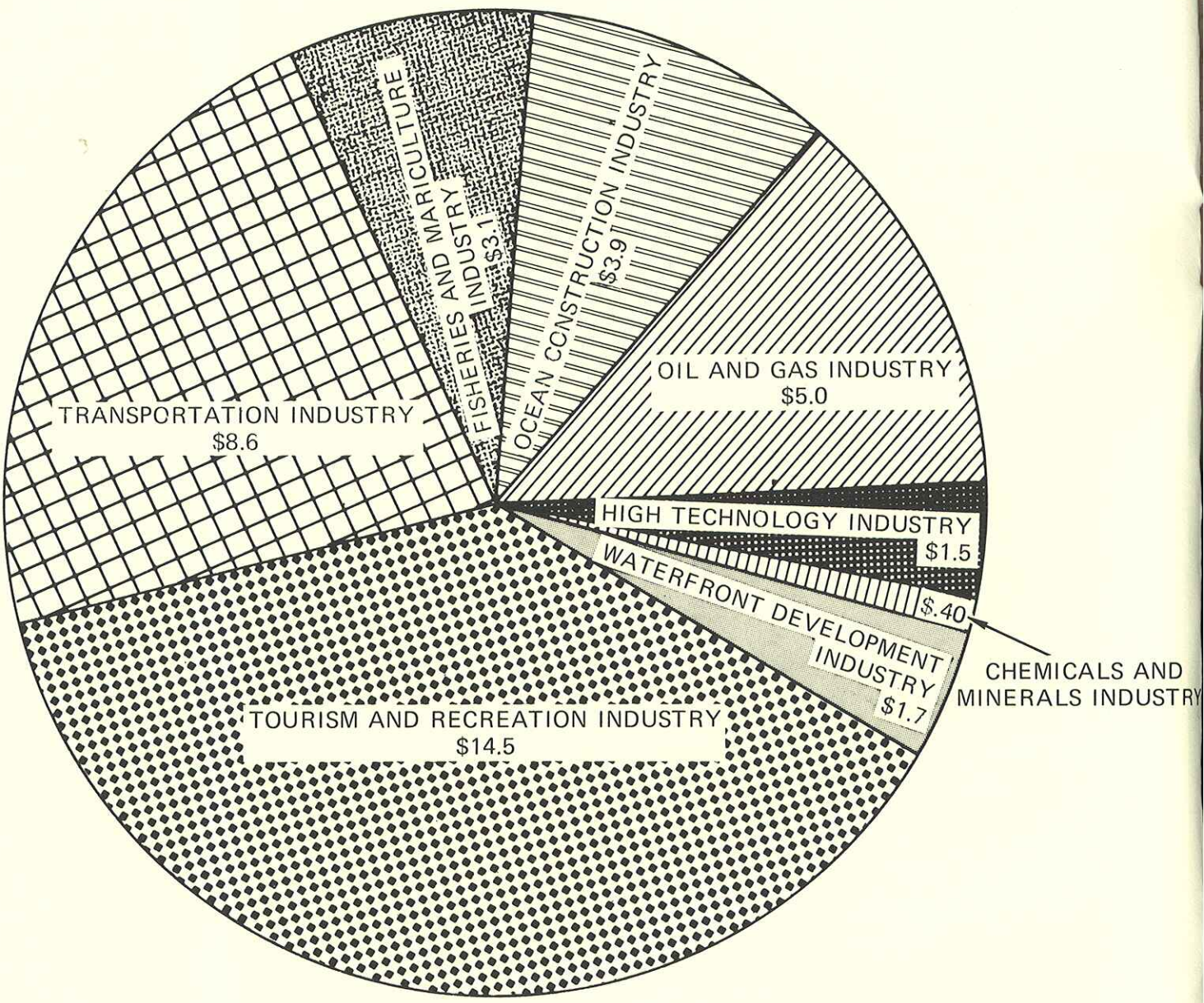
Texas Industry and the Ocean

ESTIMATED 1970 U.S. OCEAN MARKET



TOTAL U.S. MARKET – $38.7 BILLION

TEXAS' SHARE – $5.8 BILLION

DOLLARS IN BILLIONS

November 30, 1970

The Honorable Ray Lemmon, Chairman
House of Representatives Interim Study
Committee on Oceanography
Capitol Station
Austin, Texas

Dear Sir:

When the House of Representatives Interim Study Committee on Oceanography was created by the 61st Texas Legislature, it was immediately apparent to many segments of Texas industry that this committee's work would have an important impact on the future development of ocean-related industrial activities in the state. Consequently, a voluntary group of executives from various Texas industries formed an informal working organization to offer advice, provide information, and otherwise assist the Interim Study Committee in achieving its goals.

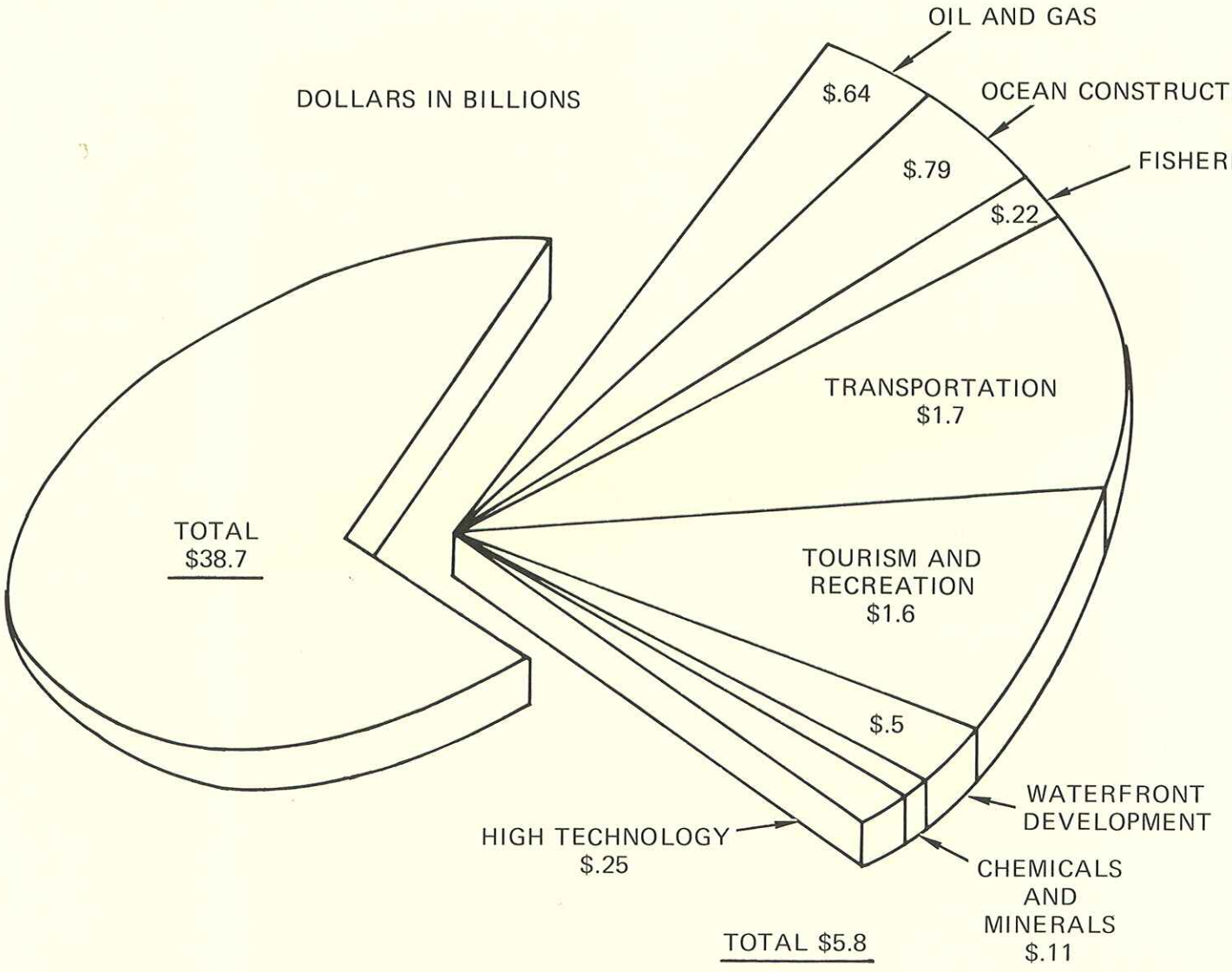
During the course of 1970, this unofficial group became known as the Industry Advisory Group. It is hoped that its efforts were useful and that it contributed in some small way to the success of the Interim Study Committee on Oceanography. In closing out its activities, the Industry Advisory Group has prepared this report which is designed to provide an insight into the problems, requirements, and potential value of ocean-related industrial activity in the State of Texas.

This report takes the form of a summary review and should not be considered as comprehensive or exhaustive. Both current and future market data are always difficult to obtain, and it is likely that some of the information compiled for this report will be at variance with similar information from other sources. Nevertheless, the information contained herein is based upon the best judgment of knowledgeable leaders in Texas industry and, therefore, should be of significant value in assessing the future of ocean-related industry in Texas. The recommendations included in the report represent a consensus, and unanimity throughout industry should not be assumed.

The members of the Industry Advisory Group are listed on the last page of this report. The additional persons who contributed to this report and to the other activities of the Industry Advisory Group are too numerous to mention individually. I am sure, however, that you will join me in expressing our gratitude and appreciation to Mr. Bascom Lynn, Dr. Sid Wells, and Mr. Jim Suggs for their responsive efforts throughout 1970.

Felix W. Fenter

TEXAS SHARE OF ESTIMATED 1970 U.S. OCEAN MARKET



The House of Representatives Interim Study Committee on Oceanography was created by the 61st Texas Legislature for the purpose of conducting a thorough study into the feasibility of a Texas institute of oceanography. The Committee, composed of legislators, academicians, and industrialists consisted of Rep. Ray Lemmon, Chairman; Rep. Menton Murray, Vice Chairman; Rep. Lauro Cruz; Rep. Forrest Harding; Rep. Bill Presnal; Dr. Richard Geyer; Dr. George Kozmetsky; Mr. Robert Bybee; Mr. William McIlhenney; Dr. Cecil Green; and Mr. Jot Hodges, Jr.

INTRODUCTION

It is apparent that the ocean does not represent a single market but rather an environment composed of many complex and diverse industries, large and small. On the following pages the magnitude of economic value, potential growth, problems, and recommendations of industries which are of vital importance to the Texas economy may be observed. Industries' involvement in the ocean is substantial and will continue to expand as technology advances and the demand for natural resources progresses.

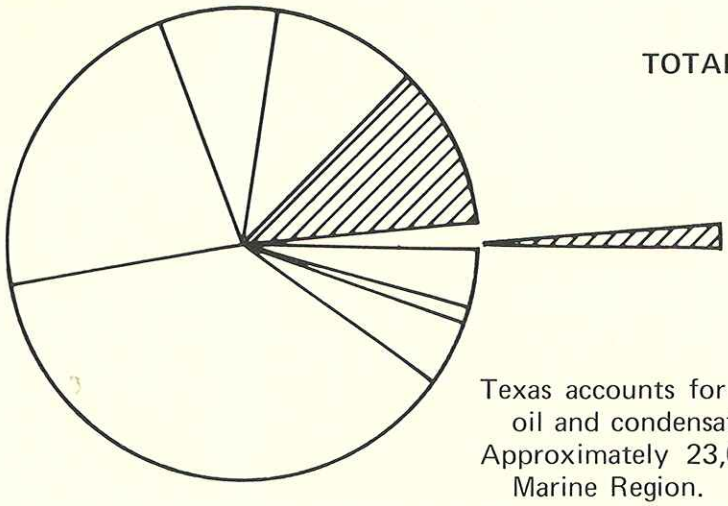
As population pressures and industrial growth continue to increase, the demands placed on the natural environment will also increase and severe problems may arise. It is, therefore, necessary that industry and government work together, along with the academic institutions that will provide trained manpower, to effect proper long range environmental planning before these problems occur and while reasonable accommodations are still possible.

The ocean is a hostile environment but industry will learn to cope with the hostilities as long as it is economically practical. So long as there is a stable and compatible governmental environment in which to operate, the economics of return-on-invested capital will provide the incentive for established industries to expand and for new industries to emerge.

Presently in the State of Texas there are numerous federal, state and municipal government entities that regulate or control some aspects of marine resource development. On the state and municipal level, their mission is usually accomplished simply by extending their normal operating procedures into the coastal and offshore areas. This fragmentation, and in some instances no clear delineation of jurisdiction, add considerably to the already difficult tasks facing an industry attempting to operate in the marine environment.

In order to promote an orderly growth of ocean-related industry and, at the same time, insure proper management of the natural environment, it appears necessary that within the framework of Texas government there be established an entity to provide a focal point for marine resource development. Such an organization would be a progressive and important step forward in providing a mechanism for industry, government and academic institutions to communicate and respond to the needs of each other.

OIL AND GAS INDUSTRY



TOTAL U.S. MARKET FOR OIL AND GAS INDUSTRY

$5.0 Billion

TEXAS' SHARE OF MARKET

$640 Million

Texas accounts for some 35.8% annually of the total domestic crude oil and condensate production.

Approximately 23,000 people are employed in oil and gas in Texas Marine Region.

The majority of the oil companies operating in the waters of the world headquarter in Texas.

The offshore geophysical search for oil and gas in the free world is a $200 million per year business. Approximately 75% of this money is either paid directly to or finds its way back to Texas companies

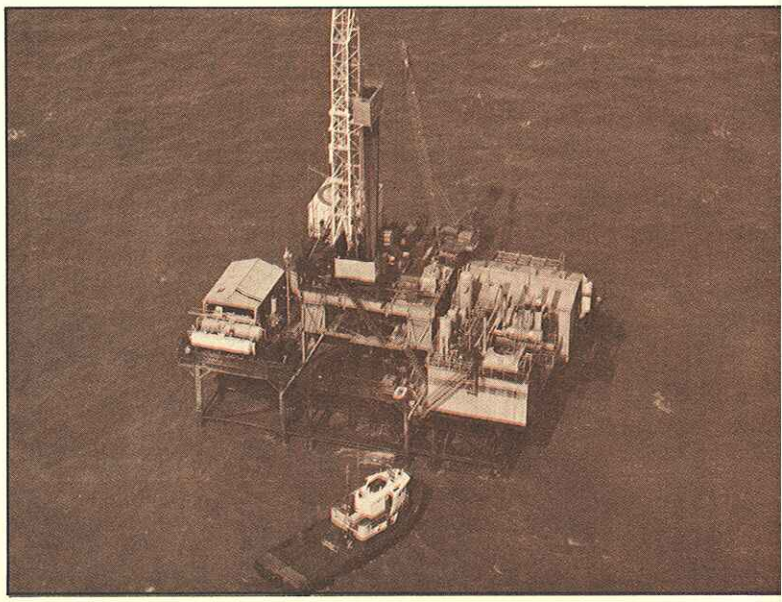
95% of the scientific instrumentation on geophysical vessels operating offshore is built in Texas.

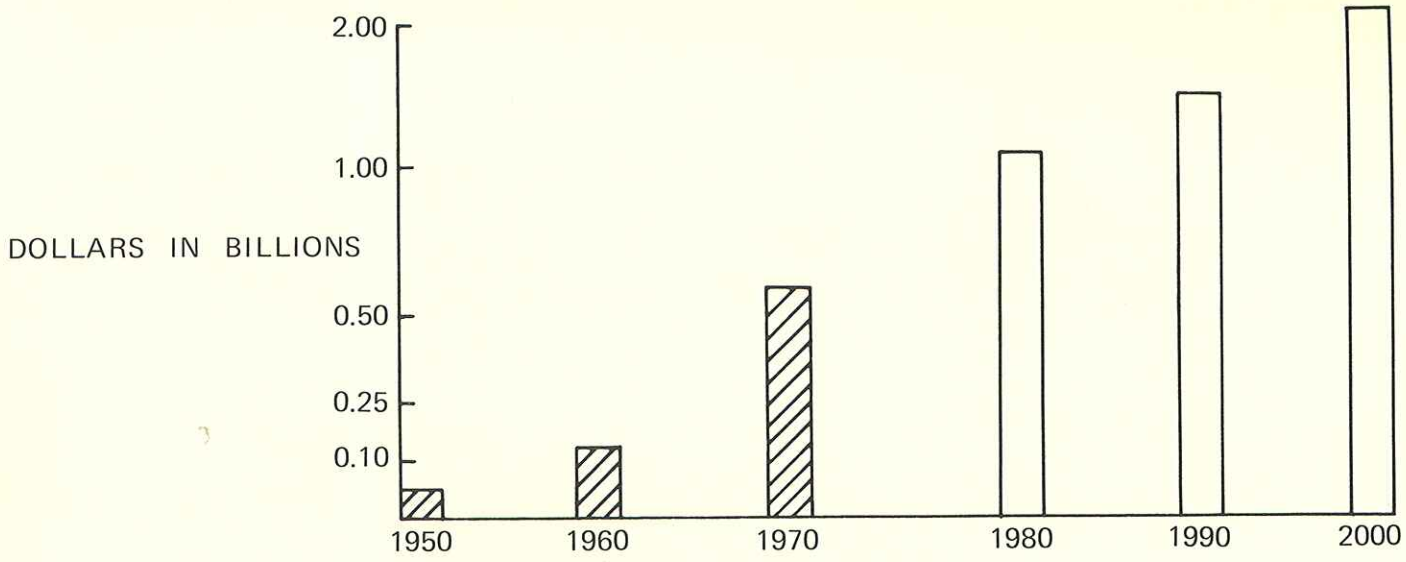
80% of the $75 million spent annually on seismic data processing is expended in Texas.

PROBLEMS

Determination of the "Fair Value" for an offshore lease.
Ambulatory status of the Texas coast line.
Poor public image concerning pollution.
The price structure of oil and gas.
Must find in the next 20 years at least three times as much oil and gas as has been found in the past 100 years.
Obtaining trained and experienced personnel to keep pace with the demand.
Vast areas of offshore Texas have not been penetrated by a drill.
Difficult to get data and information concerning offshore operations.
Safety for personnel is more difficult to provide in the ocean than it is on land.
Huge capital requirement and competition for exploration dollars.

In the sixties, the offshore industry grew to be the "glamour child" of the petroleum industry. As the sixties came to a close, this industry had matured to a "big growth industry," which has become exceedingly competitive, highly technical, and extremely expensive. The oil industry is now unlocking many doors that will enable man to explore and exploit the oceans for minerals, for food, for knowledge, and for pleasure.





GROWTH

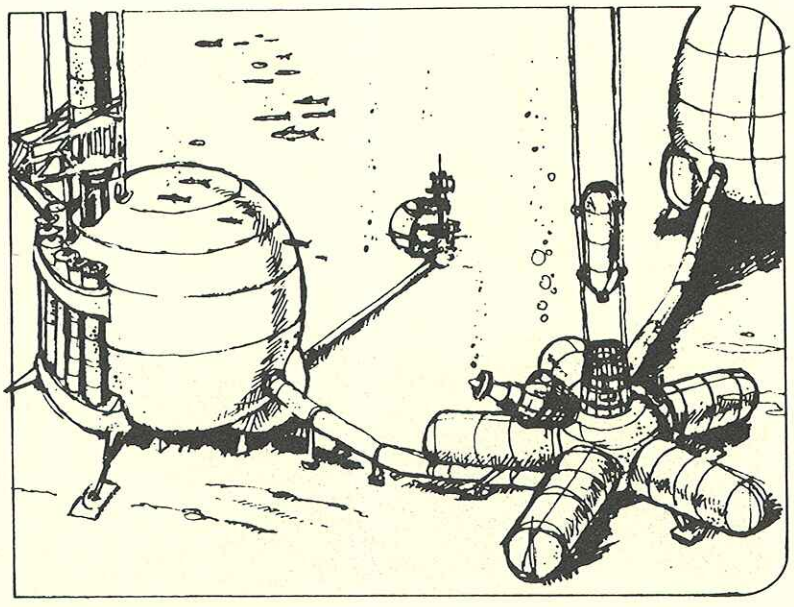
Offshore investment is growing at the rate of 18% annually. Investment offshore is currently 10 billion dollars annually, and is expected to about triple to 30 billion dollars or so by the end of the decade.

POTENTIAL

Economists are projecting nearly 100% increase in worldwide demand for oil and gas by 1980. To meet this demand, oil and gas produced from offshore wells will quadruple from the already sizeable present level.

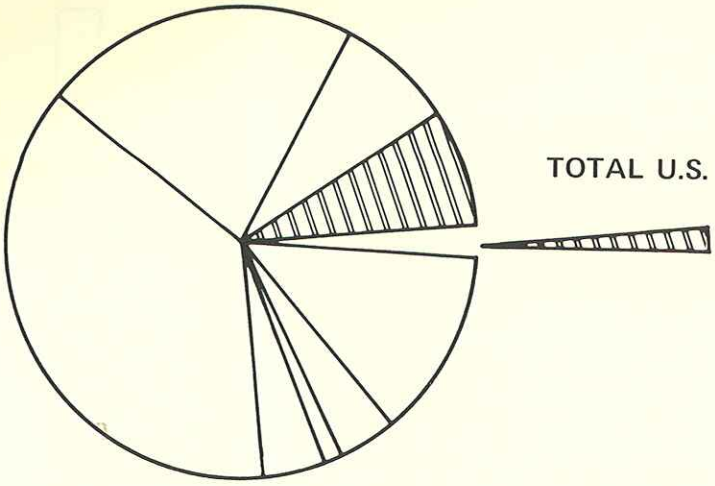
REQUIREMENTS

Laws and regulations should be periodically updated as technological advances occur.
An increase in both volume and accuracy of environmental data, particularly in deeper Gulf water.
Highly skilled technicians, ocean-oriented engineers, and well trained, ordinary mechanics.
A more equitable application of the Ad Valorem Tax Law to offshore mobile drilling units.
State support in correcting the mistaken image of the oil and gas industry today.
Future development of regulations should be maintained under a single agency rather than the diffused sources of authority which exist at present.
One central state authority should have an accurate and up to date map of all offshore oil and gas exploration, production, and collection facilities.
Consideration should be given to the standardization of nomenclature between industry for the geographical location of offshore oil and gas facilities.
A more orderly timetable and longer lead time on lease sales, by both the State and Federal Government, would aid the petroleum industry budget planning.



Serious research and development work is being done to place completion, production, processing, and maintenance of offshore oil and gas wells on the ocean floor, out of the reach of severe weather.

OCEAN CONSTRUCTION INDUSTRY



TOTAL U.S. MARKET FOR OCEAN CONSTRUCTION INDUSTRY
$3.9 Billion

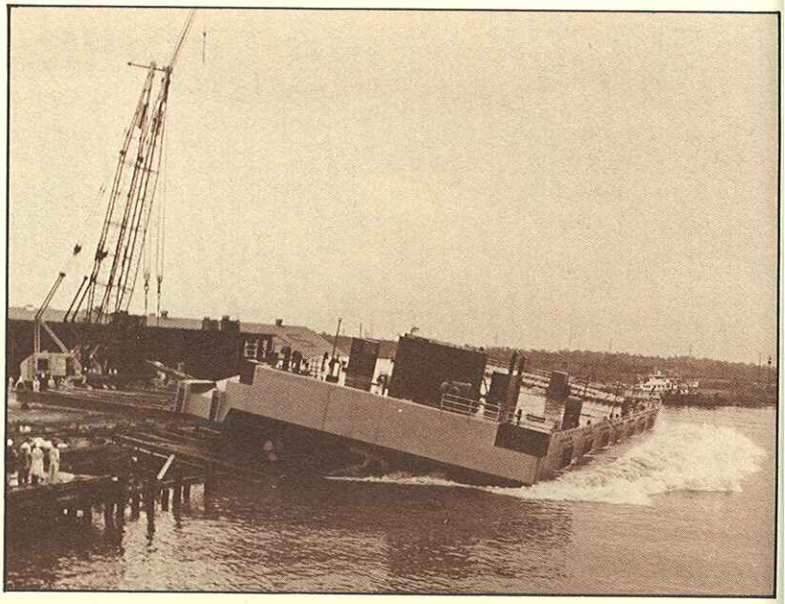
TEXAS' SHARE OF MARKET

$790 Million

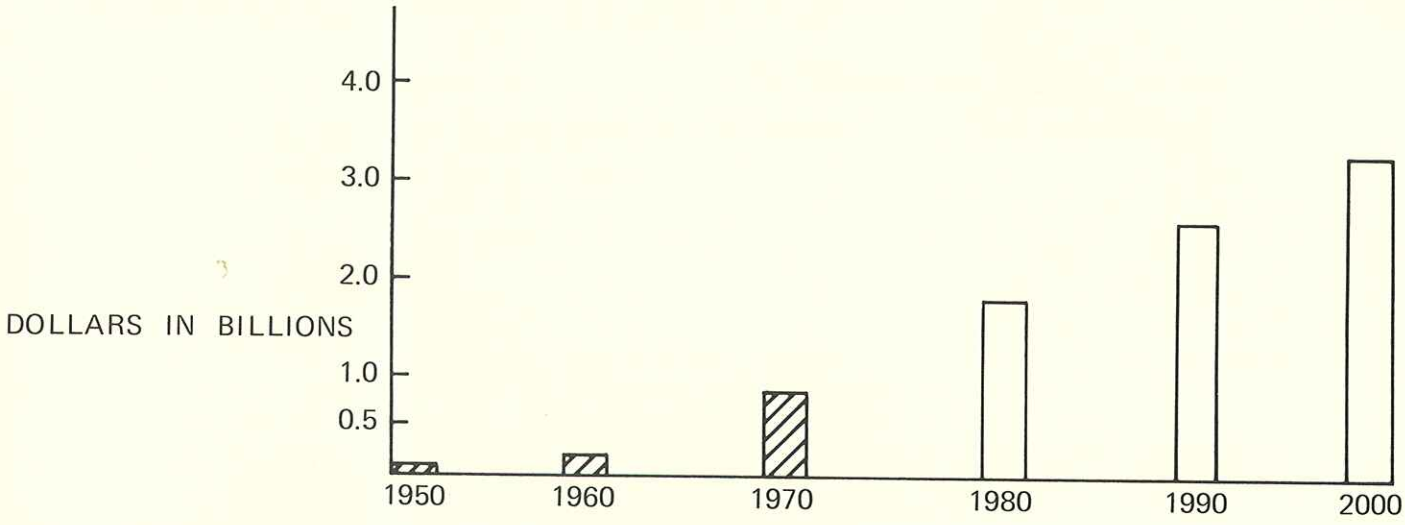
Texas' 1968 lease sale totaled $593,900,000.
Offshore construction companies invest $20-$30 million in Texas each year on plant and equipment.
20,000 jobs provided in Texas by total industry, not including suppliers.
$400 million in revenue to Texas offshore construction companies annually, worldwide.
$100-$200 million in revenue to Texas shipyards annually.
$85 million in annual revenue to the Texas service and supplier companies of other ocean construction industries.
$40-$50 million in revenue to the Texas inshore construction industry annually.

PROBLEMS

Possibility of additional taxes on shipbuilding and ship repair industry.
Lack of deep harbors and waterways.
No model basin test facilities.
Lack of agency for coordinating inland, marine, offshore and shoreline improvements projects.
Possibility of new bridge construction limiting access to inland shipyards and fabrication facilities.
Little or no defense for the oil industry on offshore pollution issue by Texas politicians.
Lack of detailed survey of all offshore underwater structures and pipelines.
Foreign competition in the shipbuilding and marine industry.



Texas shipyards specialize in both the fabrication of new offshore work vessels, construction barges and drilling rigs as well as the repair of existing marine equipment. Typical of the fabrication work is this new barge which will be utilized in the laying of submarine pipe in the Gulf of Mexico.



GROWTH

Total market expected to increase between 6% and 10% annually.

POTENTIAL

Regular and prospective shipbuilding markets for American shipyards and American ship component manufacturers over the next 10 years are estimated to approximate $50 billion.

Only 5% of the available federal offshore leases in Texas are currently leased.

REQUIREMENTS

Legislative support of Civil Works programs of the Corp of Engineers for improving Texas harbors and channels.

An objective approach to how little damage to marine life is actually done by oil pollution.

Legislative support for establishing new technical secondary and vocational schools.

Establishment of a state Coastal Management Agency.

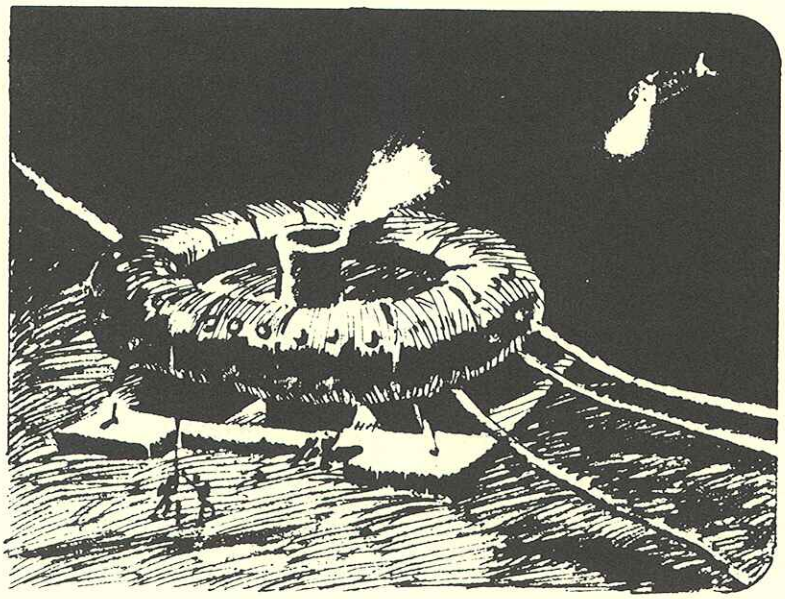
Maintenance of current tax levels for ocean construction industries.

Maintenance of current access to inland waterways.

State funds for offshore archaeological explorations.

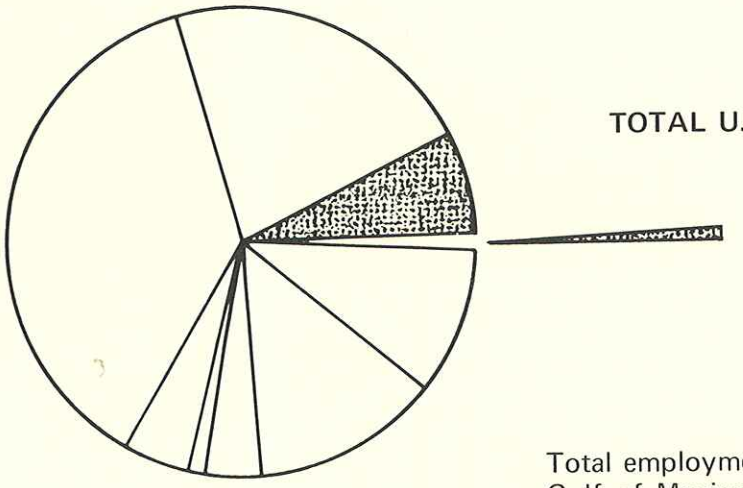
Support for legislation calling for building additional ships for the Coast Guard, Navy, and Merchant Marine.

Establishment of a model test facility at a Texas university.



As offshore exploration continues in ever-increasing depths, future structures may resemble this artist's conception of a submerged platform designed for 600-foot water depths. Texas-based companies will actively participate in the design, fabrication and installation of all types of offshore exploration and production facilities.

FISHERIES AND MARICULTURE INDUSTRY



TOTAL U.S. MARKET FOR FISH AND FISH PRODUCTS

$3.1 Billion

TEXAS' SHARE OF MARKET

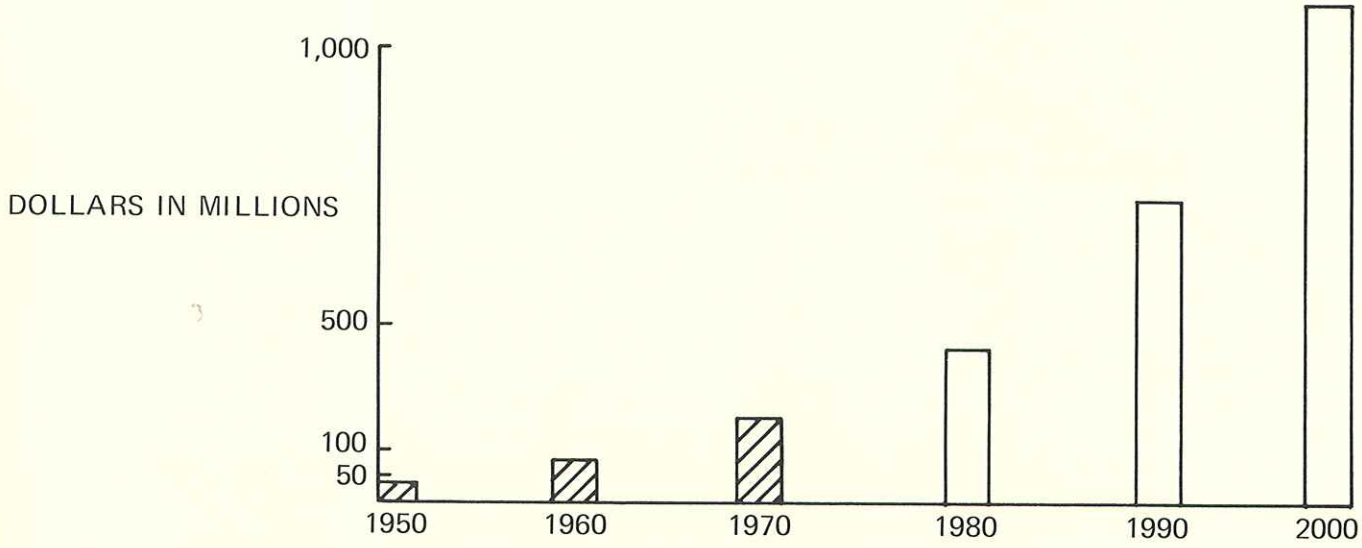
$220 Million

Total employment in excess of 15,000.
Gulf of Mexico produces 1/3 of U.S. landings of 4.2 billion pounds.
Potential of Gulf estimated at 14 times current landings.
Shrimp lead all other species in value nationally ($123 million) and represent 24% of value of all U.S. landings.
Texas leads all other states in shrimp production.
"Food-From-The-Sea" will be of critical importance to the Nation for its future food and protein requirements.

PROBLEMS

Premature or misleading publication of contamination cases.
Public uninformed about seafood nutrition and preparation.
Environmental degradation of estuarine nursery areas and poor enforcement of conservation regulations.
Conflicts between commercial fishermen and sportsmen.
Lack of trained manpower for vessels and equipment and need for extension services.
Lack of fishing compacts with neighboring states and fishery jurisdiction on the high seas.
Full potential of Gulf of Mexico hardly exploited.
Regulation of resource by act of Legislature.
Lack of sufficient basic and applied research.
Harvesting methods obsolescent and inefficient.
Fleet insurance inadequate and expensive.
Illegal sale of shrimp by crews.

The design of equipment presently used to harvest shrimp from inshore and offshore waters is similar except that offshore boats and the nets used are larger. A typical offshore trawler ranges in size from 55 to 70 feet in length, with a few as long as 75 to 80 feet or more. Two nets, usually made of synthetic twine, are fished simultaneously from booms. Here, a typical trawler is being unloaded, and the shrimp are being transferred to the processing plant on a conveyor.



GROWTH

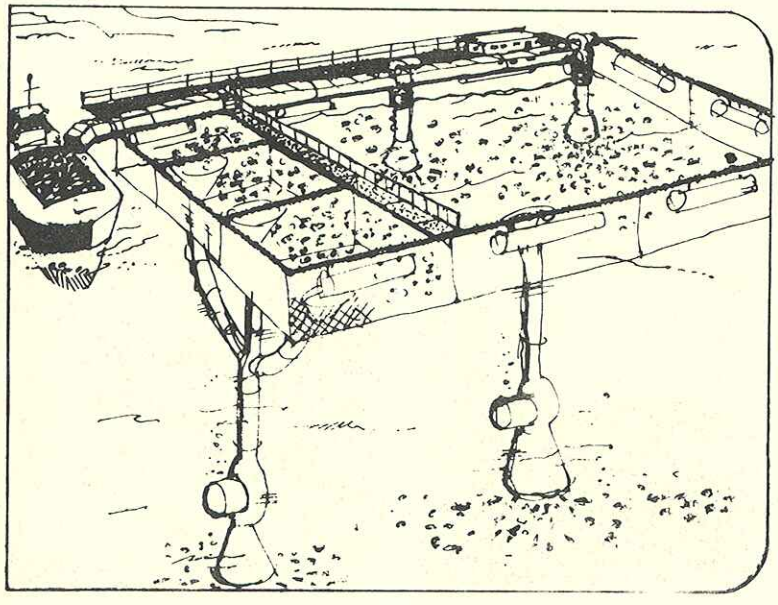
Total market expected to double every ten years

POTENTIAL

World population growth will require Food-From-The-Sea.
U.S. market will continue fantastic growth of recent years.
Emerging nations are virgin markets for seafoods.

REQUIREMENTS

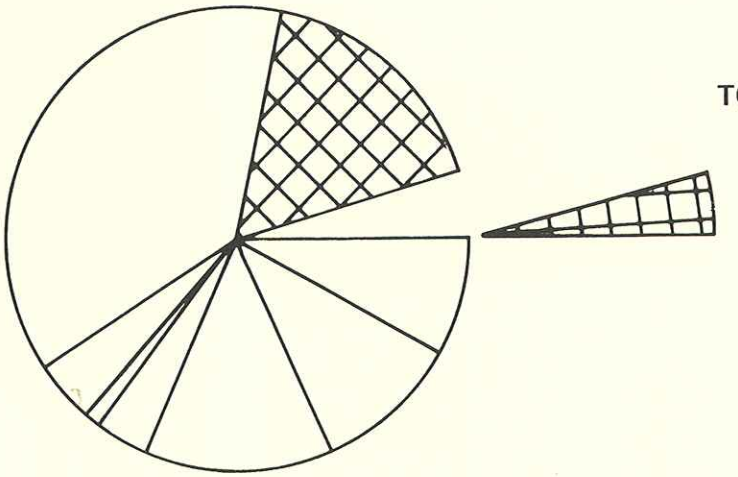
Coordinate management of the resource with neighboring states, and enforce management regulations.
Place resource management (conservation) with professionals.
Evolve state programs to develop fish resources fully.
Preserve living marine resources for future food needs.
Restore and preserve a healthy estuarine environment.
Protect the fleet's interests on the high seas.
Continue and intensify basic and applied research.
Provide insurance coverage and trained manpower.
Offer extension services to boats and plants.



Develop new concepts in harvesting methods.
Product development for unutilized species.

Shrimp farming may be one way in which shrimp production can be increased in the U.S. This artist's conception portrays the biologist's concept of a future shrimp farming operation. Shrimp grown from eggs to postlarvae in a hatchery may be reared in ponds to sizes suitable for bait for sports fishermen, for marketing for human consumption, and for seeding wild populations in estuaries.

TRANSPORTATION INDUSTRY



TOTAL U.S. MARKET FOR TRANSPORTATION

$8.6 Billion

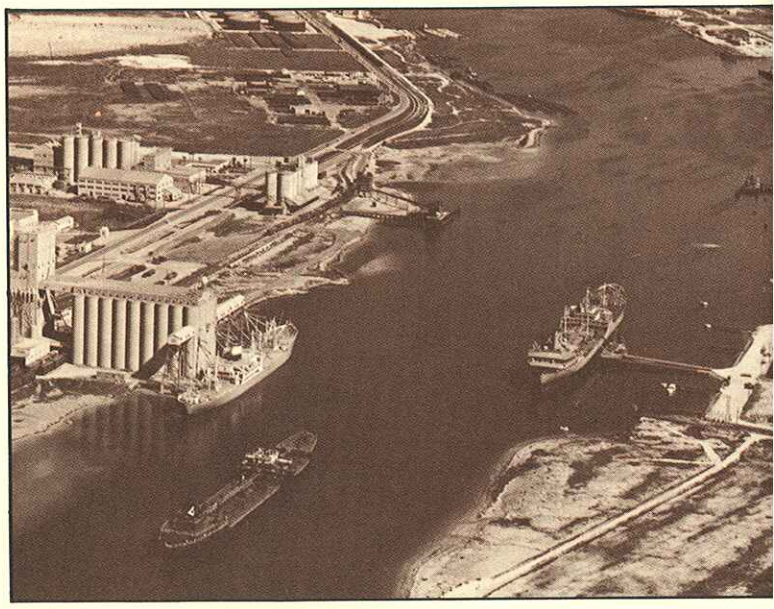
TEXAS' SHARE OF MARKET

$1.7 Billion

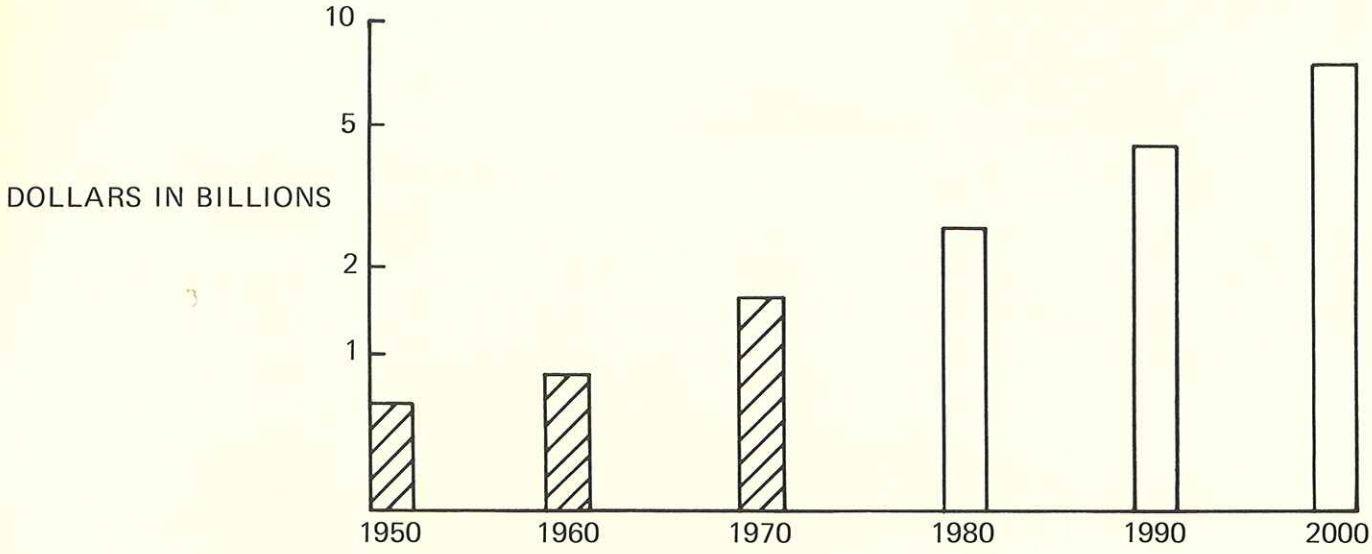
Texas has 12 deep-water ports.
More than 5% of all American manufactured goods is shipped through Texas ports.
Each ton of cargo generates between $4.50-$18.50 for the port's economy.
30,000 employees
185 million tons of cargo moved through Texas ports last year.

PROBLEMS

Lack of communications between industry and federal, state, and local government in the interpretation of existing laws and regulations.
Lack of an adequate licensing system for waterways operators and crews.
Lack of properly trained crews on intercoastal waterways.
Pollution problems.
Lack of skilled labor in shipbuilding and repair industries.
Fragmentation of jurisdiction in state and federal regulatory agencies.
Access to inland waters often limited by bridges.



Vast quantities of manufactured goods and raw materials pass through Texas ports and waterways continually supplying the major markets of the world.



GROWTH

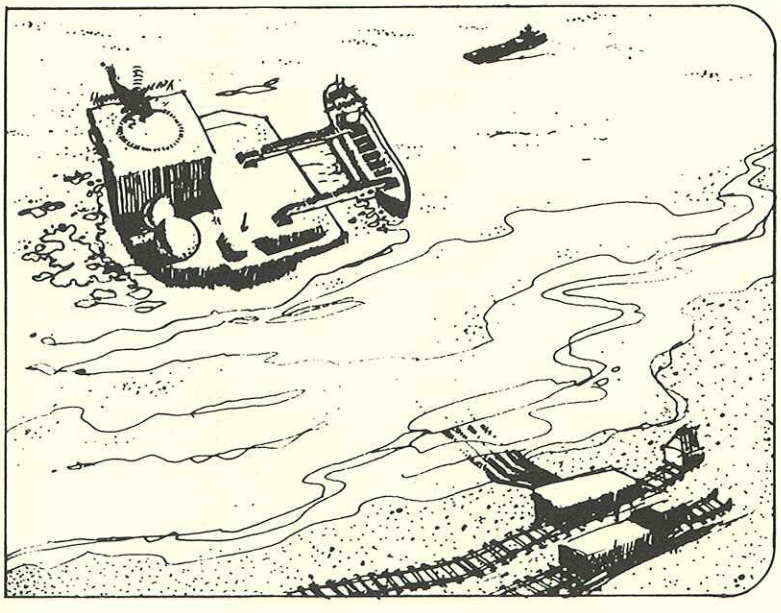
Average annual growth is expected to be 7%.

POTENTIAL

$50 billion U.S. market for shipyards and ship components in the next decade.
35% increase in waterborne commerce by 2020.

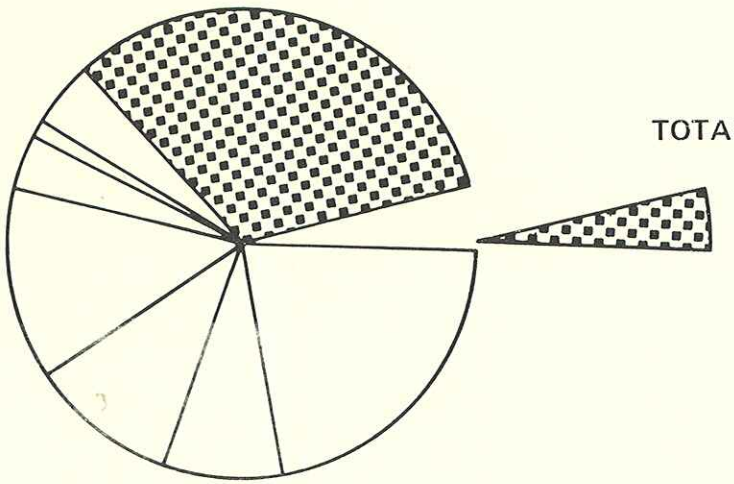
REQUIREMENTS

New deep-water channels, harbors and waterways to accommodate deep-draft super tankers.
A focal point in state government that is responsive to the needs of the industry.
Long range planning for development of intercoastal waterways on a statewide basis.
Non-polluting spoil disposal areas.
Equitable freight rates for different commodities.
Mutually beneficial resolution of labor problems.
Revitalization of shipbuilding industry.
Increased education and training facilities for maritime activities.



With the advent of giant container ships and deep-draft super tankers, new offshore cargo handling facilities will be constructed to accommodate the greatly expanded harbor development requirements.

TOURISM AND RECREATION



TOTAL U.S. MARKET FOR TOURISM AND RECREATION

$14.5 Billion

TEXAS' SHARE OF MARKET

$1.6 Billion

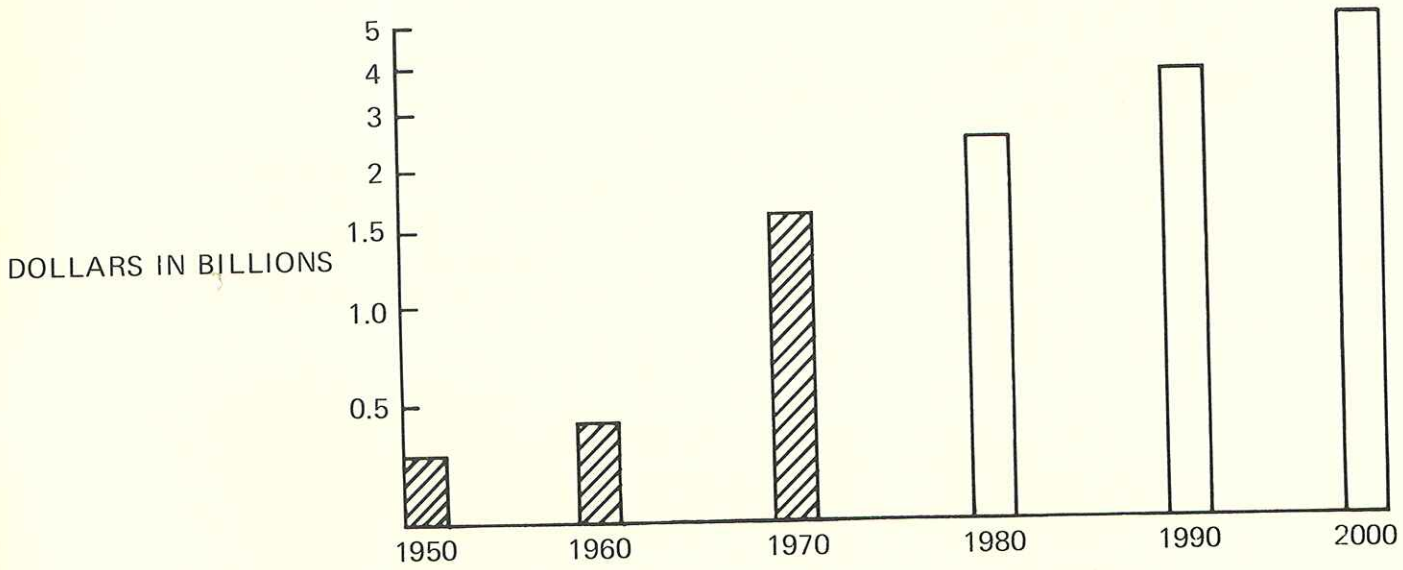
State expenditure for tourism promotion – $1.2 million.
Taxes paid by out-of-state visitors in 1969 – $141 million.
Return on investment to state – $118 to $1.
Tourist dollar "turns over" 7 times in a community.
22,307,000 out-of-state tourists in 1969.
$1.6 billion spent by visitors.
Benefits to industry – approximately 240,000 jobs.
- $407 million – motel and hotel industry.
- $407 million – food and drink industry.
- $329 million – gas, oil and auto industry.
- $188 million – entertainment and recreation.
- $235 million – retail stores – clothing, gifts, services.

1964 – 1969 – number of tourists increased 58%.
1964 – 1969 – tourist spending increased 130%.

PROBLEMS

Difficulty in establishing property boundaries and ownership.
Conflicts between recreational and non-recreational users.
Unavailability of insurance for beach front areas.
Conflicts between developers and preservationists.
Lack of potable water in many coastal areas.
Poor image as a tourist attraction.
Insufficient parks and recreational areas.
Poor highway access to many coastal areas.
Excessive low quality development.
Conflicts of social goals.
Environmental pollution.

The approximately 1100 miles of the State's tidal coast line is generally undeveloped and not readily accessible except for isolated metropolitan areas. Warm Gulf waters, sandy beaches, favorable climate, an extensive variety of fish and wildlife, and a lack of commercial attractions characterize the area.



GROWTH

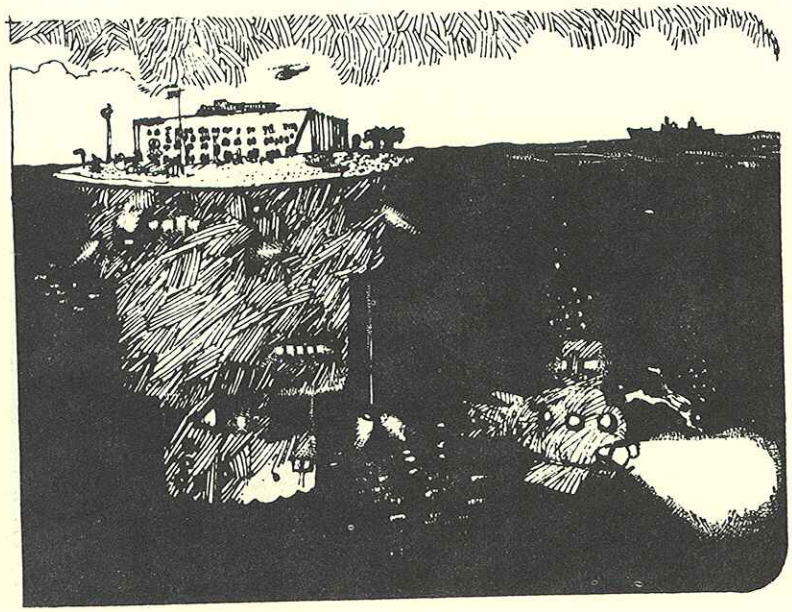
Total market expected to increase at a minimum of 5% annually.

POTENTIAL

Tourism along the Texas Coast may double each decade.

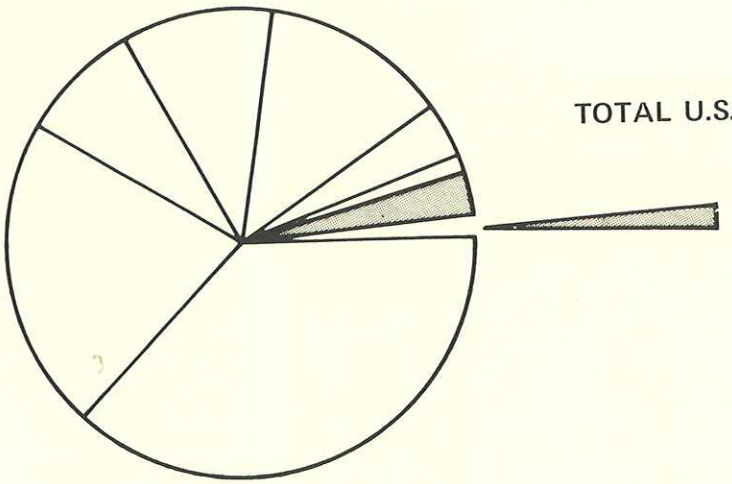
REQUIREMENTS

Protection of Coastal wildlife refuges from encroachment of commercial activities.
Evolve a State/Regional matching fund program for tourism development and promotion.
Development of natural advantages into balanced and specialized areas.
Attraction of large scale investment and development.
Regional land use management plans and enforcement.
Intelligent promotion of natural advantages.
Improve information and direction services.
Establish and enforce strict building codes.
Development of non-seasonal attractions.
Severe weather protection and environmental planning.



Well planned total development complexes offering a complete economic spectrum of tourist and recreational facilities, interspersed with nature and wildlife areas, will be developed in accordance with regional master plans.

WATERFRONT DEVELOPMENT INDUSTRY



TOTAL U.S. MARKET FOR WATERFRONT DEVELOPMENT

1.7 Billion
Capital Investment Per Year

TEXAS' SHARE OF MARKET

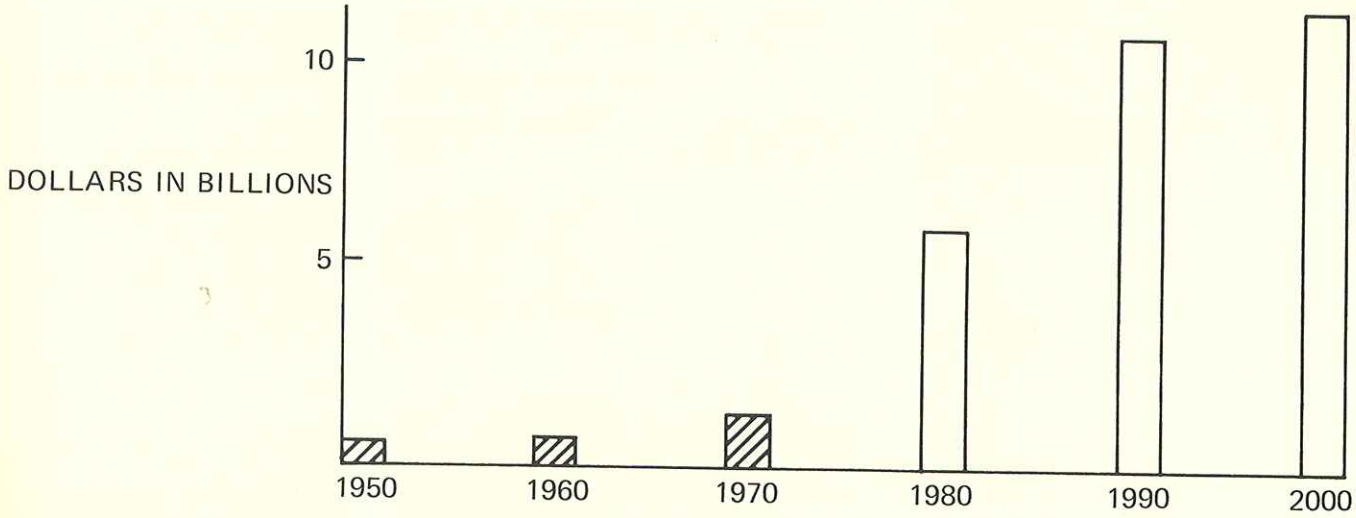
$500 Million
Capital Investment Per Year

$6 million per day into state economy
Capital investment of $500 million per year.

PROBLEMS

Insufficient knowledge concerning the effects of waterfront development upon the ecology of the developed area.
Progress in an area that is harmful to the ecology of other bays or estuaries.
Limited information on factors concerning engineering design of waterfront facilities.
Silt removal for water clarity at sea-oriented attractions.
Achieving a balance between conservation and economic programs.
Attracting industries which will abide by pollution laws.
No Federal or State laws regarding access and use of our beach areas.
Only 5% of Texas waterfront available for development.
Provincial attitude of local financial organizations.
Limited waterway access to and from Gulf.
Poor access to waterfront area.
Availability of potable water.
Limited waterway access to and from Gulf.
Poor airline service.

At present, waterfront development is only beginning to emerge along the Texas coastline. Waterfront development is limited to those areas with potable water supply.



GROWTH

Total market expected to increase approximately $500 million annually.

POTENTIAL

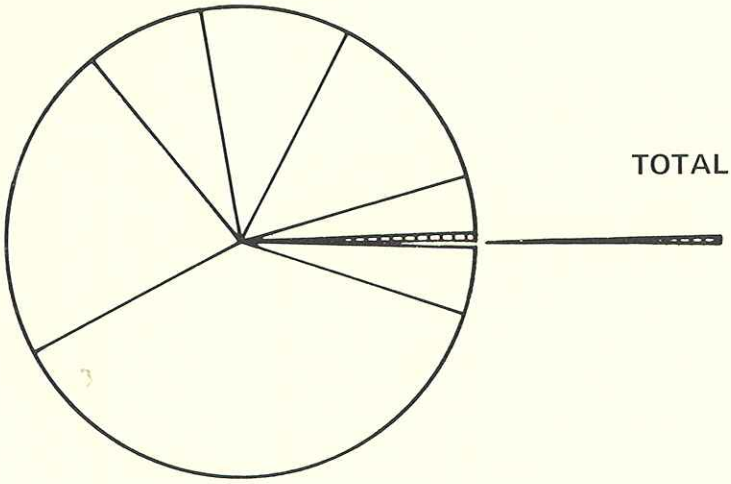
As many as 20 new cities with 40-50,000 people each.
20,000 new hotel rooms.
Growth and development of ocean-oriented attractions are only limited by one's imagination.

REQUIREMENTS

A state agency to control architecture and enforce building codes for purpose of reducing hurricane and flood insurance.
Establish an Institute of Oceanography at an existing university for dissemination of engineering and scientific information.
Establish a State authority that would regulate, zone and enforce control over private and public use of our marine resources.
Establish an Environmental Control Commission.
Establish parks while land is still available.
Protect nesting sites while we can.
Protect oyster reefs while we can.

With the assurance of a good water supply and indicated improvements being made in the highway system, it is anticipated that by 1980, water-front development of the area will appear as shown.

CHEMICALS AND MINERALS INDUSTRY



TOTAL U.S. MARKET FOR CHEMICALS AND MINERALS

$400 Million

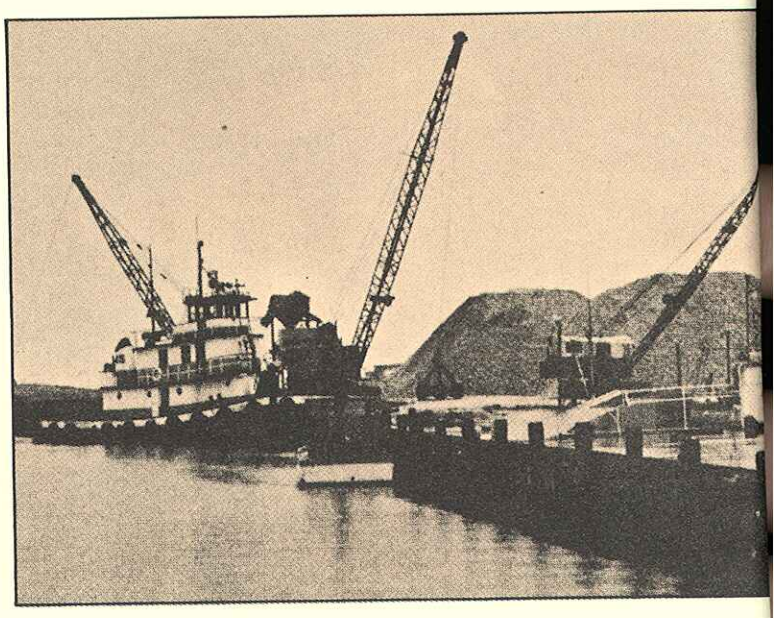
TEXAS' SHARE OF MARKET

$111 Million

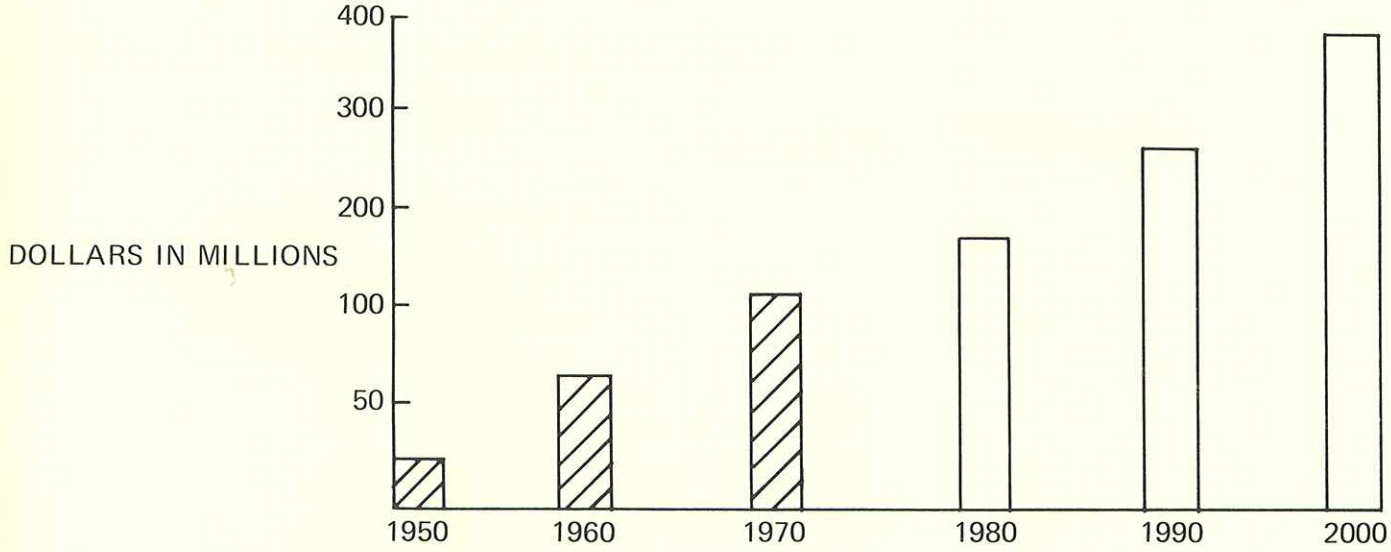
The economy of many areas along the Texas coast are very closely tied to the minerals industry. As advances in mineral extraction technology occur, numerous new jobs will be created resulting in higher standards of living for the citizens of Texas.

PROBLEMS

Conflicts between mineral producers' and recreational-preservationists' interests.
Environmental pollution.
Lack of coordination between state agencies and shell producers.
Economics of basic exploration in virgin areas.
Economics of state versus local supply-demand for aggregates.
Transportation and weather factors of continental shelf operations as compared to shallow-water bays and estuaries.
Unclear delineation of legal jurisdiction.
High risks and costs of bringing a prospect into production.
Legal questions arising when operating in international waters.



Dredging in Texas bays and estuaries has developed into a major coastal industry supplying raw material for numerous construction industries and industrial processes.



GROWTH

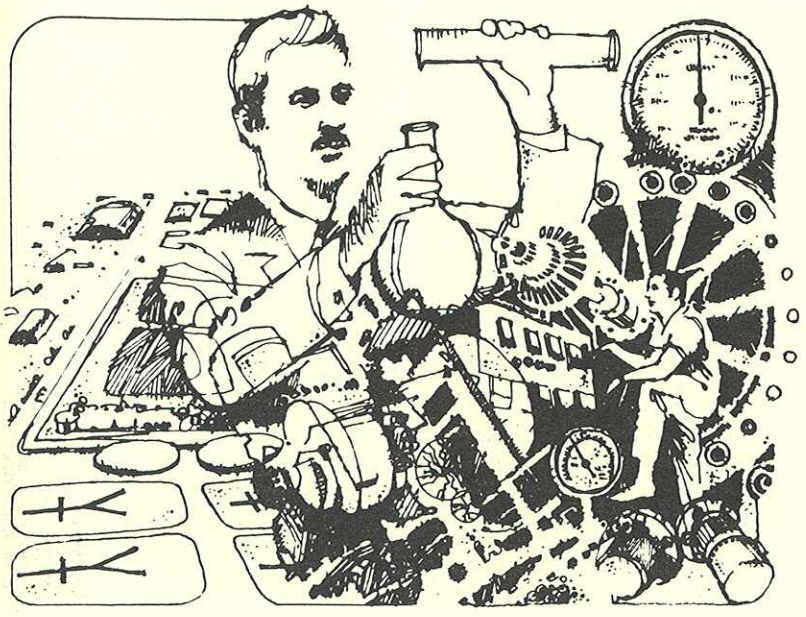
Total market expected to grow at 5-6% annually

POTENTIAL

The accelerating demand for minerals resulting from an expanding population and a depletion of terrestrial sources will cause a significant increase in the exploitation of marine minerals.

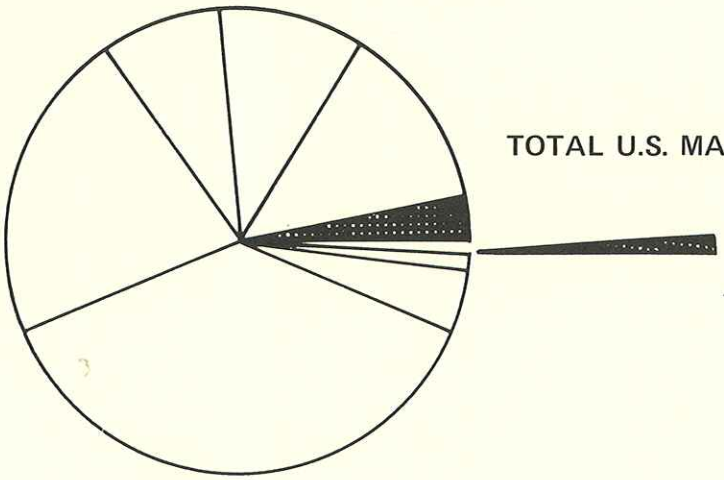
REQUIREMENTS

Geophysical and geologic charting and bathymetry specifically for industry needs.
State cooperative programs under State Agency supervision.
Improve techniques for exploration, including seismic profiling, coring, measuring and sampling.
Improve recovery and extractive technology.
Improve weather and environmental forecasting.
Improve data correlation and distribution between industry and State agencies.
Leasing legislation that is truly reflective of a committment to promote ocean mining.
High production levels to compensate for the low value of some products.
Fair and equatable international laws for mining deep-sea deposits.
Basic scientific and engineering knowledge of the marine environment.
Non-polluting waste disposal techniques.



As conventional sources of minerals are depleted, vast industrial complexes will be developed along our coasts to extract minerals from sea water and supply fresh water to an expanding population.

HIGH TECHNOLOGY INDUSTRY



TOTAL U.S. MARKET FOR HIGH TECHNOLOGY INDUSTRY

$1.5 Billion

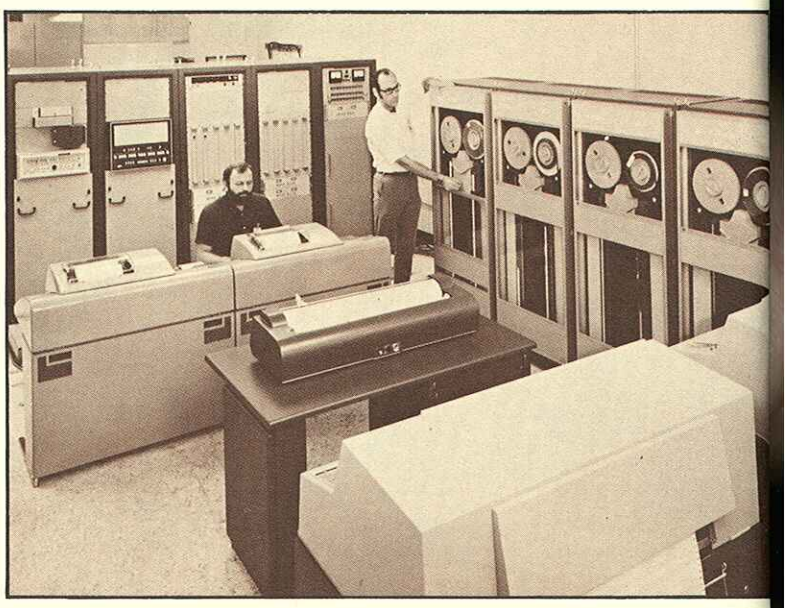
TEXAS' SHARE OF MARKET

$250 Million

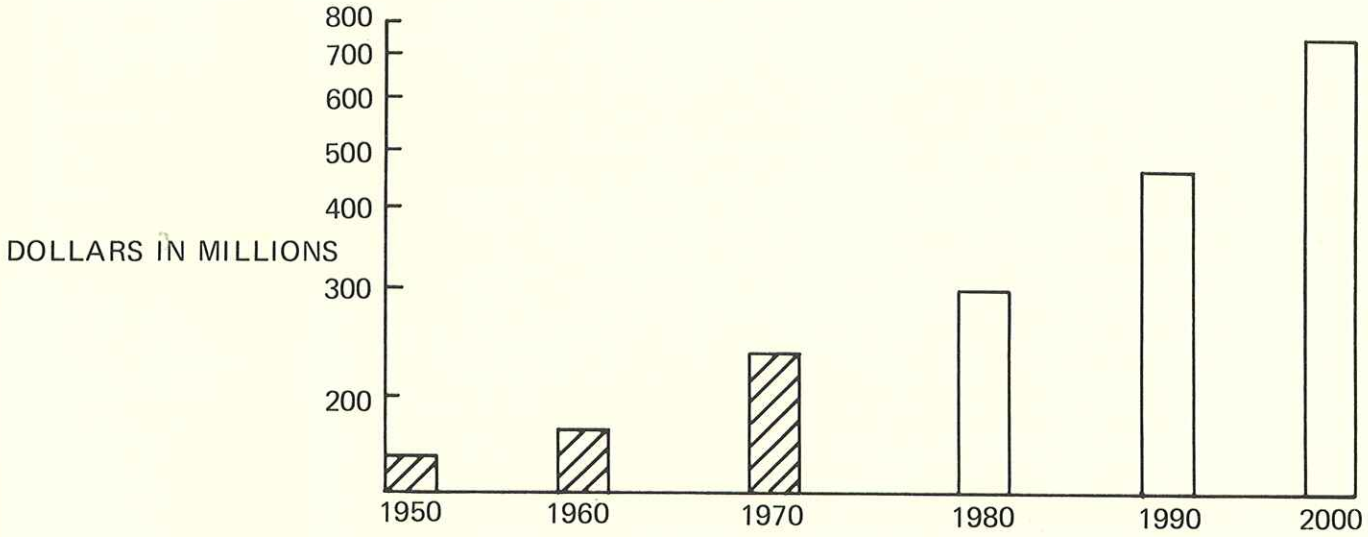
The economic growth in the state is closely tied to the increase in business activity. The high technology industry is composed of many segments of the industrial business community; shipbuilding, communications, geophysical prospecting, electronics, instrumentation, and oceanographic services. A substantial proportion of high technology business is derived from defense related spending which is expected to remain significant.

PROBLEMS

Insufficient number of trained marine technicians.
Insufficient number of naval architects.
Inadequate funding of marine research and development.
Lack of ship model test facilities within the state.
Lack of qualified water quality analysts.
Lack of minimum design codes for coastal and offshore structures.



Computers are increasingly being used aboard vessels. They greatly facilitate oceanographic data collection and processing at sea; they are used in satellite navigation for vessels; and they monitor the ship's engine operations. The computer system shown has recently been installed aboard a government research vessel and is a complete central data processing unit.



GROWTH

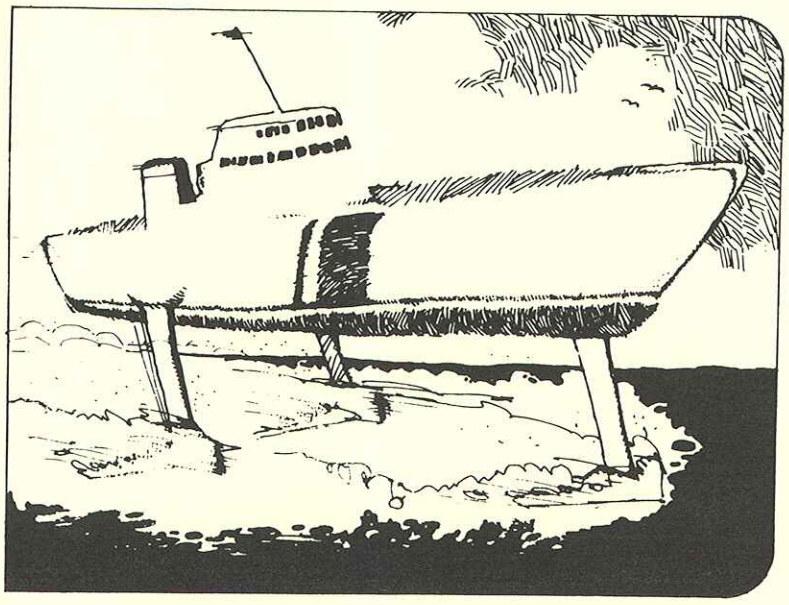
Total market expected to grow at 5-8% annually.

POTENTIAL

Investment in offshore operations growing at an annual rate of 18%.

REQUIREMENTS

A definitive set of goals for marine resource development.
Increased leasing of offshore minerals.
Establishment of a State oceanographic information facility.
Improved education and certification of technicians.
Establish base line data for future environmental studies.
Comprehensive but flexible guidelines for marine resources development.
Higher educational programs stressing practical rather than classical problems.



The development of hydrofoil vessels will significantly increase speed over the water. The design shown has a top speed of 50 knots. This compares with 20 knots or less on today's ocean going vessels.

RECOMMENDATIONS

Recommendations for State action were made during the process of obtaining the views of ocean-related industry in Texas. As might be expected, they varied considerably in content and scope. However, a pattern can be discerned and an attempt is made here to categorize the recommendations and give specific examples.

Overall, the study indicated a multi-purpose usage by industry of a relatively unexploited natural resource — *The Texas coastal zone.* By the example of states which are more advanced in their development of marine resources, Texas has a unique opportunity to either develop this resource in a way that will benefit many people, or develop it poorly and suffer the consequences. Therefore, *as a general recommendation, one of several well-established research organizations, who have done similar successful studies for other states, should be commissioned to prepare a coastal zone management plan for the State of Texas.*

Other recommendations are as follows:

● *An entity of State government should be established to initiate, coordinate and, where necessary, regulate matters concerning the Texas coastal zone. Included in its responsibilities would be long-range planning, administration of executive and legislative authority, and ensuring cooperation between Federal, State and local government.*

SPECIFIC EXAMPLES:

- A single focal point in State government for all marine resource related development with power to study, plan, coordinate, and manage should be established.
- Property ownership and boundaries should be clarified in ocean frontage areas affected by daily tidal flow with regard to beachfront development, apportionment of accretion, control over use of groins and jetties, and delineation of public beach areas.
- Adequate building codes should be established on a regional basis, particularly for coastal and marine structures.
- A complete inventory of the chemical, physical, and biological properties of state waters should be performed to provide a background upon which to base water quality standards and future pollution control legislation.
- Broad scale planning of general land usage with appropriate zoning and restrictions should be instituted to insure optimum development.

● *Steps should be taken to provide industry, the chief user of coastal zone natural resources, with a more favorable business climate, thus ensuring participation of desirable types of industry development. Implicit in this recommendation is the development of knowledge about the environmental effects of multi-purpose resource usage. Elements of creating a better business climate are: (1) study and dissemination of knowledge of the environment, (2) implementation of measures to assure compatibility of industry interests and ecological requirements, and (3) education of the public and the business community about these measures.*

SPECIFIC EXAMPLES:

- A mechanism should be established by the state for the leasing of state owned bay and estuarine areas for mariculture purposes.
- Future taxes on capital equipment for use in the marine environment should not place Texas industry in an uncompetitive position with out-of-state industry.
- A system should be established for the timely dissemination and exchange of environmental data between government, academic, and industrial users to provide a bridge between exploration and development.
- State regulated risk pools and better education of the insurance industry as to actual risks are needed to increase available coverage in areas subject to severe weather.
- Provisions in the operating procedures of the various state agencies should be established for systematically updating rules and regulations as technological advances occur.

● *State-supported education institutions at all levels should be responsive to the needs of the developing marine industry. A few specific needs can be defined now, but any major changes in institutions or programs should come only after further study of future marine resource development. It is clear, however, that marine industry, as well as other types of industry, will benefit from continuation of the high-quality academic programs relating to marine science, engineering, and technology already in existence in our state colleges and universities.*

SPECIFIC EXAMPLES:

- State supported educational programs should place more emphasis on practical rather than classical problems in oceanographic research and training.

- Technician training programs should be established by the state, commensurate with job opportunities, in both oceanographic and basic technical skills on various levels.

- A broad educational information program in marine sciences should be instituted on secondary and elementary school levels.

INDUSTRY ADVISORY GROUP

Mr. Richard Adams
Texas Instruments, Inc.
Dallas, Texas

Mr. Ralph Anselmi
Todd Shipyards Corp.
Galveston, Texas

Mr. John R. Blocker (Vice Chairman)
Dresser Industries, Inc.
Houston, Texas

Dr. F. W. Fenter (Chairman)
Ling-Temco-Vought, Inc.
Dallas, Texas

Dr. James L. Harding
Oceanonics, Inc.
Houston, Texas

Mr. Homer C. Innis
Lockwood, Andrews and Newnam, Inc.
Corpus Christi, Texas

Mr. John G. Mackin, Jr.
Fluor Ocean Services, Inc.
Houston, Texas

Mr. Ben Marks
Padre Island Investment Corp.
Corpus Christi, Texas

Mr. John A. Mehos
Liberty Corp.
Galveston, Texas

Mr. Bill R. Morrow
Republic National Bank
Dallas, Texas

Mr. William C. Price
Central Power and Light Company
Corpus Christi, Texas

Mr. E. E. Sands
Union Oil of California
Houston, Texas

Mr. William H. Tabb
Mobil Oil Corp.
Dallas, Texas

Mr. Dow Wynn
Port of Port Arthur
Port Arthur, Texas