Along with many changes that are taking place in the various fields of industrial development, what about the increasing confrontations with complex economic, political and environmental changes occurring with respect to coastal and offshore areas? The energy crisis alone raises serious questions which are of vital concern to these disciplines. New demands for maintaining and improving the quality of the coastal environment are raising perplexing questions for science and technology. Indeed, the exploitation of coastal resources poses problems of tremendous significance. In developing nations, the conflict between industrialization and urbanization on the one hand and ecological understanding and developmental restraint on the other is fairly well defined where land and water meet at the edge of the sea. There is certainly a need to keep in balance the requirements of the economy and the imperatives of the ecology. This paper reviews some of the exploitation threats by private enterprise and raises the challenge of a widening concern for solutions to these questions.

**ABSTRACT**

The possible environmental changes are tremendous. When we talk of such advances as offshore oil ports, nuclear power plants, oil drilling platforms, and related water transportation, we again see the importance of the knowledge that is gained through engineering efforts. What humans do to the seacosts may become as important as what nature does. This means new dimensions of measurement, new and sophisticated equipment, new methods of data analysis and interpretation. The physicist, the chemist, the biologist and the engineer -- even the economist and political scientist -- must join forces across disciplinary lines, across organizational lines, across geographical boundaries -- united around the world -- to better understand the oceans.

**COMPLEX DEMANDS, GROWTH AND PLANNING**

The contention here is that for coastal areas to make progress there must be an appreciation of the tremendous complexity and significance of the area in which we are bringing our expertise to bear. It has been said that the principal issue permeating the coastal and offshore zones is to provide for many diverse and conflicting demands and still obtain the greatest long-term social and economic benefits. How do we work toward the solution of this principal issue? Several approaches have been evolving: On the one hand, the "slow down" philosophy contends that industrial progress should be curtailed or stopped. This may be all right in certain situations but generally, growth must be promoted rather than hampered. The approach gaining rapid acceptance is that of coordinated planning, but the details of who does the planning may be troublesome. Should it be only National government? Where does the United Nations organization fit in, particularly with respect to international waters where "law of the Sea" problems are arising?

**ECOLOGICAL AND SOCIO-ECONOMIC CONSIDERATIONS: COASTS OF THE AMERICAS**

Whether we look at the problems of planning and development off the coasts of the Americas or in innumerable other regions of the world, we are confronted with the reality that (1) control of
ecological and physical disturbances and (2) design of the environment are key elements of economic development and planning. Most engineers, by the very nature of their concentration of efforts, have failed to effect a systematic, coordinated presentation of their diverse findings within the highly interrelated ecosystem. Therefore, a pertinent objective is to encourage planners and environmental analysts to become more aware of the intricate interrelationships between the economy and the ecosystem, and between economic development and environmental management. However, it is not necessary to make an either/or choice between nature and progress. Each individual is a part of the ecological system. We must appreciate the fact that our offshore operations are becoming increasingly valuable, there is considerable uncertainty as to how fast can private enterprise go and what are the obstacles being encountered? (2) Should the public interest require that public programs support some private undertakings? (3) What kinds of government programs would be most effective?

The field of ocean engineering provides some answers to the scientific and technical aspects of coastal, offshore, continental shelf and deep ocean resource development. In support of this physical developments, socio-economic studies such as the following need to be made: (1) The development and growth of coastal lands and marine-oriented industries. (2) Studies dealing with the efficient use of ocean resources. (3) Studies of the efficient allocation of scarce public funds for marine programs and projects. 

OBSTACLES TO EXPLOITATION BY PRIVATE ENTERPRISE

Although marine research is experiencing modest growth, the immediate outlook has been enhanced by the energy crisis. Despite the efforts going forward, all of this is still on a very small scale in contrast with the immense task, and compared with other programs, which, in the long run may be less promising. One might well question why industry has not made greater investments in coastal and off-shore exploitation, and why those who have made some research expenditures have not developed them into commercially successful processes. What then are the obstacles which prevent rapid development of coastal and off-shore resources?

1. Although it is well agreed that coastal and off-shore resources are becoming increasingly valuable, there is considerable uncertainty as to when this will actually happen for various products.

2. From an industry standpoint, some hesitancy results because of the possibility that one firm may develop better technology before the original innovation is put to actual use.

3. Much of the necessary coastal and off-shore research is such that the whole industry may benefit from the research being carried out by a single company.

4. One of the greater deterrents to seabed exploration is the question of international jurisdiction in areas beyond our territorial limits. As mentioned above, great importance is
attached to the United Nations Law of the Sea

5. There is hesitation by the financial
community to make loans available for coastal and
off-shore resource development even where early
pay-off seems possible. However, this is more
true with smaller companies than large corpora-
tions which are more able to reinvest profits
derived from other activities such as in petrole-
um development, or electronics fields.

6. The outlook of the national program of
coastal and off-shore science and technology is
uncertain.

7. There is always the possibility that alter-
native inland resources will be developed in such
a way that this would deter coastal developments.
2/, 6/

ENCOURAGEMENT OF COASTAL EXPLOITATION
THROUGH GOVERNMENT MEASURES

Exploitation of coastal and off-shore areas, as
exploration of space, requires innovations in
managerial methods and government-business re-
lations and in international cooperation. One
of the objectives of a coastal program, accord-
ing to the Coastal Zone Management Act of 1972
(16 U.S.C. 1453) is "to preserve, protect,
develop, and, where possible, to restore or en-
hance, the resources of the Nation's coastal
zone for this and succeeding generations . . ." Although this implies a preference for private
activities, nevertheless, there are functions
that can best be performed by direct Government
operations. These activities are summarized here:

1. There are basic needs such as mapping the
coastal zones and ocean floors, studying charac-
teristics of these areas, and surveying their
potential resources which are a prerequisite for
a step-up of private activities. Such activities
are now carried out by Government and private
(mostly nonprofit) research organizations on a
small scale. Research into the potentially un-
desirable effects of coastal exploitation and
other activities in these areas is a matter of
some urgency. Included are such concerns as
thermal pollution from nuclear or fossil fuel
power plants, the concentrated bitterns of desal-
nation plants, and numerous other forms of solid
and liquid industrial and urban waste pollution.

2. There is a need for training of scientists
and engineers in coastal and off-shore activities.

3. There is the need for developing the infra-
structure for a more rapid development in oceanics,
including an advanced weather service. (Here,
cooperation is taking place between space research
and oceanographic research.) These three functions are of an "overhead"
character for the general benefit of all oceanic
exploitation to be undertaken or at least financed
mainly by the Government. Some of these research
activities would be desirable even if there were
only a limited need for resource exploitation.

4. There is need to assist private enterprise
in the development and testing of technologies
suitable for oceanic exploitation. The need for
Government support is based on the fact that
major development investments by private industry
are not likely to be adequate because of the un-
certainty about the time when these investments
are likely to pay off, as well as other special
risks involved.

5. There is need to support research and pro-
mote international cooperation on the possible
use of the products of the coastal and off-shore
areas. This is particularly the case for uncon-
ventional food, the use of which has to overcome
serious obstacles. 2/, 6/, 7/, 8/

THE CHALLENGE OF SERVING THE PUBLIC INTEREST

We are here today because each of us has some
appreciation of the tremendous complexity and
significance of the potentials and challenges
which are before us in the coastal and offshore
areas. Our aim has been to bring into clearer
focus a discussion of the very important long-
term task for Government and private enterprise
because it deeply involves the public interest of
each country as well as the international community.
But perhaps our friend, Dr. Barrow of Exxon whom
we have referred to above, has summed up the
problem of balancing interests best of all in this
statement:

"What is needed today from government, from
business, from science and technology, and
from the private citizen is leadership which
is realistic rather than dogmatic; leadership
which can identify not only its own best
interests but the true public interest in a
given situation, and reconcile the two; and,
perhaps most of all, leadership which greets
change with an open mind. 5/

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