rearing areas because of the excellent protective cover and food supplies.

   * wetlands also serve as a protective buffer between the sea and land, and as open spaces for both active and passive recreational pursuits.

C. We have been talking to this point mainly about biological and chemical interactions. It should also be noted that the patterns of marine life are also very much dependent on the physical processes discussed in earlier sessions. Some of the important variables are as follows:

   1. the nature of the bottom (sand, rock, coral, etc.), which is in turn a function of geologic history

   2. the length of time an area is uncovered by the tides

   3. temperature, which is in turn partially a function of currents, which can transport great quantities of water without losing temperature

   4. the shape of the coast, e.g. the buildup of barrier beaches through wave turbulence, which creates lagoons which trap nutrients in sediments and eventually become salt marshes of high productivity

D. This interrelationship between marine life and its physical environment is nicely illustrated by looking at 3 types of intertidal areas: rocky shore, tidal pool, sand beach. A good film on this subject which was shown during the 1973-1974 academic year is Between the Tides (Contemporary Films, New York, N.Y.). The following points were brought out in the film and subsequent discussion:

   1. a rocky shore is characterized by distinct and differently colored zones, from the blackened layer above high tide through the white crust of the barnacle layer to the browns, greens and reds of the seaweeds. Each zone is inhabited by creatures according to their tolerance to living beyond the reaches of the tides, from those who

need only the wetting of the salt spray to those who cannot stand any exposure to the air.

* above high tide: black zone, periwinkle zone.

* between the tides: barnacle zone, rockweed zone, irish moss zone.

* below low tide: kelp zone.

2. tidal pools are microcosms of the intertidal zone, since creatures from all levels can live there in the absence of the pounding surf and drying sun. Life in these areas must adapt instead to fluctuating temperatures and salinity due to dilution by rain water and evaporation by sun and wind.

3. the open sand beach offers little protection for its inhabitants, who escape exposure when the tide is out by burrowing in the cool moist sand near the low tide mark. Clams, crabs, snails, and sand dollars are frequently observed in this environment.

SESSION 5: The Ecological Dimension, Continued

Purpose:

To further explore with the students a particular topical area related to the ecological aspects of the land-sea interface.

Reading Assignment:

1. B. Ketchum, ed., The Water's Edge, M.I.T. Press (1972)-read Chapter 1, pp 3-16, and Chapters 2 & 7

2. J. Brahtz, ed., Coastal Zone Management: Multiple Use with Conservation (1972)-read Chapter 3

Other References:

1. B. Ketchum, "An Ecological View of Environmental Management," in Blumstein et al. (eds.), Systems Analysis for Social Problems, Washington Operations Research Council (1970)

Discussion Summary/Outline:

This session is intended to allow for a more in-depth analysis of topics covered generally in the previous session, or to explore a related issue of current interest but not previously developed. During the 1973-1974 academic year, the topic for consideration was the effect of human presence on the ecological dimension of the coastal zone, with particular emphasis on marine pollution. The discussion was led by a noted expert in this field, Dr. Bostwick Ketchum, Associate Director of the Woods Hole Oceanographic Institution, who accompanied his presentation with slides on the following topics:

1. world population growth

2. world population which could be supported at U.S. levels of affluence with present day world production rates (Hulett, 1970)

3. importance of marine resources to world food needs -- fish as a percentage of total animal protein consumption for various countries.

   * for one-half of the world's countries, fish contributes

over 50% of animal protein; in U.S., fish meal used to feed chickens
* absurd to point to marine environment as a panacea for the world food problem, but it is not unimportant either
* present world fish catch is approximately 60 billion lbs.- the maximum sustainable yield might be 120 billion lbs.
* phytoplankton present in 1 part per million, so its not practical to directly mine the vegetable content of the sea
* upwelling areas in shallow waters account for one-half of all productivity -- 90% of U.S. fish catch depends on marshes for an important part of their life cycle

4. nutrient cycling processes in the marine ecosystem

   * shows what is known (quantitatively) and where negligible information is available about the process

5. matrix of human impacts on an estuary

   * effects of various use on water quality, habitat quality, natural resources and human uses (recreation, esthetics, health, income, etc.)

   * ranked as: detrimental, caution, no direct effects, beneficial, good or bad

6. human use of the North Atlantic Estuarian Zone

   * resource base categorized as unchanged, moderately modified, severely modified

7. sequence of land fills in Boston Harbor over a period of time since 1775

8. plot of salinity and distribution of material introduced in the Hudson River estuary as a function of distance from the river mouth out to sea.

9. chlorophyll content of polluted water in the Hudson River estuary as a function of phosphate presence

   * it is estimated that the estuary is capable of recycling the pollutants of 100,000 people

10. offshore oxygen content and heavy metals concentrations in dumping areas of the New York bight.

11. coastal zone management research needs

12. a conceptual framework for water quality evaluation

   * imports, exports, determinants of environmental quality

SESSION 6: The Esthetic Dimension: The Visual Appearance of Coastal Zones

Purpose:

To develop an appreciation for the unique esthetic and cultural attributes of coastal landscapes and land forms and the range of visual sensations afforded by the water's edge.

Reading Assignment:

1. North Atlantic Regional Water Resources Study Coordinating Committee, "Appendix N-Visual and Cultural Environment," in North Atlantic Regional Water Resources Study (May, 1972)-- read sections, I, II and V (pp. 125 - 173 only)

Other References:

1. California Coastal Zone Commission, Appearance and Design, Policy paper by George Liskam, consultant (1974)
2. R.A. Lehman, "The Principles of Waterfront Renewal," Landscape Architecture, July, 1966.
3. I. McHarg, Design with Nature, Natural History Press (1969).
4. San Francisco Bay Conservation and Development Commission, The Bay Area Plan (1972)

Discussion Summary/Outline:

During the 1973-1974 academic year, this session was conducted by Prof. Gary Hack of the M.I.T. Departments of Architecture and Urban Studies and Planning. Prof. Hack illustrated his presentation with slides and prepared the following lecture notes.

People have gravitated to the edges of oceans and lakes for as long as recorded history. Partly this is because their livelihood depended upon the exploitation and use of water, but I suspect the reasons run much deeper.

Attitudes about water and the places where water meets land are deeply ingrained in our culture; necessity cannot explain why oceanfront land for housing typically is sold for several times the value of land away from the shore, or why a large proportion of the city makes weekend pilgrimages to nearby beaches.

In designing for the use of water edges we would do well to pay attention to the richness of experience, meanings and associations these areas invoke. To mention a few:

- The water itself: its importance to mythology and religion; baptism and cleansing; unfathomable depths and distances; the origins of life on land; the womb and immersion; loss of life without traces; distant lands and cultures to be discovered; the habitat for monsters and friendly creatures; the rhythm of tides and ties to celestial phenomena; its changing moods.
- The confluence of land and water: spectacular or subtle, but constantly changing atmospheric effects; fog, the ocean storm, calms; sunrise and sunset; the moon over water, doubled in intensity through reflection; ever-present sounds; natural processes extending beyond our lifetime, as erosion and land formation; the dock and the port, celebrating passage; the rich habitat of the intertidal zone; creatures and debris washed up on shores; the violence of waves on rocks in the storm; lands' end, water as defense; the working harbor.
- Unique experiences to be had at the water edge: fixation on the eternal horizon; being without clothes, shedding social conventions; testing human capabilities, swimming, sailing, promenading, viewing and being viewed; alone or with others; in tune with

natural cycles; good luck, fishing; exploring, discovering and learning; modulated climate, seabreeze, land breeze; fresh foods from the sea; bathing; sand castle fantasies; embarking and arriving; the symphony of sounds.

Through design we may heighten or detract from these qualities. No two areas will offer the same potentials, as the best solution is always a unique matching of physical setting with the motivations and imagery of those who will inhabit it.

Nevertheless, in managing coastal development from the standpoint of appearance and design, it is possible to generalize about certain physical attributes that tend to suggest different policies. These include:

-The shape of the shoreline. Coves, peninsulas, points, estuaries or straight expanses do evoke different feelings. Coves shelter, are inward focused. Low development which rims the shore, an intricate system of wharves or activities which extend out into the water all reinforce this character. Peninsulas, by contrast, are vantage points with outward views. Development should probably be more clustered and can be higher to capitalize on the view. And so on ...

-The slope of the land mass. Where hills or mountains meet the water with steep slopes, different policies need prevail than where the land is flat or gently rolling. Preserving the viewshed (ensuring that the shore is visible from public highways or approaches) will require different policies tailored to slope.

-The extent and character of the coastal shelf. Broad beaches demand different approaches than narrow strips or cliffs along the water. Whether the shore is rocky or sandy will shape policies,

beyond the obvious differences of activities each environment will support.

-Vegetation and ecology. Each type of system will support its own imperatives. In fragile dune ecologies we may wish to exclude building completely; a rocky forested shore may support extensive development.

-Relationship to settlement patterns. Built-up urban shorelines are faced with vastly different demands for use than wilderness shores, and the degree of man-adaption permitted will surely be modified accordingly.

The most sensitive policies for shoreline development are those which balance the unique characteristics of settings with concerns for occupancy and use.

SESSION 7: Coastal Resource Utilization and the Incidence of Adverse Effects

Purpose:

To illustrate the scope and extent of the social needs and demands that the resources of the coastal zone are called upon to provide for, and to highlight some of the problems of shoreline misallocation and degradation that have attended the pressures for development.

Reading Assignment:

1. B. Ketchum, ed., The Water's Edge, M.I.T. Press (1972) -- read Chapters 5 and 6, skim Chapters 3 & 4
2. D. Ducsik, Shoreline for the Public, M.I.T. Press read Chapters 2 and 3 (1974)

Other References:

1. U.S. Department of the Interior, The National Estuarine Pollution Study (1969)
2. Commission on Marine Science, Engineering and Resources, Our Nation and the Sea, U.S. Government Printing Office (1969)
3. Environmental Protection Agency, The Economic and Social Importance of Estuaries, Estuarine Pollution Study Series, No. 2 (April 1971)
4. R. Teeters, Jr., "Present and Future Demands Upon the Coastal Zone," in Multiple Use of the Coastal Zone, a seminar sponsored by the Federal Interagency Committee on Multiple Use of the Coastal Zone, National Council on Marine Resources and Engineering Development, Williamsburg, Virginia (Nov. 13-15, 1968)
5. D. Ducsik, "Coastal Zone Utilization," in Coastal and Offshore Environmental Inventory--Complement Volumne, Marine Experiment Station, Univ. of Rhode Island (1974)

Discussion Summary/Outline:

Over the past three hundred years, the American coastal region has provided a valuable resource base for the growth and progress of this

Nation. The first settlements that grew up around the natural harbors of the coastal zone have since developed into thriving centers of population and commerce. The resources of the land-sea interface have acted and continue to act as a magnet for development of all kinds -- transportation, industry, housing, fishing, mineral extraction, energy production, waste disposal, etc. -- while at the same time providing opportunities for recreational, scenic, historic and cultural enjoyment in a unique environmental setting. Until recently, the capacity of coastal resources to accommodate these multiple endeavors has been viewed as adequate, but today the ever-increasing pressures for utilization have come into conflict with growing concern over degradation and possible misallocation among competing uses.

This session is intended to provide an overview of the status of coastal zone development as a whole and some of the problems that exist on a nationwide scale. From these discussions, outlined below, we will try to distill out a feel for what needs to be accomplished in managing the use of the coastal zone, particularly the shoreline itself.

I. Status of Shoreline and Coastal Zone Utilization

A. Nature and extent of shoreline.

1. detailed tidal shoreline at high tide, including the shores of river basins up to a river width of 100 ft.

   * 100,000 miles (all states and territories) of which 88,600 is tidal and 11,400 is on the Great Lakes
   * 60,000 miles when Alaska, Hawaii and territories are excluded.

2. general shoreline (the coastal "envelope") - in units of 30' of latitude, or on a scale of $1:1.2 \times 10^6$

   * 6,000 miles for Atlantic, Pacific, Gulf and Great Lakes States

* 12,400 for all seacoast states and territories excluding Great Lakes)

3. recreational shoreline (existence of marine climate; on U.S. water boundary; 5 mile view over water to horizon)

   * 22,000 miles on Atlantic, Pacific, Gulf of Mexico & Great Lakes
   * 4,400 beach miles, 11,400 bluff miles, 6,200 marsh miles

4. estuarine areas (fish & wildlife habitats)

   * 15.6 million acres on Atlantic, Pacific, Gulf of Mexico and Great Lakes
   * 7.4 million acres ranked as "important"
   * 6,200 acres of recreational marsh

5. erodible shoreline

   * 36,000 miles out of approximately 60,000 miles of Atlantic, Pacific, Gulf of Mexico, and Great Lake shores.

B. Coastal Zone Development

1. population of coastal regions in relation to total U.S.

   * 33% within coastal counties (15% of U.S. total land area)
   * 50% within 50 miles
   * 70% within a day's drive

2. population density also relatively large

   * 7 largest cities are on coasts and 80% of the population in coastal counties are in urban areas
   * there are 45 million people in the North Atlantic Region alone with an average density of 264 per square mile. Relative to the U.S. total, 26% of all employment, 30% of income and 20% of total earnings are generated in this region.
   * in the Boston to Washington metropolitan corridor, with 80% of the region's population, population density averages 764 per square mile

3. the littany of uses engaged in by industrialized society

   * manufacturing: 40% of U.S. total in coastal counties, over 20% in North Atlantic Region, which also has over 50% of all industrial plants

   * navigation/waterborne commerce: 1600 facilities at 132

Atlantic, Pacific and Gulf of Mexico ports, through which pass 350 million tons of foreign trade worth about $100 billion; 620 million tons of domestic cargo handled

* mineral extraction: 5 billion tons of sand and gravel extracted annually, 10% in rivers, bays and sounds; $1 billion annually in offshore petroleum drilling

* electric power generation: 10,000 Kwhr per capita consumption supplied in part by 86 fossil plants on the East Coast and 32 on the West Coast; with nuclear facilities (at about 400-1000 acres each) on the rise, cooling water requirements by 1980 are expected to reach 80 trillion gallons per year (1/5 total river runoff); 240 trillion gallons projected for 2000.

* waste disposal: 8 billion gallons municipal wastes and 22 billion gallons of industrial wastes per day; in a year muncipal wastes from a city of 10 million people amount to 6,000 metric tons of nitrates and 15,000 metric tons of phosphates; storm runoff for the same size city generates 6,000 metric tons of nitrates and 800 metric tons of phosphates; 90 million tons of dredging spoils are dumped in coastal waters each year

* recreation: over 112 million people participate in 7.1 billion ocean-oriented occasions each year, spending $14 billion. Seventy-percent of property values along ocean and Great Lakes are accounted for by shorefront homes.

* fisheries: two-thirds of ocean population spend essential part of life cycle in estuaries; 75% of commercial seafoods nurtured in coastal areas; 5 billion lbs. landed annually, worth $300 million.

* many others: housing, transportation, open spaces & conservation, etc., etc.

4. the extent of development in coastal areas can be illustrated in a slide presentation of land-use inventory data developed by statewide planning programs. For example:

* California: harbors of refuge; historic preservation sites; coastal classification system; scientific/educational sites; prime agricultural land; developed frontage; estuaries and wetland areas; geomorphic provinces; coastal highways; land use and ownership; population accessibility.

* Rhode Island: coastal counties; topography; land use; public water system; public sewer system; electric power system; industrially-zoned land; openspace inventory; surface water supplies; 1990 highway system

II. The Adverse Effects of Unenlightened Shoreline Development

A. The physical dimension

1. 42% of U.S. shores undergoing significant erosion (16,000 miles - 2,600 critical, 12,800 non-critical), much of which is a result of unwise construction practices.

B. The ecological dimension

1. loss of living marine resources and wildlife through destruction of nutrient rich areas and habitats

* 1922-1954: 25% of all salt marshes in U.S. destroyed by fill, dikes, drainage walls, etc.,; from Maine to Delaware, another 10% was destroyed between 1954 and 1964.

* in the last 20 years, 7% of all important estuarine habitats have been destroyed, a loss of over half a million acres. California lost 67% of its habitats, New York and New Jersey 15% each, Connecticut and New Hampshire 10% each and Texas 8%

* in San Francisco Bay, 80% of the 300 sq. miles of tidal wetlands have been filled, and waterfowl nesting and feeding in the area dropped from 3 million to 600,000 at one point.

2. permanent and adverse charges to ecological systems

* pollution, dredging, etc.
* thermal discharges from power plants often cause 18° F rise and disrupt temperature sensitive aquatic organisms
* radioactivity, pesticides, oil spills, heavy metals, other toxic substances

C. The cultural/esthetic dimension

1. marked decrease in open spaces for public use; loss of cultural, historical, scenic and other recreation-related opportunities

2. less than 2% of total shoreline is in public hands for recreation; this is about 5% of the shoreline considered suitable for recreation.

The above discussions clearly indicate that the primary rationale for coastal zone management is the need to effectively incorporate certain ecological, amenity, and other environmental considerations into the social

system which determines the allocation and use of coastal resources, particularly those at the water's edge. A recent analysis* of substantive coastal land use management laws at the State level has shown that their main thrust has been to provide for protection of the coastal environment from adverse impacts of uncontrolled development. The four purposes cited most frequently among laws of seventeen states were: protection of wildlife and fisheries, protection of ecosystems or the natural environment, control of development, and enhancement of esthetic values. Other related purposes were enhancement of public recreation and public access, conservation of soil and water resources, and prevention of erosion, sedimentation and pollution. Development and other economic purposes were cited in relatively few laws.

It should be noted at this point that these laws were part of the initial social reaction to severe problems of degradation and abuse of the coastal zone and would therefore be expected to be protective in nature. In the longer term, however, there must be a recognition of the need to strike a balance among all socially-desired objectives in relation to coastal resource utilization, and considerations of economic opportunity will necessarily rank high on the list. This perspective is reflected in the federal coastal zone management law which, though motivated by the same forces as the state laws and still environmental in orientation, is aimed at achieving wise use of the land and water resources of the coastal zone without ignoring the needs for economic development.

Both federal and state coastal zone management legislation will be discussed further in subsequent sessions.

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* See S. Zwicky and J. Clark, "Environmental Protection Motivation in Coastal Zone Land-Use Legislation," 1 Coastal Zone Management Journal 103 (Fall, 1973)

SESSION 8: Selected Problem Areas in Coastal Zone Utilization

Purpose:

To explore a particular topic of current interest with regard to the misallocation and misuse of coastal resources. During the 1973-1974 academic year, the topic chosen was decay and underutilization of urban waterfronts. Other possible topics include public access to the shoreline, dredging and filling of salt marshes, siting of major facilities such as power plants or refineries, etc.

Reading Assignment:

1. Marx, The Frail Ocean, Coward-McCann, Inc. (1967)- read Chapters 12 ("Waterfront: The Clear Reflection") and 13 ("Waterfront: The Cracked Reflection")
2. Balchen and Linville, "The Waterfront: Let's Face It," American Institute of Architects Journal, April 1971
3. Ducsik, "Selected Materials on Boston Harbor and Waterfront," package of articles, clippings and presentations (unpublished)

Discussion Summary/Outline:

This session was devoted to the problems of the Boston Harbor waterfront, as the class was addressed by Mr. William Lambe of the Sierra Club, who presented slides on the architectural history of the downtown waterfront and the Sierra Club's proposals for a downtown park; and by Mr. Carl Koch, visiting professor in the M.I.T. Department of Architecture, who presented slides on the manner in which a number of European cities have achieved a compatible diversity of use of their waterfront districts.

A background paper developed by the author, which outlines the status of the Boston Harbor waterfront and suggests a study effort to come to grips with its future, is included here to illustrate the types of issues that are facing a number of coastal cities.

The Future of the Boston Waterfront: A Proposal for Study*

1. Introduction

Historically, the resources of the land-sea interface in New England have played an integral role in the development of the region. One focal point for this development has been the urban waterfront, the commercial gateway of colonial times around which has grown up the coastal metropolis of today. The intensification of social demands attendant to such growth has multiplied the pressures on this limited resource base to accomodate a wide range of uses, many of which have led to a build-up of pollution and severe restrictions on public access. With the recognition that historical decision processes have been inadequate in protecting the "amenity" values unique to the coastal region has come a new era of legislative activity. Massachusetts, Maine and Rhode Island all have taken steps to regulate the use of certain important coastal resources, especially those of ecological significance. These efforts are all part of a larger national trend that has been termed a "quiet revolution" in land-use control and which recognizes land as the key ingredient in environmental management issues.

The urban waterfront epitomizes the need for enlightened management of our coastal land resources, and the Boston waterfront is prototypical of the situation faced by many cities throughout New England. Due to its proximity to population centers, the diversity of its natural characteristics, and the potential ability to accomodate multiple uses, this Inner Harbor waterfront is a unique economic, recreational and cultural resource for the Boston Metropolitan region, the Commonwealth of Massachusetts, New

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* expanded version of a paper presented by the author at a meeting of the New England section of the Marine Technology Society, November, 1972.

England, and the Nation as a whole, It is a good port location, valuable not only for the generation of commerce but also for the opportunities it might present for the urban public to enjoy its scenic, aesthetic and historic qualities - all a part of New England's traditionally close association with the sea. In addition, it serves as the urban gateway to the adjacent Outer Harbor, which lends itself beautifully to conservation, recreation and open space development: the waters for boating, fishing and clamming; and the islands for swimming, camping, hiking and the enjoyment of magnificient open vistas.

The unique importance of the Inner Harbor as a resource to the people of Massachusetts and the Nation is further underscored when one considers it within the context of regional and national economic, environmental and other social needs and values. For example, there are strong forces on the horizon that will influence the development of the waterfront to accomodate a number of activites that are potentially beneficial to the economic well-being of Boston and the State, some of which also pose threats to the ecology and the visual-cultural environment. If growth is to be sustained in activities such as deep-sea mining of minerals and fossil fuels, marine extraction of sand and gravel, processing and distribution of oil, and electric power generation, there may be a need for large industrial tracts on the waterfront. At the same time, urban development programs will continue to seek prime waterfront parcels for new housing and commercial units. All these, combined with the needs of fisheries and other marine-related commercial operations (including waste disposal, cargo handling, transportation, aqua-culture, marine research and education, tourism, etc.) spell increasing demands for waterfront facilities in the Boston Inner Harbor.

Aside from economic activity, the other major social needs whose

satisfaction the Boston waterfront is uniquely suited to provide are recreational and cultural. The Harbor serves as the focal point for a region that contains some 2.5 million people and is projected to increase to about 3.3 million by 1980. New Englanders presently lead the nation in per capita participation in water-related outdoor recreation, reflecting the availability of an attractive shoreline, better-than-average income and education, a high degree of urbanization and a long heritage of affiliation with the sea. As these trends continue and as the needs for recreational activities become an increasingly important part of the social milieu, especially in urban areas, efficient utilization of the waterfront will be required to meet the demands for beaches, boat launching facilities, fishing piers, and open spaces for passive recreation.

2. The Status of the Inner Harbor Waterfront

It has been said that Boston is one of the two most "liveable" cities in the United States. An important contributing factor in this regard is the extent to which the value of open spaces for public use has been recognized. The Boston Common and Public Garden downtown and the Esplanade and Memorial Drive along the Charles River provide a pleasant contrast to the hustle and bustle of the center city. Hopefully, the Harbor Islands will soon provide additional opportunities for recreation and conservation of open spaces. In addition, the revitalization of the Government Center area has helped make the downtown area one of the few exceptional urban environments in the Nation.

But for all these significant assets, Boston has an ugly backyard! Pollution is a major problem - sewage, storm run-off, industrial and ship wastes, debris from rotting piers, and oil slicks have made the Harbor more of a dump than an aesthetic attraction, especially in the Inner Har-

bor. Public access, again primarily in the Inner Harbor, is minuscule. The Southeast Expressway provides an incongruous barrier to the waterfront, cutting off both physical and visual access. The properties of public agencies such as Massport, the BRA, and the Navy - which comprise appoximately 65% of the Inner Harbor shoreline - generally exclude the possibility of public access, while only a fraction of these public holdings are devoted to recreation - the tip of Castle Island and a playground in the North End. What of the enjoyment people derive from walking along a harbor and observing the activities there, the interactions of ship and water and land? All the pre-industrial revolution ports recognized this set of values and in most of them one can still take advantage of the promenades, avenues and harbor view parks that the builders of these ports provided. In Boston similar access to the Inner Harbor is limited to two or three wharves under private development, the Aquarium-BRA development, and a few privately owned restaurants. It is somehow symptomatic that the Aquarium - of all places - has had its back to the Harbor, providing (until recently) a single small room for observation of the waterfront. (This room is always crowded and it is clear from the excitement and the interest generated that many children regard the time they spend there as the high point of their visits.) What of historical values? The site of the Boston Tea Party has been filled in; a prime historical attraction - "Old Ironsides" - is lost in a maze of Charlestown's back streets; and there is some concern that motel development planned for Long Wharf will disrupt the visual qualities of the Gardner Building, the oldest brick waterfront structure in Boston.

While the most striking problem characterizing the waterfront is the almost total lack of social amenities such as clean water, public access, aesthetic and visual quality, and historic and architectural preservation,

there may also be reason to believe that the waterfront is being inefficiently used from an economic as well as social standpoint. The waterfront is dotted with areas of decay and under-utilization, with dilapadated piers, antiquated warehouses and ragtail commercial operations providing distressing evidence of low-level use of high-value land. The use of valuable waterfront acreage for activites such as hospitals, parking lots and storage areas for which proximity to water is not an essential operational ingredient is also evidence of possible distortions in the land-use process. Some have even suggested that continued subsidization of commercial cargo operations on the waterfront may not be in the best economic interest of the region, in view of the competitive situation in relation to larger eastern ports. While many of these assertions are as yet unsubstantiated, taken together they suggest that the economic status of the waterfront may be as seriously in need of upgrading as the social status.

At the root of the problems of the Boston Inner Harbor as a resource is the conspicious lack of any comprehensive approach to its management. To illustrate, consider the following fragmentation of legal and regulatory controls that influence public and private resource utilization in the Harbor:

> Local -- common law principles of tort and property law, zoning, public health regulations noise abatement ordinaces, waste disposal regulations, urban redevelopment, etc.
>
> Regional -- Metropolitan District Commission highways, bridges, parks and sewage treatment; Massachusetts Port Authority bridges, piers and airport
>
> State -- regulation of transportation, construction, waste disposal, recreation, fishing and

shellfishing, filling, etc., by Public Health, Public Works, and Natural Resources agencies; regulation of water and air quality by Natural Resources and Public Health Agencies; state aquisition of Boston Harbor Islands; judicial review of state agency decision-making, etc.

Federal -- HUD housing, sewage and urban renewal programs; EPA water and air pollution control and facilities programs; FAA definition of navigable air space; Corps of Engineers navigation, "refuse" discharge and other controls; Coast Guard enforcement activities; DOT jurisdiction under Act of 1966, Federal Aid to Highways Act of 1970; DOD through military installations; Department of the Interior offshore oil leasing, fish and wildlife resource jurisdiction, etc.; AEC nuclear power plant licensing; National Environmental Policy Act; Court review of Federal Agency decision-making, etc.

Planning -- Metropolitan Area Planning Council (MAPC) studies of Boston Harbor and Massachusetts Bay Circuit; other major studies of Massachusetts Bay and Boston Harbor (21 from 1892 to 1972); transportation, waste disposal and other studies for Massachusetts; special studies of power plant siting, coastal wetlands etc.

De facto -- citizen group and individual pressures on political and regulatory bodies, individual (including corporate) decisions.

Amidst this collage of decision-making entities, it is not infrequent to find public agencies working at cross-purposes, private enterprise stifled in the face of multiple vetoes, and the efforts of concerned citizens lost in a maze of bureaucratic maneuvering.

3. The Future is Now

Within the above context of disjointed social control, decisions are being made that will materially affect patterns of development along the waterfront far into the future. The most disturbing aspect of this situation is the fact that perspectives on the Harbor and its problems are incredibly myopic. The question "What should be done about the waterfront?"

inevitably brings as many different responses as there are knowledgeable "experts" -- again reflective of the mosaic of special interests, limited mandates and parochial objectives that characterize the Harbor situation. Consider, for example, this flurry of proposals recently put forth or contemplated for various segments of the waterfront:

1. Boston School Committee proposals for Occupational Resource Center, high school, and track facilities in educational parks at present navy yard site;
2. Senator Brooke proposal for national park at navy yard;
3. Sierra Club plan for Great Cove Square waterfront park;
4. Massport plan for rejuvenation of Commonwealth Pier and Boston Fish Pier area to accomodate cruiseship operations;
5. Board of Education plan for middle School along East Boston Waterfront (Border Street);
6. Mayor of Chelsea plan to attract development proposals for 102 acre Chelsea Naval Hospital tract; preliminary study focus on apartment, specialty shop and marina uses.
7. BRA plans for industrial development of South Boston Naval Annex and Charlestown shipyard; assorted BRA waterfront development proposals for commercial, residential and public use;
8. MAPC proposals for central ferry terminal development on Long Wharf in conjunction with the Boston Harbor Islands Comprehensive Plan;
9. Private plans for residential and retail development in Lewis Wharf and South Boston areas;
10. Boston Bicentennial Commission plans for waterfront activities during 1976.

Clearly, things are beginning to happen at the waterfront as more and more it is being seen as a golden opportunity rather than a barren wasteland. But amidst the confusion of proposals and counter-proposals, some basic assumptions remain unchallenged and broader questions go unasked. Are the present and projected uses of the waterfront consistent with

society's desires for both public (playgrounds, parks, etc.) and private (industry, shipping, fishing, etc.) uses? Do the benefits derived from existing and proposed uses outweigh the costs of lost opportunity for more valued uses? Are we leaving open the options necessary to respond to future economic, environmental and social needs of the Commonwealth? Is broader public control needed, and if so, what kind of public control is best suited to the task? Regrettably, there are no existing means by which such questions can be posed and answered within a coherent resource management framework. In the absence of such a framework, the future of the Harbor waterfront -one of Boston's most valuable resources - will be cast by default before the winds of political controversy.

4. What Needs to Be Done?

The situation described above has recently been highlited in a report to the Massachusetts Secretary of Environmental Affairs by the Ocean Resources Task Force on Governmental Reorganization:

> "While a large number of studies have focused on various aspects of the Boston Harbor, none have taken a comprehensive look at the overall allocative system, how effectively harbor resources are used in terms of social values, and which market or non-market mechanisms are best suited to revitalize the region. Untangling the complicated and sensitive web of economic, social, legal and political issues regarding utilization of the waterfront alone will be an enormous task. Therefore, WE RECOMMEND THAT A BOSTON HARBOR REVIEW COMMISSION BE CREATED TO DEVELOP AN UNDERSTANDING OF THE HARBOR AS A WHOLE, TO ESTABLISH GUIDELINES AND DIRECTION FOR THE FUTURE MANAGEMENT OF THE HARBOR AND TO DEVELOP AN INFORMATION BASE TO SUPPORT A JUDGEMENT AS TO WHICH ALLOCATIVE SCHEMES AND POLICY MECHANISMS ARE MOST DESIRABLE FOR SECURING ITS EFFICIENT UTILIZATION."

The author of this presentation, having participated in the

aforementioned Task Force effort, is interested in seeing these recommendations become reality. But such events do not take place overnight; they evolve over time and require the accumulation of broadly-based political support. It is instructive in this regard to look to the experience of San Francisco and the circumstances surrounding the creation of the highly successful San Francisco Bay Conservation and Development Commission. In 1963, a report entitled "The Future of San Francisco Bay" was prepared by the Institute of Governmental Studies at the University of California. This study pointed out that a large portion of the Bay was very shallow and so easily capable of being filled that at some point in the future the Bay might be reduced to a river. This disturbing prediction of a "San Francisco River" captured the public imagination and was of particular significance in calling attention to the problem and spurring future action.

In Boston, it is too late to do anything about filling, since the Inner Harbor is now but a corridor (some would say an open sewer) to the wharves and central business district of the city. While the problem of water pollution in this area remains serious, a number of efforts are being mobilized to confront it, including rehabilitation of storm sewers, upgrading of sewage treatment facilities, regulation of ship wastes and improvements in the water quality of the Charles, Mystic and Chelsea Rivers. On the other hand, the economic and social problems of the waterfront have received considerably less attention even though they are probably of greater long-range significance. If a concerned public sector effort to reverse the trends of degradation and misuse of the waterfront is to materialize, a report on the "Future of the Boston Waterfront" could provide the necessary impetus, the initial spark. Such a report would pre-

sent an overview of where the Inner Harbor waterfront is going and where its fragmented institutions are taking it. This analysis would be particularly useful and timely for three reasons. First, with the passage of recent coastal zone management legislation at the federal level, it would be wise for the state to begin to gear up for the task of developing a coastal management program that meets the requirements for federal assistance. One such requirement is that the states develop guidelines on priority of uses in particular areas and such an effort is specifically authorized in situations in need of immediate attention, which is certainly true of the waterfront. Second, the mobilization of a coordinated effort on behalf of the waterfront could lead to substantial improvements in time for the national bi-centennial celebration in 1976, when hordes of visitors are expected to descend upon the city in search of the historic, cultural and aesthetic values it purports to offer. Third, a framework for the evaluation and assessment of specific proposals could be of immediate use in view of the upcoming availablity of large waterfront tracts due to military divestment decisions. Thus, the time is especially ripe for the preparation of a report such as the one proposed herein, even though the need for action is abundantly clear even without these considerations.

5. Elements of a Proposed Research Project

There is little advantage to be gained by adding to the existing series of studies of specific projects, but a real need to take a broad and unbiased view of the range of options open regarding the future of the waterfront. The objective of the study would be to lay the analytical groundwork and provide a stimulus for the development of a significant and

far-reaching program of effective management of the Harbor waterfront.

The study would comprise the development of a comprehensive picture of the Harbor situation by collecting information from technical, economic, legal, political, visual/cultural and other sources. This would not be an attempt to generate vast quantities of new data; rather the purpose would be to organize and integrate existing and readily available data within a conceptual framework that can be applied to actual and proposed uses and development activities. This would provide the cornerstone for future efforts by developing an in-depth, broad-based understanding of the present and potential Harbor situation, and by identifying gaps in our knowledge of both the physical and social processes at work (e.g. a gap in physical knowledge may be an absence in data on land ownership or environmental effects; a gap in social knowledge may be in the form of incomplete data on community values or economic costs).

The primary elements of investigation would be as follows:

1. Examination of harbor situations in other U.S. and foreign cities where a compatible diversity of use has been achieved. While the preparation of a scenario for physical development (master plan) for the Boston waterfront is undesirable, it is useful to develop an appreciation for the range of alternative development schemes as illustrated by other harbor areas.

2. Identification of current usage of the resource base and the range of opportunities that exist for multiple utilization. Analysis will include both supply aspects (suitability, accessiblity, availability and other siting considerations) and demand aspects (requirements for goods and services and related demographic factors).

3. Review of institutions for planning and control of the waterfront, together with mandates, objectives, programs and proposals for development, with particular focus on plans for the utilization of military properties currently undergoing divestment. Evaluation of potential environmental, economic and other lost opportunity costs and social effects.

4. Formation of an assessment of the future of the waterfront which is based upon the efforts described above, as viewed within the multi-objective context of local, regional, state and national needs and values -- both economic and amenity-related.

This research would be of major significance in both a specific and general fashion. Immediate practical value can be realized through the stimulation of an effective management program for the Boston waterfront at a critical point in its history, when a number of decisions will soon be made that will affect the course of its use (or mis-use) far into the future. The broader significance of the proposed project lies in its applicatinn of a broad, inter-disciplinary methodology to a complex resource management problem that is prototypical of those to be confronted as state and federal governments begin to develop coastal and land-use management programs. In short, the proposed study would come at a time when the need for such projects and the desire of citizens and governments to undertake them is readily apparent.

SESSION 9: The Coastal Zone in Legal Perspective

Purpose:

To illustrate the allocation of legal authority and jurisdiction and to describe the extent and scope of public and private rights in various segments of the coastal zone. Intended to provide the nedessary legal background for subsequent discussions of coastal zone management legislation and litigation.

Reading Assignment:

1. B. Ketchum, ed., The Water's Edge, M.I.T. Press (1972)-read Chapter 11, pp. 305-327

2. D. Ducsik, Shoreline for the Public, M.I.T. Press read Chapters 6 and 7

3. Griffin, "Legal Bases for Coastal Zone Management," 6 Marine Technology Society Journal 43,(Mar-Apr, 1972)

Other References:

1. Clark, ed., Water and Water Rights (1967)

2. Pearson, "Significant Government Activities Concerning Coastal Waters and Estuarine Areas," L.L.M. Thesis at Harvard School of Law (May, 1972)

3. Leighty, "The Source and Scope of Public and Private Rights in Navigable Waters," 5 Land and Water L. Rev.391 (1970)

4. Garretson, The Land-Sea Interface of the Coastal Zone of the United States: Legal Problems Arising Out of Multiple Use and Conflicts of Private and Public Rights and Interests, U.S. Dept. of Commerce Clearinghouse No. PB-179-428 (September 1968)

5. Comment, "Public Rights and the Nation's Shoreline," 2 Environmental Law Reporter 10179 (Sept. 1972)

6. Note, "The Public Trust in Tidal Areas: A Sometimes Submerged Traditional Doctrine," 79 Yale Law Journal 762 (1970)

7. C.F. Schwan, Jr., "Current Means of Control and Regulation of the Coastal Zone with Particular Reference to State and Local Powers", Seminar on Multiple Use of the Coastal Zone, National Council on Marine Resources and Engineering Development (Nov., 1968).

8. University of Maine School of Law, "State, Public, and Private Rights, Privileges and Powers," Volume II of Maine Law Affecting Marine Resources (1970)

9. Schoenbaum, "Public Rights and Coastal Zone Management," 51 North Carolina L. Rev. 1 (1972)

Discussion Summary/Outline:

I. The Legal "Components" of the Seashore

A. There are four distinct sectors each covered by its own set of legal regimes:

1. the water

2. tidelands (land between the high and low tide marks)

3. submerged lands (other than tidelands)

4. uplands (above high tide)

B. Note that the legal boundaries are entirely artificial in relation to any natural systems, the operation of which regularly cross all interfaces

1. the boundaries do correspond to categories of human activities in the coastal zone

II. Ownership in the Seashore

A. Whether public or private rights are in effect depends mainly on ownership, which has its origins in English common law.

1. historically, sovereign authority over land in England was vested in the King (jus privatum-proprietary interest or private title) -- extended to sea and lands beneath the sea after the Norman Conquest

2. thus, the original source of title to land was a grant from the King, and land grants proliferated in the period preceding the Magna Carta.

3. private ownership began to interfere with conduct of the nation's commerce in navigable waters -- jus publicum concept developed to protect certain public rights, even if proprietary title granted to an individual -- this is the origin of the public trust in tidelands and navigable waters

4. 13 original colonies inherited both proprietary and trust interests held by Crown when Union formed, subject to rights granted to U.S. government

5. Supreme Court has verified original state ownership and trust in tidelands and submerged lands within state boundaries, with implied control over the waters (subject to preemptive federal authority in certain areas such as navigation) - disposition and use of these lands is thus governed primarily by state laws.

B. Three issues in the determination of rights through ownership

1. location of the high tide line is often the most difficult problem--most courts sanction the use of the "mean high tide" as determined according to certain technical guidelines -- some states use the vegetation line

   * this mark may be hard to locate and sophisticated techniques such as infrared photography are sometimes needed

   * in marshy areas, the tide line may be nearly impossible to determine and the resulting title dilemma makes the legal status of public and private rights uncertain

2. the legal status of the tidelands or submerged lands

   * some states have routinely disposed of these public lands without regard to the concept of holding certain public rights in trust

   * other states recognize private rights down to the low water mark, with limited trust rights reserved for the public (e.g. fishing, navigation)

3. the navigability of the watercourse

   * some lands may be submerged beyond low tide but not navigable in fact

   * the various legal tests for navigability, however, essentially define navigable as anything that flows

C. So,public ownership applied originally to at least all "wet" areas. The next question is - what public rights exist through ownership? And what rights are protected by the public trust doctrine?

1. where public ownership exists in "wet" areas, the public has broad rights of use (e.g. recreation, fishing, swimming, boating, etc. in navigable waters, subject to control by state.)

* private landowners adjacent to navigable watercourses have certain rights also (riparian rights) which allow them to make a reasonable use of the water attendant to uses of their shorelands - these rights must be exercised in a manner compatible with the rights of other riparian owners and the public

* both public and private rights are subject to constraints in connection with the paramount national interest in navigability (navigation servitude) - stems from commerce clause of U.S. Constitution which is also used as a basis for the federal water pollution control program

2. private rights through ownership in "wet" areas, created by land grants or colonial ordinances or other means of disposition by the state, are subject to rights held in trust.

   * the extent of public rights protected under the trust doctrine is a matter of state law and has its origins in the English Common law (which recognized public rights to fish, navigate, & otherwise conduct commerce but not to swim for recreation)

   * in the U.S., some states have expanded the scope of the trust doctrine to include recreation -- history shows that the doctrine seems to be interpreted in light of contemporary notions of the public interest in the shore- future application in U.S. uncertain

D. Ownership and Rights in Upland (Dry)Areas

1. grants of title to private parties very extensive

2. private property rights not subject to trust doctrine in these areas - public interest asserted through exercise of governmental powers (regulation, acquisition, etc.)

3. some other common law doctrines have, in certain instances, been applied by courts in a few states to limit the extent of private rights in order to preserve public access

   * prescription: public easement (right of particular type of use) can be created through continuous, open and adverse use - conditions usually specified by statute (must be without owner's permission; he must have had some legal remedy which wasn't exercised, etc.) - applied in Texas and Florida court cases

   * customary rights: customary use dating to "time immemorial" creates a public right - applied in Oregon case

* dedication: devotion of property to public use, with owner intending to dedicate and public accepting (both can be express or implied)- applied in Texas, Oregon and California cases

* public trust: public trust theory applied to municipal beaches requires they be made available to general public--precludes use of exclusionary devices such as exorbitant parking fees and other forms of discrimination against non-residents - used in New Jersey and New York cases

SESSION 10: The Legal Dimension, Continued

Purpose:

To acquaint the students with the means available to governments to compel, induce or otherwise bring about desired patterns of coastal land-use, with emphasis on land-use regulation and constitutional limitations on the police power.

Reading Assignment:

1. D. Ducsik, Shoreline for the Public, MIT Press (1974)- read Chapters 8 and 9

2. "Guide to Local Land-Use Protection," xerox sheet on Massachusetts laws and federal programs

Other References:

1. Hagman, Urban Planning and Land Development Control Law (1971)

2. Ells, "Massachusetts Open Space Law," and Dawson, "Massachusetts Open Space Law Supplement-1972," 4 Open Space and Recreation Program for Metropolitan Boston (1969)

3. Herring, ed., Open Space and the Law, Institute of Governmental Studies, Univ. of California at Berkeley (1965)

4. Whyte, Securing Open Space for Urban America: Conservation Easements, Urban Land Institute Technical Bulletin No. 36 (December, 1959)

5. Kusler, "Open Space Zoning: Valid Regulation or Invalid Taking," 57 Minnesota L. Rev. 1. (1972).

6. Bosselman, Callies, Banta, The Taking Issue (1974)

7. Delogu, "The Taxing Power as a Land-Use Control Device" 45 Denver L. J. 279 (1968).

Discussion Summary/Outline:

I. The Power to Spend for the General Welfare

A. Purchase: the federal government and the states and municipalities (when authorized by the state) have the constitutional authority to

spend money for almost any conceivable public purpose

1. the federal government has 13 national parks along the coast, 9 national seashores, 28 historic areas and 91 sites in the wildlife refuge systems - states have similar programs, often aided by the federal Land and Water Conservation Fund Program set up in 1965.

2. at the local level, conservation commissions or other municipal agencies often have the power to purchase land; with the various state and federal assistance programs, a town can often get $3. in aid for every $1. it puts up.

B. Eminent Domain: power to condemn land for a public purpose - need not be used by the public at large - compensation must be paid.

C. Easements: treat interests in property as a "bundle of sticks" that can be divided up among owners - government purchases only certain rights - can be positive (right to a particular use) or negative (right to prohibit development).

II. The Power to Regulate and the Rights of Private Property

A. The police power, in general, is the ability of society through state government to interfere with private property rights in favor of the public interest - this power is inherent in the concept of government ("police" comes from Greek word for citizen) and is used to promote the health, safety and general welfare of society - takes many forms (zoning, subdivision laws, building codes, etc.)

1. nothing specifically in the Constitution about the police power, therefore it is reserved to the states by the 10th amendment; it is basically an invention of the courts (some argue it can be derived from the 14th amendment), who determine both the scope and extent of its valid exercise.

2. scope: what is the general welfare? the notion is expanding- courts look at the temper of the times and give great deference to legislative judgement- some purposes are:

   * health & safety, peace & quiet
   * controlling density, stabilizing property values
   * aesthetics, cultural/historical values, scenery, architectural beauty, etc.
   * preservation of open spaces, including protection of natural areas (flood plains, wetlands) for conservation and recreation

3. extent: how far can regulation go in infringing on private property rights? land-use controls are constrained by the 14th ("due process") and 5th ("taking") amendments to the Constitution

* 14th amendment - "nor shall any state deprive any person of life, liberty or property without due process of law; nor deny any person equal protection under the law" - fairness precludes arbitrary, unreasonable, capricious government activity; means must be substantially related to ends; similarly situated persons must be treated similarly

* 5th amendment - "nor shall private property be taken for public use without just compensation" - not as restrictive as it first appears - hinges on legal meaning of "taking"

B. Development of the Legal Context: The Constitutionality of Land-Use Regulations as Applied

1. early state court attitudes - taking almost limited to physical expropriation - legislatures given especially free reign when acting to prevent nuisances
   * Brick Presbyterian v. City of New York (1826) - police power supercedes contracts
   * Commonwealth v. Tewksbury (1846) - well within power of government to preclude actions injurious to the public interest
     Commonwealth v. Alger (1853)
   * Welch v. Swasey (U.S. 1909) - great reluctance to interfere with legislative judgment, entitled to great respect
   * Hadachek v. Sebastian (U.S. 1915) - public interest paramount, even with severe damage to private interests

2. the landmark case: Penna. Coal v. Mahon (U.S. 1922)

   * Justice Holmes thought police power getting out of hand-being used to legitimize unconstitutional but necessary acts (1872 law review article)

   * Kohler Act challenged as unconstitutional taking

   * general rule: while property may be regulated to a certain extent, if regulation goes too far it will be recognized as a taking - matter of degree, not kind

     * depends on circumstances (which previous courts tended to ignore)
     * large value diminution in this case

3. So, in general, taking issue decided by balancing need for regulation with extent of impact

4. the zoning cases: Supreme Court speaks to due process clause

* Euclid v. Ambler (1926) - if validity fairly debatable, if reasonable minds may differ, legislative judgment should prevail
* Zahn v. Brd. of Public Works (1927) - court won't substitute its judgement for the legislature's
* Nectow v. City of Cambridge (1928) - must be necesaary basis for infringing on reasonable uses - willingness to look at means in relation to the ends, see if reasonable minds might differ, or if clearly erroneous decision made.

5. then, Supreme Court retired from the land-use issue, essentially leaving guidelines for the state courts to deal with in three broad areas of consideration:

   * objectives or philosophy of the regulation - focus on the ends sought(from early cases)
   * the nature of the regulation-focus on the means used (the zoning cases) - due process aspects
   * the extent of impact on private property rights (Penna.Coal v. Mahon) - taking aspects

6. philosophy of the court

   * don't substitute your judgement, but
   * be willing to look at the facts to determine

      (i) for due process aspects: balance need vs. potential for abuse of power
      (ii) for taking aspects: balance public need vs. impact on individual rights - does it go too far?

   * in general, balance need for flexible government with principle of individual freedoms

C. Land-Use Law in the State Courts: Adding Flesh to the Bones

1. review of the state case law in connection with the constitutionality of land-use regulations in specific situations does not yield a unified theory or underlying rationale

   * the broad guidelines laid down by the Supreme Court leave much room for subjective judgement - the outcomes of cases are therefore very much dependent on the circumstances
   * best to look for factors which seem to frequently enter the judicial calculus

2. with regard to the objectives of the regulation, the courts give a large measure of benefit of the doubt to the legislatures, but will also look at:

   * the extent of social consensus on an issue - the closer to traditional objectives (health or safety, preventing

nuisances, etc.) the better

* the extent of the public affected

* the extent to which the objectives are usually achieved by another mode of governmental operation (regulations which decrease gov't purchase cost, limit buyers to government, or allow for public or quasi-public uses are particularly frowned upon)

* a frequently cited case on how far the courts will go in upholding the objectives of regulation is: McCarthy v. Manhattan Beach (California, 1953)

3. with regard to the nature of the regulations, the courts are careful to enforce due process standards and will scrutinize regulations that depart from accepted practices.

   * non-euclidian zoning, cluster subdivisions, control of residential growth are examples of areas where courts have moved cautiously - especially wary of danger of arbitrary action on part of regulatory authorities

4. with regard to the impact of the regulation on property owners, the courts will look at the extent of denial of all reasonable, beneficial, or practical uses

   * physical invasion always invalidated

   * diminution in value an important factor, but not always controlling - regulation need not preserve the most beneficial or economical use

   * reasonable uses prohibited for an unreasonable length of time generally not allowed

   * how few uses constitute a taking very much a function of the circumstances & other factors weighed by the court

D. Concluding Remarks

1. many factors enter into the judicial calculus, the importance of which are a matter of degree and therefore heavily dependent on the facts of the matter

2. there is much room for subjective judgement on the part of the courts

3. the "secrets to success" in having land-use controls upheld are:

   * careful drafting of ordinance: relate objectives to traditional health, safety, welfare concerns where possible; leave as many reasonable uses as possible; include provi-

sions for administrative steps to guard against abuse; etc.

* proper pleading: emphasize strength of legislative commitment to objectives of regulations; point out reasonable or beneficial uses still permitted; etc.

* good factual evidence: keep good records, utilize expert testimony - "facts win cases"

SESSIONS 11 THROUGH 14: Coastal Zone Management at the State Level:

Purpose:

To familiarize the students with the status of shoreland management activities in the respective coastal states and the current nature of the legislative and administrative responses to coastal zone problems.

Reading Assignment:

1. J.Armstrong and Earl Bradley, Jr., "Status of State Coastal Zone Management Programs," 6 Marine Technology Society Journal, nos. 5 and 6 (2 part series, Sept.-Dec. 1972)

2. M. Grant, Approaches to State Coastal Zone Management, Marine Bulletin 13, Marine Advisory Service, University of Rhode Island (January, 1973)

3. F. Bosselman and D. Callies, The Quiet Revolution in Land Use Control - Summary Report, US Gov't Printing Office (1972)

4. Selected chapters on individual states from Armstrong and Bradley, A Description and Analysis of Coastal Zone and Shoreland Management Programs in the United States, University of Michigan Sea Grant Program (March, 1972)

5. U.S. Department of Commerce, NOAA Coastal Zone Management Task Force, Status of State Coastal Zone Management Efforts (preprint -May 1973)

6. N. Smith, P. Katner, A. Macbeth, "Model Coastal Zone Statute," Coastal Zone Management Journal 209 (Winter, 1974).

Other References:

1. H. Ponder, "Survey of State Coastal Management Laws," in connection with A Study of Legal and Economic Problems of Wetlands Management, Chesapeake Research Consortium.

2. M. Grant, "Administrative and Political Considerations of Alternative Approaches to Coastal Management," University of Rhode Island (1972)

Discussion Summary/Outline:

During the 1973-1974 academic year, the topic of coastal zone manage-

ment at the state level was covered in a series of oral presentations by the students. The class was divided into eleven teams, each of which was assigned a particular coastal region comprising one or more states. Each team prepared a lecture of approximately 45 minutes in duration, and each student was required to submit a 10-15 page paper on his individual contribution to the group effort. Among the topics dealt with in the papers and presentations were as follows:

1. natural characteristics of the land-sea interface and immediately adjacent areas;
2. the extent and scope of coastal resource utilization in the area;
3. the nature and severity of coastal problems that have been experienced;
4. responses to these problems and current or anticipated management activities (laws, policies, programs)

This topical organization of the presentations parallels the thematic development of Part I of the subject.

The allocation of effort among team members was left to each team. In most cases, it was found preferable for each person to deal with all the topics as they related to one state. In some cases, however, each team member developed one topic for all the states in the region, recognizing that neighboring states may have similar natural characteristics or common problems. When only one state was assigned to a team, the effort was divided according to issues or activities at sub-state regional levels (e.g. San Francisco Bay vs. remainder of California coast). In order to facilitate the research of the students, the instructor provided the names and addresses of appropriate persons in each coastal state who could be contacted for relevant materials; prepared a listing of materials available from libraries and personal collections; and suggested a number of additional sources where reference information might be

obtained.

To assist the instructor in grading oral presentations, each student was given an evaluation sheet and asked to rank the presentations of fellow students, the general criteria being how well the lecture presented a clear picture of the status of the coastal management situation in the state in question. On the back of the evaluation sheets the students were asked to write down any comments or suggestions they had on the presentations as a whole. Both the feedback that was received in this manner and the experience developed in the course of the presentations suggest that the oral format, though potentially very beneficial in principle, leaves much to be desired in practice. Some of the most significant difficulties, which were both observed by the instructor and reflected in the students comments, were as follows:

1. the presentations were frequently not well organized, with students spending too much time on details, mostly in connection with the characteristics of the resource base
2. much of the materials covered were similar and the presentations at times seemed repetitive
3. the presentations tried to be comprehensive as well as specific, without having enough time to be both; as a result, much more time was used than expected, the entire exercise became tedious at points, and there was little or no opportunity for class discussion at the end

In summary, the majority of the students felt that it had been difficult to get an integrated and coherent perspective on the activites of each state. This appears to be attributable to the difficulty of having students inexperienced in public speaking attempt to digest a large amount of largely unfamiliar material and then convey the essentials in a very limited time period. Some students suggested that the oral format could be improved on by strictly enforcing the time limit so as to force more efficient preparation; or by handing out one page summaries that

could contain background information on the resource base so that the talk could focus more on problems and programs. Other students suggested alternative participatory formats, such as panel discussion or debate. However, the majority of students felt that the topical area could much better be dealt with by having the instructor discuss a few representative states and examine the various approaches and issues that characterize different classes of programs. At the same time, most in the class felt that they had personally profited from the exercise of "getting the hands dirty" by doing a paper on the situation in a given state. It was also felt that, while opportunities to give oral presentations should be an important part of the educational experience, the instant circumstances did not allow for such presentations to be effectively carried out. Some students suggested that a better context for an oral presentation would be the final paper for the subject, the results of which could be summarized and put up to discussion and debate.

From the foregoing observations, it seems that the most desirable format would be to:

1. continue to have each student prepare a paper on a particular coastal state;
2. relegate a comprehensive treatment of the states' programs to the reading assignments;
3. focus only on the salient issues and alternative approaches in the state programs, perhaps illustrated by a couple of case studies of representative state programs. A sample topical outline covering four sessions might be as follows:

1. Session A:

   * background on history and administration of land use plan-

ning in the U.S.

* general discussion of the "quiet revolution in land-use control" - environment as a focus for land regulation - land as resource as well as commodity

* review of different types of state programs and laws, both coastal zone and land-use in general

* identification of important policy variables and administrative and political issues

2. Sessions B and C:

* focus on one or two coastal states and discuss in greater detail the characteristics of their management program with emphasis on the practical aspects of program operations

* bring in guest speaker from one or more coastal states to add insights based on actual experience

3. Session D:

* follow up discussions on issues, approaches, experiences of guest speakers, etc.

* examination of suggested model state coastal zone management laws

* review of most up-to-date information on status of state coastal zone programs, not yet documented in the literature

* identification of particular areas of concern that have yet to be successfully dealt with at the state level

SESSIONS 15 and 16: Coastal Zone Management at the Federal Level

Purpose:

To acquaint the students generally with the resource management activities of various federal agencies, and to explore in depth the legal and administrative aspects of the Coastal Zone Management Act of 1972.

Reading Assignment:

1. Ludwigson, "Coastal Zone Management, A Whole New Ball Game", Environment Reporter Monograph No. 18, pp. 1-5 (March 8, 1974).

2. Knecht, "Coastal Zone Management -- A Federal Perspective," 1 Coastal Zone Management Journal 123 (Fall, 1973).

3. Selected government documents, including:

   * The Coastal Zone Management Act of 1972, P.L. 92-583
   * House Report 92-1049, accompanying H.R. 14146, House Committee on Merchant Marine and Fisheries
   * Senate Report 92-753, as accompanying S.3507, Senate Committee on Commerce
   * House Report 92-1544, conference report accompanying S.3507

4. E.F. Hollings, "Congress and Coastal Zone Management," 1 Coastal Zone Management Journal 115 (Fall, 1973).

5. Mandelker and Sherry, "The National Coastal Zone Management Act of 1972," 7 Urban Law Annual 119 (1974).

Other References:

1. Selected articles from the National Journal on legislative history and background of federal coastal zone

management legislation (2/28/70, 12/9/72)

2. Commission on Marine Sciences, Engineering, and Resources, Our Nation and the Sea, U.S. Government Printing Office (1969) -- see Chapter 3, pp. 56-61.

3. North Atlantic Regional Water Resources Study Co-ordinating Committee, "Appendix S -- Legal and Institional Environment," North Atlantic Regional Water Resources Study (May, 1972).

4. University of Maine Law School, Maine Law Affecting Marine Resources, particularly "Volume One: State Government Organization -- Agencies Dealing with Marine Resources," and "Volume Four: Resources from the Sea and Federal Limitations on State Control" (1970)

5. New England River Basins Commission, Federal Interest and Capability for Assisting in the Management of Maine Coastal Resources" (January, 1971)

Discussion Summary/Outline:

In the first of the two sessions on coastal zone management activities at the federal level, discussions should center on the activities of various federal agencies in the coastal zone, together with the legislative history of the Coastal Zone Management Act of 1972. The first session thus provides the background for a more in-depth treatment of the substantive aspects of this federal law in a subsequent session. It may also be desirable to devote a third session to recent federal activities in the related field of national land use policy and legislation. During the 1973-1974 academic year, materials on federal programs related to coastal resources were covered in the reading assignment; two classes were devoted to a review of the federal Act and its administrative implementation; and an additional meeting for a status report and question and answer

session on pending national land use policy legislation was held with Dr. Michael Telson of the U.S. Senate Interior Committee. The following outline summarizes the topics discussed in the sessions dealing with the Coastal Zone Management Act of 1972.

I. The Coastal Zone Management Act of 1972

A. Designed to perpetuate the quiet revolution in land use control by offering financial assistance to the coastal states to develop coastal zone management programs.

B. Congressional findings (sec. 302) and declaration of policy (sec. 303) reflect three major themes:

1. the need to give high priority to natural systems in coastal regions, in view of the damage or loss of living marine resources, wildlife, nutrient-rich areas, and other adverse effects on ecological systems; decreasing open space for public use together with the loss of special natural and scenic characteristics and cultural, historic, and esthetic values; and shoreline erosion

2. the need to take a balanced approach as between protection and development, in view of the national interest in effective management and the achievement of wise and beneficial use giving full consideration to ecological, cultural, historic, and esthetic values as well as to needs for economic development

3. the need for a co-ordinated governmental effort with the states as the focus but with the active participation of federal and regional agencies and municipalities, together with effective citizen participation

C. Important definitions

1. "coastal zone" -- coastal waters and adjacent shorelands strongly influenced by each other and in proximity to the shoreline, including transitional and intertidal areas, salt marshes, wetlands, and beaches

* extends seaward to the outer limit of the U.S. territorial sea (3 miles)
* extends inland to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters
* excludes federal lands

2. "management program" -- a comprehensive statement in words, maps, illustrations, or other media of communication, prepared and adopted by the state in accordance with the provisions of the Act, setting forth objectives, policies, and standards to guide public and private uses of lands and waters in the coastal zone

D. Substantive requirements for the development and administration of state management programs are contained in sections 305 and 306, which have been greatly elaborated on in the form of federal guidelines and approved regulations promulgated by the Office of Coastal Environment of NOAA. These sections comprise the heart of the CZMA, and are closely interrelated, as illustrated in Figure 4. The most convenient way to discuss the substantive aspects of these sections is to deal with each of the six elements of section 305 and key this discussion to the elements of section 306 when appropriate. Since the final approval regulations for section 306 have not been promulgated as of this writing, it is not possible at this point to accurately describe the detailed requirements the state management programs must comply with

E. The last significant section of the Act deals with interagency coordination and cooperation (sec. 307).

1. the views of federal agencies principally affected by a state management program must be adequately considered prior to approval of the program by the Secretary of Commerce

2. federal agencies conducting or supporting activities directly affecting the coastal zone, or undertaking any development project in the coastal zone, must do so in a manner consistent with approved state management programs

3. any applicant for a required federal license or permit to conduct an activity affecting land or water uses in a state's coastal zone shall provide in its application a certification that the proposed activity complies with the state's program -- the state must then notify the federal agency concerned that it concurs or objects to that certification; no federal license or permit shall be granted until the state has concurred, unless the Secretary of Commerce finds that the activity is consistent with the objectives of the Act or is necessary in the interests of national security.

SECTION 305 -- Management Program Development Grants

(b)(1) identify boundaries

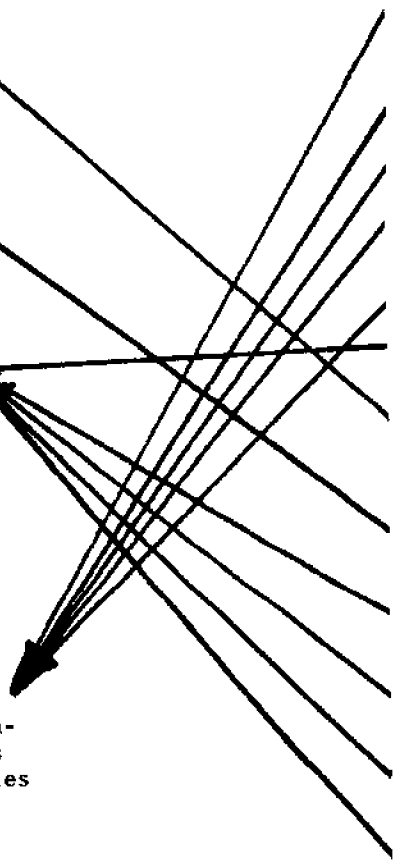
(b)(2) define permissable land and water uses with direct and significant impact on coastal waters

(b)(3) inventory and designate areas of particular concern

(b)(4) identify means by which state exercises control over uses defined in (b)(2)

(b)(5) broad guidelines on priority of uses in particular areas, especially those of lowest priority

(b)(6) describe the organizational structure proposed to implement the program, including the responsibilities and interrelationships of all relevant government agencies at all levels



SECTION 306 -- Administrative Grants

(c)(1) develop and adopt program according to federal rules and with full governmental and public participation

(c)(2) coordinate and provide effective mechanisms for continuing coordination with local, area wide, interstate, and regional agencies and plans

(c)(3) hold public meetings

(c)(4) approval of program by Governor

(c)(5) designation of single state agency to receive and administer grants to implement the program

(c)(6) state must be organized to implement the program

(c)(7) state must have necessary authority to implement the program

(c)(8) program must adequately consider the national interest in siting of facilities necessary to meet requirements other than local in nature

(c)(9) procedures for designation of specific areas for preservation or restoration

(d)(1) state must have power to regulate land and water use and resolve conflicts

(d)(2) state must have power to buy or condemn fee simple or lesser interests in lands and waters

(e)(1) program must have one or a combination of 3 modes of state-local relationships

(e)(2) program must have method of assuring that local regulations don't unreasonably restrict or exclude uses of regional benefit

FIGURE 4: Relationships Between Sections 305 and 306 Regarding Content and Approval of State Coastal Zone Management Programs

4. coordination with federal pollution control and possible land use regulation

   * requirements established under Federal Water Pollution Control Act and the Clean Air Act shall be the water pollution control and air pollution control requirements applicable to the state's program
   * if a state coastal management program covers shorelands that subsequently come under the jurisdiction of another federal official designated to administer a national land use program, the Secretary of Commerce shall obtain the concurrence of that official prior to approving the program in question

F. Other sections deal with public hearings, purchase of estuarine sanctuaries, research and technical support, and program administration at the federal level. These items are all discussed at the various points in the administrative regulations, and will not be further elaborated here.

PART TWO: ANALYSIS OF COASTAL ZONE MANAGEMENT ISSUES

SESSIONS 17 and 18: Coastal Problems as the Result of Accidents in the Organization of Economic and Political Activity

Purpose:

To develop the analytical framework within which coastal problems can be understood as the logical consequence of deficiencies in traditional economic and political institutions.

Reading Assignment:

1. Ducsik, Shoreline for the Public, M.I.T. Press (1974) -- read Chapters 4 and 5

2. Devanney, "Shall We Allocate the Coastal Zone Uneconomically," in Proceedings of the Second New England Coastal Zone Management Conference (1971)

Other References:

1. Devanney, et. al., Economic Factors in the Development of a Coastal Zone, M.I.T. Sea Grant Project Office, Report No. 71-1 (November, 1970).

2. Hite and Laurent, Environmental Planning: An Economic Analysis -- Applications for the Coastal Zone, Praeger Publishers (1972) -- see Chapter 2.

Discussion Summary/Outline:

1. Background

The upwelling of national concern regarding the use of unique coastal resources has been precipitated by the failure of existing institutions to incorporate amenity values -- especially those other than local in nature -- into allocative decison processes. Due to accidents in institutional design, historical processes have been under-representing cer-

tain important social values while over-representing others. For example, public beaches have not been sufficiently provided while private development has mushroomed; water quality has not been maintained as industrial and municipal wastes have made sewers out of many estuaries; and certain ecologically-important wetlands have not been protected from indiscriminate dredging and filling for residential or commercial use. These problems stem from a basic weakness in our decentralized economic and political decision processes; i.e., the unjustified proposition that the activity of individuals or groups seeking thier own self-interest within a limited sphere of concern will always tend to maximize the welfare of the society as a whole. The purpose of this section is to lay the conceptual foundation for understanding these phenomena by providing an analysis of the institutional mechanisms -- both economic and political-- which govern the allocation of coastal resources among competing uses.

Saying that resources have somehow been misallocated implies that there exists some optimal allocation of resources that is consistent with the overall values of society. While this "social optimum" is impossible to determine in practice, it is quite useful to deal with in principle when trying to develop an understanding of the allocative system. And integral to the notion of optimality are the concepts of efficiency and social balance, which must be given clear and well-defined meanings.

Efficiency and social balance are important concepts becasue there is only a limited amount of resources available to our society, including labor

technology, and natural resources, all of which are allocated to the production of a wide variety of economic "products", which are nothing more than whatever society finds desirable (physically, psychologically, aesthetically, or otherwise). Public beaches and salt marshes can be thought of as "products" in this sense, along with automobiles, television sets, health care, and other familiar goods and services. Since resources are limited, the total of all products that can be produced is also limited. And since there is a ceiling on the amount of products that might be available, the amount of each product that society gets depends on how much of all the others it desires. So, in other words, there are many combinations of products that society might have, but the total level of production is limtied by the supply of resources. When we succeed in achieving the total production possible given the resources at our disposal, we are being efficient; and when this production is distributed among goods and services in accordance with aggregated social values and prevailing notions of equity and fairness, then we are also being socially-balanced.* Efficiency without social balance is sub-optimal.

Within this context, we can think of amenity uses of the coastal shoreline (recreation, conservation, etc.) as desirable products to which coastal land and water can be allocated, along with other products

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*It is the notion of social balance which tends to make the analysis of optimality vague and imprecise. While it may be possible to make good approximations as to the efficiency of production, "values" are often difficult to aggregate and "fairness" is a matter of subjective judgment.

(energy, waste disposal, private housing, industrial goods, etc.) that represent other aspects of social well-being (e.g. jobs, health, etc.). However, the conceptual goals of effieiency and social balance remain unchanged. Public policy must be directed toward achieving optimality, i.e., efficiency in production together with the most desirable balance between the different dimensions of well-being. But what are the instruments of public policy? In the United States, we rely on two interdependent decision systems: a free-enterprise, competitive market economy; and a representative democracy form of government. Historically, we have exhibited a strong cultural preference for market mechanisms in the allocation of resources, with governmental action to correct for market imperfections. Since our previous observatons lead us to believe that these allocative processes have misallocated coastal resources, we must now discuss why this has happened.

2. The Organization of Economic Activity

In every situation where finite resources are utilized to satisfy needs that are almost infinite, there must be a means of setting priorities. The private market is the primary mechanism through which we exercise the choice among the combinations of products that might be provided, thus determining the allocation of resources.

In a perfectly competitive market, aggregated personal values are translated into desired amounts of production through the workings of the price-profit system. The price mechanism brings about effective proportional representation of individual values through the

"vote of the dollar. The profit mechanism fosters efficiency through the flexibility of decentralized decision-making. If certain basic conditions are met, there will exist a set of market prices such that the activities of profit-maximizing firms and benefit-maximizing consumers who respond to those prices will automatically direct the economic system into an efficient allocative position.* This is a powerful result. If the market can co-ordinate itself through a complex series of mutual adjustment processes, without the necessity of outside intervention, then efficiency is assured. This has led many economists to advocate reliance on market processes to the greatest possible extent; indeed, a good deal of government activity is designed to maintain the conditions necessary for markets to perform efficiently (i.e., control of monopolies). Yet even the most loyal defenders of the competitive market system admit that there are circumstances in which assumptions and conditions are violated such that the markets fail to provide certain worthwhile outputs and underproduce others.

Aside from assumptions with regard to the nature of business behavior and the "perfectness" of competition, there are two criteria governing the efficacy of market performance:

> 1) All desired products must be priced, and social values must be capable of articulation through willingness-to-pay a price. This price must reflect the total social cost of lost opportunity, i.e. the value for other uses that is given up

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*For a more extensive discussion, see Arrow, "The Organization of Economic Activity: Issues Pertinent to the Choice of Market vs. Non-Market Allocation," The Analysis and Evaluation of Public Expenditures: The PPB System, Vol 1, at 47 (U.S. Gov't. Printing Office, Wash. D.C. 1969).

when resources are applied to the production of any particular product. For the economic system to move towards optimality with every transaction, the social benefits of devoting resources to the production of the product in question must exceed the costs.

2) Information must be available at low cost to both producers and consumers. Producers need knowledge of available technologies, demand, and the costs of factor inputs. Consumers need to know what goods are available and what their characteristics are. Both need to know the relevant set of prices. In some instances, information might be scarce, costly to collect, unreliable, or hard to understand and evaluate without special training.

Markets fail when the above criteria are not satisfied, and this happens under certain circumstances. For example, the transaction costs of organizing a fully-informed market may be excessive. Costs are always attached to the collection and dissemination of information regarding the terms surrounding transactions; and when these costs are too high, the existence of the market is no longer worthwhile. Markets also fail when the characteristics of certain goods and services make them inherently unsuitable for provision by a private enterprise system. The classic examples of this situation occur in relation to the use of common-property resources such as air and water. When prices do not exist for products such as these, markets will tend to overcommit resources to the production of other products, thereby foreclosing the opportunity to allocate some of those resources to more valued (but misrepresented) uses. Products that are subject to market failure are sometimes referred to as "public goods", and their provision necessarily entails some form of collective (govern-

mental) action since the economic system, left alone, will tend to produce too many private goods and not enough public ones.

Before proceeding, one other aspect of private market operations should be noted. Even when the criteria for effective market performance are satisfied and efficienct resource allocations are induced, the result may not be socially optimal. This is because the outcomes of market transactions reflect the distribution of income in society. Goods and services are provided by the market in conformance with relative social desires, but only insofar as the participants are able to pay. But ability to pay frequently does not correspond to the value society places on having certain products. Therefore, even though the market can bring about efficiency, it makes no claim for achievements regarding social balance. This, too, may give rise to the need for collective action.

In coastal regions, the private market is ill-suited for the allocation of land and water resources for amenity use; it fails in two respects. First, ecology, aesthetics, open space, history, and culture as products do not lend themselves to the necessity of pricing. Consider, for example, the difficulty in trying to determine the value of a scenic bluff or a sand beach to the regional public. Conceivably, a developer could provide coastal roadways with scenic vistas, or beaches with parking facilities and bath houses, and charge user fees; but the uncertainty in setting a fee based on the willingness-to-pay of a diverse public and the possibility of little or no short-term return on a large investment make this highly unlikely.

Even if the public could be polled to determine thier preferences for beach recreation, the transaction costs of gathering such information could be prohibitive. Also, there is no guarantee that the information would be accurate, since people tend to misstate their preferences for economic goods depending on whether or not they think they will be provided anyway. Thus, the need for elaborate and perhaps impossible studies to determine demand functions without the benefit of observing a market provides a seemingly insurmountable obstacle to the provision of beaches or other facilities through private initiative. A second reason for market failure is the common-property characteristics of the land-sea zone; i.e., the aesthetics, unique climate and physical makeup, wealth of biological life, etc. As one commentator has noted:

> ... The land component of lake/bay resources perhaps possess no more common-property traits than does any land that can be plotted and deeded. However, when resource attributes of lakes and bays are considered, either singly or collectively, as the environment, the pervasiveness of common-property characteristics will constrain the process of converting those resources into public services.*

What this means is that,in the absence of any effective articulation of their value for amenity uses, coastal resources will be overcommitted to those uses for which there does exist some mode of value-expression (i.e., a market price). These uses frequently entail highly capital-intensive development, such as industry, housing, commerce, industry, and private recreation (beach clubs, private marinas, etc.). For example, the

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*Craine, "Institutions for Managing Lakes and Bays," 11 Natural Resources Journal 519, at 524 (1971).

development of the shore as vacation home sites provides an immediate and well-defined return on investment. The same is true for other forms of private, commercial, or industrial development on the shore, since markets exist whereby the value of the resource to these enterprises can be articulated. Wetlands preservation or public open space, on the other hand, ranks low on the capital-intensive scale; their value to the public is diffuse, costly to collect, and possibly unquantifiable.

While market failure presents a compelling rationale for government intervention in the coastal allocation process, there is an additional source of justification. It is possible that even a properly-functioning market would, as Craine has put it, "progressively limit to the higher income classes the benefits arising from shoreline access." This conflicts with the expanding notion of coastal resources -- especially unique environmental ones -- as something that all people should have equal opportunity to enjoy regardless of income or place in life.

We can easily conclude from these observations that amenity "products" derived from coastal resources have every right to be considered public goods, since an unfettered market would often incorrectly allow the bids for private development to far outstrip those for public amenity use. The question that presents itself now is: Why has governmental action failed to represent the amenity interests of the public in the allocation of coastal resources?

3. The Organization of Political Activity

While private market mechanisms are relied upon as the essential ingredient of the allocative system, they operate within the broad legal

and political constraints established by the government. In this section, we will examine how the organization of political activity affects the allocation of coastal resources for amenity uses. This organization consists of a large and diverse group of governmental units at federal, state, and local levels, who exercise some form of jurisdiction or control over the varying amounts of coastal property. Theoretically, these governmental units are in the position to effect policies that could move the overall allocative process towards a socially-optimal use of these resources.* But we shall see that political controls, for a number of reasons, also have the potential to perpetuate inefficient resource utilization.

While fiscal difficulties are often important factors that serve to inhibit effective collective action, they are not so significant as the other common nemesis of all government activity; i.e., the stifling effect of jurisdictional boundaries which, by a curious osmosis, permit the diffusion of problems throughout the region while blocking any corresponding flow of governmental responsibility. This points to the natural consequences of fragmented political control over a resource such as the coastal shoreline, which is obviously no respecter of jurisdictional boundaries. Prime recreation areas, for example, are irregularly distributed throughout most regions, and ever-increasing leisure time and mobility bring increasing numbers of recreationalists to any richly-endowed location within an expanding radius of urban centers. So while the problems

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*In some quarters, it is even asserted that the decentralized, mutual-adjustment political system functions much like the free enterprise economic system and has orderly processes working toward socially optimal decision-making. For an extensive discussion of this hypothesis, see Lindblom, The Intelligence of Democracy, New York Free Press, New York, N.Y. (1965).

transcend local and even state borders, the responsibility to deal with them has not been fixed due to the absence of any logical place in the conventional government structure. Through enabling legislation, local communities have often been left to control in an uncoordinated fashion the allocation of resources that are of regional importance; and through constitutional mandate, states often exercise control in situations that involve a strong element of national interest. And as one might expect, there are orderly forces at work which cause local decision-makers to act irresponsibly with respect to the regional interest, and state decision-makers to act irresponsibly with respect to the national interest.

Through the powers of zoning, subdivision control, acquisition, eminent domain and the like, municipal governments are in the best position to encourage uses of coastal resources most consistent with the general welfare. But the particular economic and political context within which local governmental units make decisions about shoreline use can lead to inefficient allocation on a broad scale.* We have noted how the uneven distribution of prime recreational shoreline property places heavy demand pressures from the region on specific communities, making their coastal properties more valuable than some neighboring towns not similarly "blessed" with good beaches or whatever. Yet, in the absence of any mechanisms to articulate this regional value, the municipality is free to use its powers on behalf of purely local objectives. This can best be illustrated by looking at the decision-making process involving some

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*See generally, Devanney, et. al., Economic Factors in the Development of a Coastal Zone, M.I.T. Sea Grant Office, Report No. 71-1 (November, 1970).

coastal zone project, perhaps a power plant project. Let us first distinguish between two types of effects that might be associated with such a project -- direct and indirect. Direct effects are those that accrue to the consumers or users of the project: the user of the power supplied, the former bathers on a closed beach, the swallowers of polluted air, the viewers of marsh wildlife, etc. All of these effects are felt by the local community and by the regional society in general. Yet only those effects (beneficial or otherwise) that accrue to the local populace enter into the decision. The community may be willing to give up beach or bluff property to have a power plant, but this may not be optimal allocation of that resource on a regional basis. But the "votes" of the region are not counted -- only those of the local community affect the decision!

We might ask why a community would be willing to give up this valuable property in such a way? The answer is that the local community with its particular economic and political context is also subject to a second type of effects, called parochial effects. These accrue to the suppliers of the resource that make the investment possible. Construction workers who build the plant will spend a substantial portion of their paychecks in the locale of the plant, certainly benefiting local merchants, doctors, and bar owners. These people, in turn, spend some of this money in the locale, and so on; this creates the traditional multiplier effects on local payrolls and retail earnings. Another very important factor is the broadening of the tax base that would result from the new industry. For the local community, these benefits are very real;

but considering the regional economy as a whole, parochial benefits are not net benefits since those which are associated with one location will be about the same as those associated with an alternative site (barring large unemployment differentials). Parochial benefits represent a transfer payment from one place in the economy to another, with no net benefit associated with the choice of site (even though there is a net benefit to the community chosen). Yet, parochial benefits can be overwhelmingly important to political bodies representing the local community. As a result, a local community can rationally view a project in a very different manner from the regional economy as a whole. The region and the local community feel positive and negative direct effects -- the community alone feels the parochial effects. Thus any added benefits will persuade the community to act in its perceived self-interest and approve the power plant siting, with no consideration of the negative direct effects on the region as a whole.

The phenomenon described above is by no means limited, of course, to the local level. The same example could be used to illustrate how a state, in considering a license for a power plant through a Department of Environmental Protection or some similar entity, might not adequately consider regional or national energy needs in the face of possible environmental impact on a statewide basis.* By the same token, a federal

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*The Congress has expressed its concern over such situations in the Coastal Zone Management Act of 1972, which specifically requires state management programs to provide adequate consideration of the national interest involved in the siting of facilities necessary to meet needs that are more than local in nature.

licensing agency such as the AEC might not sufficiently weigh state or local concerns over environmental impacts of the same power plant in favor of broader considerations of national energy needs.* The point is that,in each case, decision-makers act primarily in response to the forces generated within a limited sphere of concern, and there may be no mechanisms whereby other legitimate concerns can be effectively incorporated into this decision process. This situation is directly analogous to the phenomenon of "external diseconomies" frequently discussed in the environmental economics literature.

4. Concluding Remarks

We have asserted in this section that the organization of economic activity militates against the incorporation of amenity values into decision processes surrounding the allocation of coastal resources; and that the organization of political activity which has traditionally been relied upon to compensate for market deficiencies can also contribute to the misallocation of such resources when decisions of more than local significance are made solely on the basis of local needs and values. These observations pose two serious issues regarding the role of governmental (collective) action in coastal allocation:

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* This type of conflict and lack of co-ordination among federal and state governments was highlighted by Senator Henry Jackson in his introduction of the National Land Use Policy Act of 1970, which is presently under consideration by the Congress in amended form. See Congressional Record-Senate, at 837 (January 29, 1970).

the issue of state-local relationships, and the issue of how decisions are to be arrived at once responsibilities are rearranged as between the various governmental sectors. These issues will be dealt with in subsequent sessions. Before proceeding with these discussions, however, it is at this point useful to see to what extent the difficulties posed by the organization of economic and political activity might be remedied through court action. In this respect, the dominant and recurring theme involves judicial interpretation of the 'taking' issue as it applies to coastal situations, and this will be the topic for consideration in the next three sessions.

SESSIONS 19 and 20: Coastal Zone Management in the Courts

Purpose:

To analyze a number of cases involving beaches, wetlands, flood plains, and other elements of the coastal environment which have been the focus of land use regulations at state and local levels.

Reading Assignment:

1. Ducsik, Shoreline for the Public, M.I.T. Press (1974) -- read Chapter 10

2. Selected coastal cases, including:

   * Kerpelman v. Board of Public Works (Md., 1971)
   * Maine v. Johnson (Me., 1970)
   * Just v. Marienette County (Wisc., 1972)
   * Candlestick Properties v. San Francisco BCDC (Calif., 1970)
   * Spiegel v. Beach Haven (N.J., 1966)
   * McCarthy v. Manhattan Beach (Calif., 1953)

3. Bosselman, Callies, Banta, The Taking Issue, U.S. Government Printing Office (1974) -- read Chapters 9, 11, and Part V.

Other References:

1. Bosselman and Callies, The Quiet Revolution in Land Use Control, U.S. Government Printing Office (1972) -- see the sections on San Francisco, Massachusetts, Wisconsin, and state wetland and shoreland laws.

2. Heyman, "Open Space and the Police Power," Open Space and the Law, Institute of Governmental Studies, Univ. of California at Berkeley (Herring, ed., 1966).

3. Kusler, "Open Space Zoning: Valid Regulation or Invalid Taking," 57 Minnesota L. Rev. 1, at 54 (1972).

4. Note, "Coastal Wetlands in New England," Boston University Law Review (1973).

5. "State and Local Wetlands Regulation: The Problem of Taking Without Just Compensation," Virginia Law Review (1972).

Discussion Summary/Outline:

I. The Coastal Environment as the Focus of Land-Use Controls

A. "Open space" refers to whole range of special wetlands, floodplain, shoreland, scenic preservation, and recreational districts within which controls are intended to prevent or seriously restrict development in order to keep the resources in their natural stae and/or foster uses which are consistent with that state.

1. frequently cited objectives: conserve natural areas, prevent floods, protect marine ecology, prevent erosion, maintain scenic qualities of shore, etc.

2. some possible constitutional obstacles:

* may be hard to relate to traditional nuisance-preventing type functions of government -- link is closer with acquisitive functions of government
* severe value diminution often results when few private uses are left to the owner

3. other difficulties: lack of universal public or legislative support; unfavorable judicial attitudes and precedents from other jurisdictions

4. nevertheless, recent years have seen a flood of these regulations, many of which have been tested in the courts

* need to examine some of these cases in the light of the legal context of land-use controls developed in previous session (No. 10)

B. Examination of coastal cases yields no consistency in the interpretation of constitutional due process and taking considerations. There is plenty of room for subjective judgement on the part of the judiciary, and the facts are extremely important since decisions can often be legitimized either way depending on the specific circumstances. And even in similar factual situations, courts in different jurisdictions have arrived at different results.

1. one key to constitutionality seems to lie in the extent to which some reasonable use is left to the owner, but even here some courts are divided.

II. Selected Flood Plain Cases

A. Though not necessarily coastal in nature, some flood plain situations provide useful insights into the attitude of the courts with respect to regulations to keep resources in their natural state.

B. Dooley v. Town Planning and Zoning Commission of Fairfield (Conn., 1966)

1. much of the property on high ground and not under water even in a hurricane

2. land depreciated 75% by flood plain ordinance

3. publically-oriented allowed uses practically limit buyers to government agencies

4. court finds the regulation unreasonable and declares it invalid

C. Morris County Land Improvement Co. v. Parsippany-Troy Hills Township (N.J., 1963)

1. ordinance creates a "meadow development zone" in a swampy area, limiting uses to traditionally public ones

2. evidence indicated that proximate objective was to keep land in its natural state so as to secure it as a water retention basin and as public open space

3. court again invalidates ordinance

D. Baker v. Planning Board of Framingham (Mass., 1967)

1. planning board disapproves a subdivision for sole reason that it would increase municipal costs for sewage and surface drainage

2. court rules that keeping land in its natural state for use as a water retention basin is not a legitimate exercise of police power

E. Vartelas v. Water Resources Commission (Conn., 1959)

1. Connecticut Supreme Court upholds regulation setting up an encroachment line along a river, making virtually all development impossible

2. great loss of life and damage from 1955 floods the prime consideration

F. Turner v. County of Del Norte (Calif., 1972)

1. similar situation as above, with severe flooding in 1964

2. court affirms absolute prohibition on residential and commercial structures in a flood plain

G. Turnpike Realty v. Town of Dedham (Mass., 1972)

1. court upholds flood plain restriction and refuses to inquire into motives in view of legislative statement of purpose

2. since the ordinance is supported by other valid considerations of public welfare (e.g. disaster protection), then the fact that conservation objectives are also listed does not invalidate it

III. Selected Wetlands Cases

A. Maine v. Johnson (Me., 1970)

1. acting pursuant to the Wetlands Control Act, a state board denied a permit for dredging and filling which would cause damage to conservation objectives in a marshy area

2. the court in its opinion focuses on the effect of this action on the value of the land, which was severely diminished

3. citing Pennsylvania Coal v. Mahon, Dooley and Morris (see above), the court held that the regultion went too far in restricting use of the land, and was in fact conferring a benefit on the public without any compensation being given

4. case thought to be weak as long-term precedent, since pleadings could have been improved upon, and language by the same court in subsequent cases seems to indicate a shift in judicial attitudes

B. Just v. Marienette County (Wisc., 1972)

1. Wisconsin shoreland zoning law requires counties in unorganized territory to adopt zoning ordinances

2. Marienette County seeks injunction against landowner's engaging in filling without a permit; ordinance challenged as unconstitutional taking without compensation

3. court focuses not on the diminution of value that would accrue to the landowners but on the harm to the natural environment that would be prevented--"the changing of wetlands and swamps to the damage of the general public by upsetting the natural environment and the natural relationship is not a reasonable use of that land which is protected from police power regulation"

4. court also noted that certain uses of the land in its natural state were still permitted

C. Candlestick Properties v. San Francisco Bay Conservation and Development Commission (Calif., 1970)

1. owner of parcel of land along San Francisco Bay denied a permit to deposit fill for construction purposes, even though adjoining properties had been filled or were in the process and the area was dotted with abandoned ship hulls and not navigable at high tide

2. the court distinguished the case from a number of similar cases that had reached negative decisions, and did not attach great weight to arguments relative to the diminution of value and denial of all reasonable use

3. the court upheld the action and was strongly influenced by the clear statement of public purpose made by the state legislature in setting up the regulation system

IV. Selected Beach Cases

A. Spiegel v. Beach Haven (N.J., 1966)

1. local ordinance establishes a building line to control excavation and construction along dunes

2. two of the plaintiff's four lots fall totally within building line; they argue that no economic use could be made of their land as a whole

3. court upholds the ordinance, claiming that some reasonable uses could be made of the properties, taken as a whole

4. facts were very important in this case; the town presented a good deal of evidence to support the public purposes behind the ordinance, while the landowner did not make a convincing case that his uses would be unreasonably restricted

B. Forde v. Miami Beach (Fla., 1966)

1. court disallows an ordinance which has the effect of permitting only uneconomical development, i.e., single family residences in a beach area of high reclamation costs

C. Walker v. Board of County Commissioners (Md., 1955)

1. oil company's shorefront property zoned agricultural/residential; company had intended to build refinery -- greater value in industrial use

2. court holds that the ordinance did not deprive the company of all beneficial use, while attaching great significance to the stated intent of the regulations to preserve the natural characteristics of the Chesapeake Bay area

D. McCarthy v. City of Manhatten Beach (Calif., 1953)

1. often pointed to as the limit to how far a court will go in validating a restrictive regulation

2. beach used by public from turn of century; city tries to establish dedication, fails, then tries unsuccessfully to arrange state purchase; then zoned for single family residences in 1929

3. in 1940, the owners try to fence off the beach and charge admission, and apply for change in zoning classification to commercial use, claiming no value for residential purposes; change denied, and public tears down fences

4. in 1941, the city rezones the area as a "beach recreation district," allowing for lifegaurd towers, wire fences, small signs, and other appurtenances to a public or commercial beach

5. the owners then apply for a reclassification back to single family residential use, expressing an intent to subdivide and sell lots; request denied, then taken to court as an unconstitutional "taking" of private property

6. the court decided in favor of the town, citing the facts that the plaintiff failed to prove no economical use could be made of the property as a beach recreation district, that the area was inundated during storms and posed a safety hazard, that illicit and immoral activities would take place under the pilings of private homes, and that the highest and best use of the resource was as a recreational beach (as determined by the town's comprehensive plan).

7. if has been said that no previous case had so severely restricted reasonable uses and had been so clearly designed to secure for the public a beach for recreational use. Nevertheless, the town prevailed, indicating once again that many courts will be sympathetic to land use regulations if there is a firm base of legislative support for the action, if it can be related to conventional police power objectives as the prevention of nuisances, and if the burden of proof is not sufficiently fulfilled by the landowner in arguing that no reasonable uses remain

V. Concluding Remarks

A. Once again, the cases are a mixed bag of rationales, and indicate that care must be exercised both in the design of a regulatory strategy and in its defense in court. In any event, the "taking" clause does not provide an absolute prohibition or even a universal obstacle for the exercise of police power regulation as applied in coastal situations

SESSION 21: The Taking Issue and the Role of the Courts in Coastal Zone Management

Purpose:

To review some theoretical and practical approaches to the taking question in coastal law and to discuss the need for administrative flexibility versus the need to safegaurd individual rights.

Reading Assignment.

1. Sax, "Taking, Private Property, and Public Rights," 81 Yale L.J. 149 (1971).

2. Bosselman, Callies, and Banta, The Taking Issue, U.S. Government Printing Office (1974) -- read Part IV.

Discussion Summary/Outline:

An issue of great importance to the effectiveness of land use controls as part of coastal zone management programs is the attitude taken by the courts in applying legal constraints to administrative action. Historically, the criteria developed by the courts in this regard were intended to safegaurd the rights of individual property owners against arbitrary, unfair, and tyrannical government action. Prof. Sax, in his early article on the taking question,* argued that resource-acquisition through regulation by government presents a three-fold source of danger: (1) the risk of discrimination ("the official procurement process provides a particularly apt opportunity for rewarding the faithful or punishing the opposition"); (2) the risk of excessive zeal ("government involved in

* Sax, "Taking and the Police Power," 74 Yale L.J. 36, at 64-65 (1964).

pursuing an important national goal ...may be prone to display a questionable zeal in acquiring the tools needed to get on with the job"); and (3) the risk of excessive exposure to losses ("a good argument can be made that the proper way to draw the line limiting exposure to losses is with the distinction betwen the demands of private competition and those of resource-seeking government enterprises.").

While the above dangers will always exist, it has become clear with the advent of the environmental movement that more diffuse rights on the part of the general public require protection similar to that traditionally accorded to private interests. Conventional notions of land-use spillovers affecting adjacent properties or an identifiable segment of the public at large have given way to a more sophisticated understanding of the inter-connectedness of seemingly discrete resource uses. This has posed renewed difficulty, for the concept of "external harm" now clearly encompasses a broad range of public interests that are not always readily identifiable or quantifiable.

Faced with dilemmas of this sort, it becomes necessary to reconsider the notion of property rights as the central element in the regulation/taking issue. Such a reconsideration has, in fact, led Sax to a reformulation of his original theory:

> The abandon with which private resource users have been permitted to degrade our natural resources may be attributable in large measure to our limited conception of property rights. Not surprisingly, an amended notion of property rights suggests a reformulation of the law of takings. Perhaps more importantly, a new view of property rights suggests that current takings

> law stands as an obstacle to rational resource allocation.*

In disowning his original view that whenever government can be said to acquire resources on its own account, compensation must be paid, Sax asserts that much of what was formerly deemed a taking is better seen as an exercise of the police power in vindication of diffusely-held claims ("public rights") to a common resource base. These rights are in jeopardy when the use of property has spillover effects on other property interests,** and should be entitled to equal consideration in legislative or judicial resolution of conflicts that arise as a result of these spillovers. The purpose of public sector activity, then, "is to put competing resource-users in a position of equality when each of them seeks to make a use that involves some imposition (spill-over) on his neighbors..." Essentially, this recognizes that the roles of government as mediator and as participant in the economic system often overlap when conflicts arise between private interests and public rights. Government must seek to mediate these conflicts, but in so doing it must also represent those diffuse public interests which would otherwise be left ignored."*** If the courts are to avoid disrupting the

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*Sax, "Taking, Private Property, and Public Rights," 81 Yale L.J. 149, at 150 (1971).

**Conflict-creating spillover effects are categorized as: (1) uses of property resulting in direct encumbrance on the uses of other property; (2) uses of a common to which others have an equal right; or (3) the use of property that affects the health or well-being of others.

***"The essence of a public rights ....approach to the question of takings should make clear that the government should vindicate the rights of the taxpayers as a group as well as the rights of individual property owners."

effectiveness of these processes, Sax feels they should confine their questions in determining whether or not compensation is due to: (1) whether or not an owner is being prohibited from making a use of his land that has no conflict-creating spillover effect; and (2) whether or not government is guilty of discriminatory action. The great advantage of this approach is that it decouples the taking issue from any artificial categorization of the modes of government activity (i.e., harm-preventing vs. benefit-compelling). This allows government a greater flexibility in balancing diffusely-held claims vs. traditional property interests, a complex task that the courts are probably ill-equipped to assume* and reluctant to engage in. At the same time, courts can focus more explicitly on developing rules to protect against governmental abuse of discretion.** While Sax acknowledges that legislative decision-processes are not always rational, he points out that the relevant issue is whether conventional rules will make the process more rational. But clearly they do not:

> ... the current takings scheme introduces an irrationality by requiring compensation when the conflict resolution system imposes extreme economic harm on discrete users but not when analoguous harm is placed on diffuse users. The proposed scheme has the advantage of making competing uses doctrinally equal, leaving their accommodation to be decided as a matter of public policy rather than of inflexible legal rules.

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*At least on other commentator is convinced that balancing tests are too difficult for the courts to apply. See Michelman, "Property, Utility, and Fairness: Comments on the Ethical Foundations of Just Compensation," 80 Harvard L. Rev. 1165 (1967).

**On the question of arbitrary and discriminatory government regulation, Sax analogizes to the judicial rules developed to prevent spot zoning. On the question of excessive zeal in seeking broad social objectives, he points out that the courts are greatly aided by political checks on decision-making processes which would not allow the "public interest" to routinely prevail over traditional private rights.

These observations have important implications for the coastal zone management situation. While the courts have substituted a balancing test for the traditional benefit-compelling vs. harm-preventing criteria in open space litigation, inevitably this balancing test will become too complex for the courts to deal with. How can the diminution in value of a regulated littoral property be compared within a legal context to the aesthetic or recreational value gained for the public at large? Such trade-offs are meant for political and administrative processes, and the courts must develop a more sophisticated approach that can both maintain administrative flexibility while guarding against potential abuses of discretion. At the same time, governmental agencies faced with the possibility of litigation challenging the constitutionality of shoreline controls should adopt a strategy for approaching the taking issue which emphasizes careful draftsmanship,sound technical evidence, and which takes advantage of open space and related environmental objectives.*

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*For an extensive discussion of these strategies see Bosselman, et. al., op. cit. Alternative strategies also suggested therein include (1) a return to strict construction of the taking clause which limits the concept to an actual physical invasion by government; (2) adoption of legislative standards to codify more precisely the line between regulation and taking; and (3) avoiding the issue altogether by relying on acquisition and/or compensation programs.

SESSION 22: The Issue of State vs. Local Responsibilities

Purpose:

To discuss the question of who should have responsibility in what circumstances for planning and implementation of coastal management programs, with specific attention to recent proposals developed by the American Law Institute.

Reading Assignment:

1. American Law Institute, A Model Land Development Code, Tentative Draft No. 3, Article 7 (1971).
2. Babcock, "Comments on the Model Land Development Code," Urban Law Annual (1972).

Discussion Summary/Outline:

Another important issue to be dealt with relative to coastal zone management programs is: How can a broader range of policy considerations be incorporated into decision processes at the local level, when the impacts of the decisions transcend jurisdictional lines? As we have seen, there has been a conspicuous absence of any regional prespective in the coastal zone, as local political subdivisions have generally responded only to local concerns regarding maintenance of the property tax base, reservation of facilities for exclusive municipal use, etc. Furthermore, regulatory approaches to shoreline preservation have historically been least effective at the local level when political pressure for development is high, as is usually the case along the coastline. However, to

put this in proper perspective, we should point out that a recent American Law Institute report has indicated that 90 per cent of the land-use decisions currently being made by local governments have little or no significant impact on state or national interests.* While this percentange is undoubtedly much higher in coastal areas where a greater portion of the resources are of more than local value, there is no conclusive evidence to suggest that management by state fiat is required as a matter of broad policy. Even though it is clear that many existing decison processes at sub-state levles are inadequate insofar as coastal resources are concerned, it does not follow that whoelsale rejection of these processes is necessary. Although ultimate decision-making at the state level is desirable in some cases, the general rule should be that co-operaton in good faith should come before pre-emption; i,e., the carrot before the stick.

We should also note that, while local governments may tend to allocate resources of regional significance solely on the basis of local needs and values, this does not imply irrational behavior on their part, since a town government is charged with protecting the interests of the town residents, not the public at large. Even though their actions may be inefficient and inequitable from the regional standpoint, we must be cognizant of the undue burdens that might be placed on both the resource base and on the coastal towns under alternative arrangements. Clearly there is a need for a broader perspective, but this perspective should not be allowed to arbitrarily preempt the legitimate concerns of the coastal municipalities.

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* American Law Institute, Model Land Development Code (Tent. Draft No. 3, 1971).

The federal coastal zone management law has suggested a new framework of decision-making wherein the states are urged to assume a more integral role vis-a-vis sub-state entities.* Prior to granting approval of funding for state programs under Section 306 of the Coastal Zone Management Act of 1972, the Secretary of Commerce must find the program provides for one or a combination of three control techniques, as follows: (1) State establishment of criteria and standards for local implementation, subject to administrative review and enforcement of compliance; (2) Direct state land and water use planning and regulation; or (3) State administrative review for consistency with the management program of all development plans , projects, or land and water use regulations proposed by any state or local authority or private developer, with power to approve or disapprove after public notice and an opportunity for public hearings.**

An innovative scheme that seems to fall within this basic framework is that proposed by the American Law Institute, as outlined below:

1. state land planning agency establishes policies and standards for local decision-making in the "big cases" which involve significant statewide or regional interests

2. project developers apply first to a municipal land regulation agency for approval, with the state planning agency as a party to the proceedings and with the process governed by state-set criteria

3. if a party to the proceedings is unhappy with the result at the local level, appeals can be made (by either developer or state planning agency) to a state land ad-

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*For a general discussion of the emerging role of the states in land-use decision processes, see Land Use Policy and Planning Assistance Act, Report No. 93-197 of the Committee on Interior Affairs, U.S. Senate (S. 268 -- 1973).

**P.L. 92-583, 86 Stat. 1280, sec. 306 (e), (1).

judicating board. At this point, there are two crucial questions: what are the "big cases", and how is the balancing of state vs. local considerations to be carried out?

4. the "big cases" are to be determined through application of statutory criteria with respect to the location, type, and magnitude of the project. The three suggested categories are as follows:

   * districts of critical state concern(e.g. those with historical or natural significance, or those which interact with major public facilities)

   * developments of state or regional benefit (e.g. power plants and other facilities that meet other than local requirements)

   * large-scale developments (e.g. residential complexes) with statutorily prescribed limits on size

5. with regard to the balancing of benefits and detriments, the Model Code sets forth ten factors for consideration by the agency in making tradeoffs. These factors deal with, among others, the effects of the proposed location on the environment, other persons and property, the municipal cost structure, housing opportunities, the provision of municipal services, and public transportation and other governmentally-aided facilities.

At this point, one important observation should be made. The organizational arrangements embodied in the ALI Model Code reflect a philosophy about decision-making that differs in many respects from traditional concepts of "master planning," where locational decisions are assumed to be made in a comprehensive fashion and then implemented through zoning and related control techniques. The theme of the Model Code moves away from this orientation and toward one of enlightened evaluation of development proposals as they are generated within the private market. While the framework for evaluation is still envisioned as comprehensive and the result of a systematic planning process,

the relationship between planning and decison-making is of a wholly different nature. This points again to the issue of how allocative decisions are to be made in the process of managing scarce coastal resources. This will be the main topic in the remaining sessions of the subject, and is probably the single most important issue on the coastal zone management frontier.

SESSION 23: The Issue of How to Make Allocative Decisions

Purpose:

To discuss the perceived inadequacies of the classic formulation of the land-use planning and decision-making process in the public sector, and point up an alternative strategy which has emerged in recent years.

Reading Assignment:

1. American Law Institute, A Model Law Development Code, Tentative Draft No. 2, Article 3 (1970).

Other References:

1. Meyerson, "Building the Middle-Range Bridge for Comprehensive Planning," J. of the American Institute of Planners 58, (1956).
2. Webber, "Prospects for Policies Planning," in Duhl (ed.), The Urban Condition (1963).
3. Meyerson & Banfield, Politics, Planning, and the Public Interest (1965).
4. Bolan,"Emerging Views of Planning," 33 J.A.I.P. 233 (1967).

Discussion Summary/Outline:

Having considered issues of organizational structure and relationships between different levels and branches of government, there remains a third and perhaps most fundamental question with regards the management of coastal resources: How should government go about reaching allocative decisions involving social, environmental, and economic impacts,

(many of which are intangible or unquantifiable), when some groups gain and others lose as a consequence of the choices made, and when the values of different groups are in conflict? Among the requirements of the federal Coastal Zone Management Act are the provisions that federally-funded state management programs must include "a definition of what shall constitute permissable land and water uses within the coastal zone" and "broad guidelines on priority of uses in particular areas." In other situations, the market system is relied on to serve these functions because it provides a simple, sure, and self-correcting process which will reflect changes in social desires. But in the case of shoreline resources, the market has clear allocative imperfections, thus providing a rationale for collective intervention. This reflects the expectation that governmental activity can, in effect, take up where the market leaves off, bringing about a distribution of coastal resources among competing uses that is more representative of social values and more responsive to public needs. The fulfillment of this expectation is the greatest challenge facing the states in the development of coastal zone management programs.

Adjusting the allocative system to correct for deficiencies without introducing additional disruptions that could counterbalance any benefits achieved will be an extremely complex task. If rational shoreline use policies are to be accomplished, the application of regulatory measures must be preceded by intelligible planning and must be related to a coherent framework for decision-making. These concepts are cornerstones of the federal Coastal Zone Management Act, which calls for the development

of unified policies, criteria, standards, methods, and processes for dealing with land and water use decisons. This approach is reflected in the Act's definition of a management program:

> "Management program" includes, but is not limited to, a comprehensive statement in words, maps, illustrations, or other media of communication, prepared and adopted by the state in accordance with this title, setting forth objectives, policies, and standards to guide public and private uses of lands and waters in the coastal zone.

With these words, the Congress has indicated that a more "enlightened" process of land-use planning and control must be relied upon to establish priorities and effectuate objectives that the market system could not. However, it still remains to be seen what is the most appropriate form of government intervention in market processes. This raises the question: Is the classical formulation of planning and decision-making in the public sector sufficient to meet the challenge of the coastal allocative problem? The historical concept of planning assumes that an efficient allocation of resources based on social values can be achieved if we employ the combined insights and learning of the economist, the environmental expert, the philosopher, and all other professionals concerned with social problems. The planning process is thought to be "a constantly evolving and continuously changing phenomenon -- an evolutionary scheme which through the medium of development policies is progressively adjusted in the flow of time to take account of unpredictable elements of technological and social change."* During the late 1920's,

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*Freilich, "Interim Development Controls: Essential Tools for Implementing Flexible Planning and Zoning," J. of Urban Law 65 (1971). See also Chapin, Urban Land Use Planning, at 98 (2d ed. 1965).

the concept of planning was first introduced on a national scale in The Standard Planning Enabling Act and the Standard Zoning Enabling Act*, prepared by the Department of Commerce and subsequently adopted by most states. In their original form, these Acts vested in city or regional planning commissions the power to develop a 'master plan' with recommendations as to the general location of public and private activities. The primary purposes in view were to protect the health, safety, morals, and general welfare of society by ensuring the orderly development of the community resource base. Toward these ends, local zoning boards have been empowered to regulate and restrict the height and size of buildings, the size of yards and other open spaces, the density of population, and the location and use of buildings, structures, and land for trade, industry, residence or other purposes. Originally, it was envisioned that zoning and other land-use controls were merely tools by which the master plan could be implementd. However, for a variety of reasons, the two concepts became separated, with zoning becoming widely accepted and with master planning -- especially on a regional basis -- never exerting important influences on urban or regional development on a broad scale.** As one commentator notes:

> ...we have been totally remiss in failing to provide legal mechanisms to protect and nourish the planning process and as a result we have almost totally failed to incorporate planning into the chaotic development of our communities...

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* U.S. Dept. of Commerce, Advisory Commission on City Planning and Zoning, A Standard Planning Enabling Act (1928), and A Standard Zoning Enabling Act (1926)

** It has been estimated that about half of all cities that have adopted zoning have no master plan at all. See Pooley, Planning and Zoning in the United States, at 6 (1961).

> ...The failure to protect and incorporate the planning process in our society is amply demonstrated by the fact that the principal tool of land development policy, zoning, is handled in each metropolitan area by hundreds of fragmented local governments without conscious committment to the concept that principles are essential to the establishment of meaningful land development policies and that rational planning of land use must be incorporated in the legal controls which are adopted to regulate the use of land.*

Aside from the fact that planning often lacked a dynamic element, the historical rejection of the planning process in relation to the use of land was due to a number of factors. A principal difficulty was that it delegated to a relatively small group of professionals the task of discovering and weighing, in a supposedly objective manner, the full range of social values attendant to the physical and social development of the community. The underlying assumption is that professionals know enough to predict what the outcomes of the allocative system might be if all values were perfectly represented, an assumption not justified by reality. This can be illustrated by looking at the theoretical foundation of classical planning, which relies upon a comprehensive approach to decision-making and which, in effect, attempts to simulate the workings of a properly-functioning market. The five step process consists of a definition of objectives in the form of a utility function; enumeration of all possible alternative actions; the evaluation of the consequences of such actions; the evaluation of these consequences in terms of objectives via the utility function; and the choice of the action which optimizes utility. Unfortunately, there are severe limitations to the application of such a technique to situations involving impacts on environmen-

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*Freilich, op. cit., at 67-68

tal and other "amenity" values associated with coastal resource allocations. For example, it may be impossible to define all the relevant objectives and their priorities in developing a utility function; it may be difficult to predict consequences in the presence of uncertainty due to the open nature of the socio-economic system; and it may be extremely costly and even impossible to perform a comprehensive analysis. In short, all the factors which militate against the formation of fully-informed markets for amenity "products" also act to severely impede methods designed to simulate the market's performance in this regard. In the case of shoreline resources, we have noted that this phenomena applies to government as well, since the values and demands of a diffuse public may be impossible to identify or too costly to evaluate.

Given that there is often no easy means of articulating and weighing the diffuse and intangible values of a diverse public, there is a danger that allocative decisions will be determined, by default, by value judgements on the part of those who administer the planning process. This, of course, is one of the risks encountered whenever planning and decision-making takes place within a basically political arena, where the existence of orderly and efficient processes for value representation is far less assured than in the context of the economic marketplace.* However, when master planning begins to rely too heavily on a

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*This is particularly true when allocative decision-making authority is vested in certain forms of limited-mandate public agencies, whose actions can often be shown to lead to resource allocations that are consistently worse than what an unfettered market would provide, regardless of imperfections. See, e.g., Ducsik, ed. "The Allocation of Boston Inner Harbor: A Case Study in Resource Management," Report of the Shoreline Development and Pollution Subcommittee of the Ocean Resources Task Force, at 37, Massachusetts Secretary of Environmental Affairs (Sept. 1972).

"father knows best" approach -- as it often has -- it becomes unacceptable in a society such as ours with a strong cultural bias against any undue centralization of decision-making authority.

The above observations indicate again the need for new approaches to any decision-making process, such as coastal resource management, which necessarily involves substantive consideration of environmental and socio-economic elements. The planning establishment itself has begun to respond to this need by reevaluating many past concepts and practices and by experimenting with new and flexible techniques.* The most significant development in relation to the planning process itself is the American Law Institute's Model Land Development Code, now in its fifth tentative draft, which represents a major attempt to overhaul the standard enabling legislation produced during the 1920's. The Code does not abandon long-term goal setting, but encourages the assembly of a wide variety of information, the making of trend predictions, and the statement of long-run objectives. From this base, planners are seen as estimating probable economic and social consequences of both governmental inaction as well as intervention to realize the objectives which are stated.. These efforts are mainly to provide a framework for a systematized program of government action over a relatively short period of time, after which the framework is expected to be readjusted. The Code therefore recognizes the limitations of comprehensive planning by emphasizing short term programs of intervention and by requiring identification of and focus on specific problems or other decision-making situations.

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*See generally Heeter, Toward a More Effective Land Use Guidance System; A Summary and Analysis of Five Major Reports, American Society of Planning Officials, Planning Advisory Service Report No. 250 (1969).

In closing, it might be said that planning is coming to be viewed in many sectors not as a mechanism for determining the use of land and other resources, but as a means of guiding public and private decisions by providing valuable inputs as to the social and environmental consequences of alternative actions. This shifting orientation is relatively new, and while promising, has yet to be applied on a large scale. It is clear, however, that if effective action is ever to provide a clearly preferable alternative to the market in the allocation of our valuable coastal resources, efforts aimed at upgrading the means by which allocative decisions are arrived at must be pursued vigorously.

SESSION 24: Allocative Decision-Making, Continued.

Purpose:

To further explore a particular topical area related to theory and/or practice of coastal planning and allocative decision-making.

Reading Assignment:

1. Cape Cod Planning and Economic Development Commission, "Resource Management" (1972)

2. The following materials should be skimmed to get a general feel for basic approach, areas of emphasis, etc.

   * Cape Cod Planning and Economic Commission, "Overall Program Design" (1974)
   * "Planning Program Details," Herr Associates (1974)
   * Cape Cod Planning and Economic Development Commission, "Land Use and Regional Goals" (1973)

Other References:

1. Belknap and Fortado, Three Approaches to Environmental Resource Analysis, Harvard Graduate School of Design, Cambridge (An overview of landscape architects' approaches)

2. Program Design for San Francisco Bay Region Environment and Resources Planning Study, Geological Survey, U.S. Department of Housing and Urban Development, Menlo Park, Calif., (October 1971) (A model planner's design for coastal zone planning)

3. New England River Basins Commission, Southeastern New England Study of Water and Related Land Resources "Plan of Study," Vol. I & II, NERBC, Boston (April 1972) (The largest environmental study impacting the Massachusetts coastline)

4. Aylward, et. al., Cape Cod Planning Study, M.I.T. Regional Planning Studies (Summer 1973) (An overview of land, economy, and services)

Discussion Summary/Outline:

During the 1973-1974 academic year, the class was addressed by Prof. Phil Herr of the M.I.T. Department of Urban Studies and Planning. Prof. Herr discussed a number of case studies in coastal resource planning that he had been involved in or was knowledgeable about, and an outline of his presentation is included below.

Current Coastal-Related Planning in Massachusetts

A. Relationship: Coastal Zone Management objectives v. traditional Comprehensive Planning objectives.

1. Both have similar rhetoric, employ similar techniques, give practitioners of comprehensive planning the feeling that another wheel is being reinvented

2. Real differences: comprehensive planning characteristically shallow in its consideration of all natural systems, generally narrowly focusses on subject municipality.

3. CZM program a way of focussing efforts on a salient resource, but not creating anything new.

B. Current coastal related comprehensive planning in Massachusetts (excludes single-function studies, of which there are legion; e.g. water quality management, air pollution control, transportation, coastal erosion, port utilization, etc.)

1. Multi-state region: Scutheast New England Water Study of the New England River Basins Commission.

* classic long-range comprehensive plan for water usage, but with major efforts at land resource analysis and planning
* well-funded , competent, good efforts at citizen dialogue, but poorly related to political decision structure, working at a gross scale (data mapping generally 1" = 1 mile).

2. State-level comprehensive planning

* state-wide land use planning project funded by state, HUD, at $190,000 for 2-year effort (really being done

in six months), designed to develop a statewide land resource system based roughly on the American Law Institute model, dealing with critical areas and developments of regional importance

* non-funded inquiry into growth and its impact on the quality of life in Massachusetts by a Legislative Commission aided by staff loaned from various administrative bureaus

3. Sub-state regional efforts

* Massachusetts divided into 13 substate planning regions, each with a regional planning agency essentially a creation of the municipalities collectively
* perform A-95 federal review functions, conduct studies (formally) qualifying constituent communities for federal grants, exhort good actions by state and municipalities, but essentially powerless
* funding largely from federal grants(HUD, DOT, LEAA) six of the 13 regions are"coastal:" Metropolitan Area Planning Council (Boston-centered, over half of Massachusetts population), Southeastern Massachusetts Regional Planning and Economic Development District (Taunton, New Bedford, Fall River, all of northern shore of Buzzard's Bay), Merrimack Valley (Haverhill, Lawrence, and environs), Cape Cod Planning and Economic Development District (CCPEDC), Dukes County Planning Commission (Martha's Vineyard), Nantucket
* more promise than delivery in effective comprehensive planning to date; most regions at some stage in studies, none presently having comprehensive land and water plans serving as an effective input to state or local decision-making.

4. Municipal efforts

* Boston Redevelopment Authority is the planning agency for Boston, has traditonally eschewed comprehensive planning, now beginning a neighborhood-based policy program, but still doing essentially no resource-based studies.
* most other coastal municipalities have prepared comprehensive plans, few of them effective, almost none of them resource oriented; few have continuing planning staffs, a one-time plan-making expenditure of $2.00 per capita is considered a big effort; federal "701" program of declining significance as its funds are diverted elsewhere (management, state-level studies, etc.)

C. Cape Cod Planning and Economic Development Commission (CCPEDC)

1. The Resource Management Program of 1972-73 analyzed county-wide population growth, employment, land availability, and fresh-water resource potential, estimated holding capacity, time remaining at present growth rate before reaching it (c. 15 years).

   * recommended actions: cluster zoning to save land, major studies to better understand water, new agency to develop industrial alternative to construction as the region's basic industry

2. Spatial analysis being done 1973-74, using overlay techniques involving environmental, cultural (built-environment), and socio-economic variables, including:

   * Cape Cod's Diminishing Land Resource
   * Regional Land Use Planning
   * Land Capability Attributes
     --Map: Land Capability
     --Map: Public Water Service
     --Map: Public Sewerage Service
     --Map: High Yield Aquifers
     --Map: Geologic Limitations
     --Map: Flood Plains
     --Map: Land Consumption
   *Development Consequence Attributes
     --Map: Development Consequences
     --Map: Tax Base Strength
     --Map: Family Income
     --Map: Comparative Unemployment
     --Map: Strip Tending Highways
     --Map: Intensive Residential Land
     --Map: Proximity to Railroads
     --Map: Large-Scale Open Space Sites
     --Map: Industrial Land Use
     --Map: Highway Access
   * Residential Consideration Attribute
   * Open Space Consideration Attributes
     --Map: Open Space Considerations
     --Map: Public Lands
     -- Map: Distance from Open Space
   * Preparation of Goal Relationships Maps

3. Analyses designed to relate locational attributes and regional goals with respect to use of land for residence, employment, open space, producing maps rating each location for each of those uses

   * work now proceeding to relate outcome of those studies to local zoning and open space efforts

SESSION 25: Allocative Decision-Making, Continued.

Purpose:

To further explore a particular topical area related to theory and/or practice of coastal planning and allocative decision-making.

Reading Assignment:

1. Devanney, et.al. Parable Beach: A Primer in Coastal Zone Economics (unpublished, 1974) -- read Chapter 1 and 3, skim remainder.

Discussion Summary/Outline:

During the 1973-1974 academic year, the class was addressed by Professor John W. Devanney III of the M.I.T. Department of Ocean Engineering. Prof. Devanney's presentation, which focused on evaluation of economic arguments in relation to coastal zone development, is outlined below.

Economic Aspects of Coastal Development Projects

Coastal zone management is a resource allocation problem. The American society must somehow decide how to allocate an essentially fixed supply of coastal zone resources among growing public and private demands for coastal areas. Historically, the answer has been to allow supply and demand to determine the usage of coastal areas through the price mechanism -- the use which would pay the most for the property obtained by it. Zoning provisions, public ownership, and tax laws have

all had an impact on the market results, but the current allocation is essentially the result of private market operations.

Increasingly, these results have been called into question. A series of laws have been passed which attempt to modify the private market operation. Usually, these laws involve a transfer of at least some part of the allocative decision to some public body. At present, along most of our coastline it is impossible to effect even a moderate-sized development without the approval of a number of municipal and state agencies. A large development will typically require the approval of a score of municipal, state, and federal bodies. This transfer of the allocative decisionmaking to public bodies places a heavy responsibility on the individuals within these bodies, for it is they who must now decide on how society uses its coastal zone. On any such decision, they will be beseiged with arguments pro and con. The intensity of these pressures reflects the increasing value that society places on the coast and the subsequent importance of their decisions.

Often the arguments pro and con some change in coastal zone allocation will take an economic form. This is a relection of the fact that an extremely important measure of a town's well-being or of a state's well-being is its wealth-- its ability to consume market goods. A prospective developer will claim that his proposal will have a substantial effect on the economy of the region and will buttress this claim with a great deal of analysis and figures. Similarly, anti-development forces will offer counterclaims also supported by extensive figures, expert testimony, and analysis.

The purpose of economic analysis is to aid the responsible public decisionmaker faced with such claims to sort out these arguments. We will be pointing out the common fallacies in many "economic" arguments, both pro and con a development, sifting out the truth, and aiming at putting the decisionmaker in a position to assess the true impact of a development on the market wealth of the political entity for which he is responsible, be it a town, a state, or the entire country. An important byproduct of our prescriptions for these public decision-makers is the establishment of the true economic basis of the conflict between individual municipality, state, and country which is central to much of the coastal zone issue.

The necessary background which provides this basis can be outlined as follows:

A. The Concept of Real Municipal Income

1. real municipal income is the total value of the goods, priced at 1974 market prices, which the town can consume with the output of the resources it controls.

2. we assume that the larger the total value of real municipal income, the better off is the town. The concept of municipal income thus ignores the distributional effects of any proposed changes within the town. The only effects that count are those on the <u>total</u> value of consumption.

B. The Black Box Concept

1. the concept of real municipal income actually draws a "black box" around the town for purposes of economic analysis; but we know that decisions reached by the town will have effects on others who are not citizens of the town.

2.. "black boxes" are thus useful to draw around other levels of responsibility, such as the state or the nation, in order to see how the economic picture varies according to the portion of society affected. In general, the effects on real income of a proposed development will be different for each level.

3. thus, it is very important when doing economic analysis to make one's "black box" explicit -- the failure to do so has often been endemic to coastal zone development debates and results in a meaningless tossing around of numbers (e.g. number of jobs created, increased town revenues, payrolls, etc.)

   * often useful to draw a black box around the developer, since an increase in his income will be necessary for him to undertake a particular project.

C. The Implications of Accepting Market Price as a Measure of Value

1. given that most market prices are for all practical purposes fixed, accepting real income as a measure of well-being involves taking a laissez-faire attitude towards how the entity within the black box chooses to spend its income

2. if one accepts the present distribution of income as given, good arguments can be made that prices, while imperfect, are an indicative reflection of people's underlying desires for those goods for which a functioning market exists

3. it is importatnt to acknowledge that real income is only one dimension of an entity's well-being, albeit an extremely important one; since the analysis of other, less tangible dimensions is often vague and imprecise, it is particularly important that analysis regarding this economic dimension, at least, be fallacy-free and truly informative

D. Present Value Theory

1. since changes in real income come at different points in time, there must be a means of balancing income effects now with income effects in the future

2. to do this, we reduce all future income effects to their present value, using an assumed interest rate and the number of years that elapse

3. in general, a dollar now is worth more than a dollar later by an amount which depends on the relevant interest rate. Equating future increases to income to an equivalent amount received now accounts for this difference.

4. in evaluating a development proposal, the time stream of revenues and outlays must therefore be converted to equivalent amounts now by means of present value calculations.

E. Choice of Interest Rate

1. different citizens of a given entity will in general have different investment and borrowing opportunities

2. so for town as a whole, we need a weighted average, an accurate estimate of which is a hopeless task. Fortunately, all that is usually needed is to run the analysis over a range of likely rates and examine the results in the aggregate

3. when a ballpark figure is needed, the highest rate of interest paid by the town on its borrowings will do.

F. Inflation

1. need to implicitly deflate all future prices back to 1974 dollars to put everything on the same basis

2. must be particularly careful to use inflation-free interest rates in obtaining present values; figures must be net of inflation

G. The Crucial Importance of Net Rather than Gross

1. only thing that counts in assessing any two alternative developments is the net difference in black-box real income between the two

2. this is a seemingly obvious statement, but frequently ignored in the public debate

   * proponents usually focus on the input side; i.e., the resources that will be employed by the development (e.g. money spent and respent within the region)
   * opponents generally focus on the output side; i.e., the value of the goods the current use of the resource produces (e.g. loss of jobs or other opportunities and their multiplied effects)

3. both sides make a basic error in talking about gross instead of net change

   * in the case of labor, for example, need to ask what it would be earning if it weren't employed on the development project; if total unemployment exists, the entire payroll is a net benefit; if full employment exists, there is zero net benefit since diverting labor to the development means a loss in output elsewhere.
   * in general, the net effect of black-box expenditures on

black-box inputs depends critically on the alternative opportunities for employment which these resources have. This principle applies to all inputs -- land, capital, materials, labor, etc. Under full employment of the inputs (market price of input equals value of output products), the direct effect on income of their purchase is zero.

4. turning to the multiplier effect, it is clear that there are non-zero net effects only when there is partial unemployment of an input; otherwise, there would be nothing to multiply

   * again, must be careful to get the net multiplied effect of and differences in regional income -- . costs are incurred in meeting demands created by respending, and these must be taken out of the gross revenues gained -- these costs again reflect the opportunity value lost by not devoting resources to an alternative use
   * in general, the net increase in first round respending is some percentage of actual expenditures, depending on the amount of black box labor input to the good or service, and the degree of unemployment in the black box respending market -- 20% is usually a generous figure for most respending markets
   * so, the net effect of the multiplier phenomenon on black box income is generally much overstated, and its influence drops off rapidly in two or three rounds.
   * arguments on the output side can be examined from the same viewpoint

5. when the proper differential perspective is taken, attention then focuses on those areas where real changes in black box income generally reside. These are:

   * changes in the cost (market price) of outputs to black box consumers
   * changes in private profits to black box investors
   * changes in public profits (tax revenues less additional cost of municipal services) to black box governmental bodies
   * changes in take-home pay to black box labor
   * changes due to respending (multiplier) which accompanies all of the above.

6. difference in black box income due to changes in labor income and respending (the latter two, above) become noticeable on net only when:

   * there is substantial unemployment which is actually reached by the development, and
   * one alternative employs little or no labor resources and the other a lot

H. Important Rules for Analysis

1. many analyses double and triple count certain income effects while missing others

2. it is therefore extremely good and even necessary practice to set up a comprehensive and consistent set of accounts to keep track of various changes; the accounts must be collectively exhaustive and mutually exclusive

3. the most appropriate choice of accounts will depend on the alternatives under analysis and the black box whose income is being analyzed.

4. it is also extremely important to choose a consistent baseline; sometimes it is most convenient to use the status quo or a carefully defined projection thereof; when analyzing all possible alternative uses of a site, it is generally best to use some fictitious alternative so that each possible alternative (including the null) can be analyzed independently

5. when you meet uncertainty, don't try to make "best guesses," but bracket the problem instead -- do analysis for a range of possible values, while noting probability of each occurring in practice

I. Concluding Remarks

1. an important point to make in closing is that, if the economic analysis is done correctly, many projects will fail on the economic merits alone, without even worrying about the less tangible environmental and social effects

2. if the project is attractive on purely economic grounds, then other methodologies will need to be employed to assist in the balancing process

   * one possible method is multi-objective analysis, which helps depict the trade-offs between changes in real income and in other dimensions of well-being (e.g. environmental quality).

CONCLUDING REMARKS

The discussions which comprise the latter half of this subject have been addressed to the proposition that new modes of collective action will be necessary to deal effectively with coastal resource management problems. The relatively straightforward observation that the organization of economic, political, and legal activity has contributed to resource misallocation in the coastal zone has some very heavy implications regarding the institutions we rely upon to order the affairs of society.

We have asserted that the full range of social values has not been appropriately reflected in how the coast is developed and used because of the difficulty in organizing markets for certain coastal uses, because of the parochial nature of political decision-making, and in some cases because of the application of inflexible legal rules by the courts. The new modes of collective action necessary for coastal zone management therefore pertain to three "interfaces" which correspond to these three causal factors: the interface between government generally and those social values which are not articulated through market mechanisms; the interface between different levels of government, particularly state and local; and the interface between the executive and judicial branches of government. New techniques are needed for the incorporation of affected interests into coastal decision processes; new arrangements are needed to effectuate the necessary intergovernmental co-operation; and new legal rationales are needed to allow for administrative flexibility in environmental regulation without undue encroachment on individual rights. In the larger sense, these new modes of collective action reflect the need to bring some form of an integral perspective to bear on problems that arise within an

extremely fragmented social environment. This is really what the "quiet revolution" in resource control -- of which the coastal zone management movement is a major part -- is all about.

Whether or not a "counter-revolution" takes place will depend in large measure on the sophistication of the policies that are developed over the next few decades. Finding manageable solutions in the problem areas outlined above will be a difficult and enduring task, in large measure because institutional change inevitably presents tradeoffs among broad social objectives. For example, the most efficient resource planning and control system might require a high degree of centralization and a relatively free hand on the part of government in relation to judicial review. Such a system, however, might unacceptably detract form concepts of decentralization of political power (as embodied in principles of home rule) and/or protection of individual rights (as embodied in constitutional provisions). Coastal zone management, in the most general sense, can thus be seen to pose issues that strike to the very heart of the institutional structure of American society.

These observations mark the end point of the scope of the materials covered in this introductory subject. Beyond this point of departure lies the frontier of coastal zone management, as represented by a growing body of literature addressed to the design and operation of coastal management programs. This is the "stuff" of which a second-level subject can eventually be made, and it can best be illustrated by a partial bibliography, with which this report will now close.

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1. Ketchum. ed., The Water's Edge: Critical Problems of the Coastal Zone, M.I.T. Press (1974) -- see Part III, especially Chapters 9, 10, and 12.

2. Articles from the Coastal Zone Management Journal, Volume 1 (Fall 1973 and Winter 1974), particularly:

* Russell and Kneese, "Establishing the Scientific, Technical, and Economic Basis for Coastal Zone Management"

* Pope and Gooselink, "A Tool for Making Land Management Decisions Involving Tidal Marsh"

* Dickert and Sorenson, "Social Equity in Coastal Zone Planning"

* Odum and Skjei, "The Issue of Wetlands Preservation and Management: A Second View"

* Walker, "Comments: Wetlands Preservation and Management: A Rejoinder -- Economics, Science, and Beyond"

3. Conference Proceedings, Tools for Coastal Zone Management, sponsored by the Coastal Zone Management Committee of the Marine Technology Society (February 14-15, 1972).

4. Hite and Stepp, eds., Coastal Zone Resource Management, Praeger Publishers (1971) -- see Part II

5. Hite and Laurent, Environmental Planning: An Economic Analysis -- Applications for the Coastal Zone, Praeger Publishers (1972).

6. Brahtz, ed., Coastal Zone Management: Multiple Use with Conservation, John Wiley and Sons (1972) -- see Part 2.

7. The Conservation Foundation, Three Approaches to Environmental Resource Analysis, Washington, D.C. (Nov. 1967).

8. Heeter, Toward a More Effective Land-Use Guidance System: A Summary and Analysis of Five Major Reports, American Society of Planning Officials (1969).

9. Thurow, Stienhart, Smith, W.A.L.R.U.S. -- Water and Land Resource Utilization Simulation (game originated by Feldt et al. at the University of Michigan) Wisconsin Sea Grant Advisory Report No. 3 (1973).

10. Sorenson, A Framework for Identification and Control of Resource Degradation & Conflict in the Multiple Use of the Coastal Zone, Department of Landscape Architecture, University of California (1971).

11. Craine, "Institutions for Managing Lakes and Bays," 11 Natural Resources Journal 519 (1971).

12. Isard et.al., Ecologic-Economic Analysis for Regional Development, Department of Landscape Architecture, Harvard University (1968).

13. Urban Land Reasearch Analysts Corporation, Toward Efficient Programs of Land-Use Controls, Lexington, Mass. (1969).

14. Assorted case studies, such as:

* "A Coastal Zone Management Case Study: The Decline of Galveston Bay," 7 Marine Technology Society Journal 16 (July 1973).

* Crutchfield, "The Puget Sound Study: A Coastal Zone Management Case," 7 Marine Technology Society Journal 1 (Jan. - Feb., 1973).

* Note, "Saving San Francisco Bay: A Case Study in Environmental Legislation," 23 Stanford Law Review 349 (1971).

APPENDIX: Student List and Paper Topics

Name and Department*	Paper Topics
William Agnew (4)	* "Coastal Zone Management Legislation in Maine"
Michael Alford (H)	* "Current Status of Coastal Zone Management in the State of Georgia" * "The Massport Out-to-Sea Terminal Project: Pros and Cons"
Toru Aoyama (1)	* "Shoreland Regulation in the Great Lakes" * "Public Access to the Waterfront in Boston -- The Effect of Boston 200"
Peter Arnold (1)	* "Coastal Zone Managment in Louisiana" * "Louisiana Superport: A Decision Without Management?"
Roger Bartlett (H)	* "Coastal Resource Management in the California Coastal Zone" * "The Role of Landscape Architecture in Coastal Zone Management"
Larry Brazil (1)	* "Coastal Zone Management in the State of Texas" * "An Analysis of Modified Seashores"
Russell Brown (13)	* "Environmental Characteristics of the North Carolina Coast" * "Pilgrim I: A Case Study in Coastal Power Plant Siting"
Ray Clark (H)	* "Conservation and Planning on the Oregon Coast" * "Planning and the Coastal Zones"
James Eckert (1)	* "Coastal Resource Management in Delaware" * "Dredging: An Economic Necessity, An Environmental Threat"

John Gambill (H)	* "Resources and Problems of the Oregon Coastal Zone" * "Land-Use Impacts of Offshore Nuclear Power Plant Siting"
Anthony Gazis (4)	* "Coastal Zone Management in Rhode Island" * "Controlling Pollution in a Coastal Region of Greece"
Thomas Gorman (CAES)	* "Overview of the Coastal Zone Situation in the State of Maryland" * "A Brief Study of Three Initiatives of Change in Land-Use Management from the Perspective of Organizational Development"
Fred Gross (1)	* "Characteristics, Utilization, and Problems along the Great Lakes Shorelines" * "Maintenance of Our Coastal Resources Through Continued Private Ownership"
Gill Hicks (1)	* "Coastal Zone Utilization and Management in New Hampshire" * "The Proposed Refinery at Durham, New Hampshire: Issues of Community Acceptance and the Decision-Making Process"
Cynthia Howard (4)	* "Maine Coastal Zone Management: Coastal Planning Activity"
Dean Johnson (11)	* "Characteristics and Problems of the Massachusetts Coast"
Daniel Katavola (13)	* "Coastal Related Laws, Policies, and Programs: Hawaii and Florida" * "Shoreline Access for Low Income Groups"
William Lee (1)	* "Coastal Zone Management in Alabama and Mississippi" * "Legal Controls of Potential Environmental Impacts of a Coastal Sand and Gravel Processing Facility"

Alan MacGregor (1)	* "Assessment of the Capabilities of Shorelands Management Programs in the Great Lakes" * "Toxic Effluents and their Effect on Coastal Zone Resources"
Susan Middleton (H)	* "Coastal Resource Management in the State of Washington" * "The 1974 Martha's Vineyard Bill -- An Analysis"
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4 = Architecture

11 = Urban Studies and Planning

13 = Ocean Engineering

15 = Management

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