THE MULTIPLE USES OF THE COASTAL ZONE AND OCEAN OFFSHORE CALIFORNIA

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Abstract

In this essay, we briefly describe current levels of use of various ocean and coastal resources. Whenever possible, given the constraints of the paucity of data on this question, we indicate how the use of specific ocean and coastal resources is likely to develop to the year 2000. In addition, a brief review of the conflicts between users of California's ocean and coastal zone is developed. The indices suggest the need for a multiple-use ocean management program for California.

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Population and the Coast

As California's coastal population grows, coastal resources will no doubt continue to gain in importance as resources to be enjoyed, explored, and developed. Presently, over two thirds of the state's 27 million residents live in two coastal urban centers - the San Francisco Bay Area and the Los Angeles Basin[1], and the population of the state is expected to increase by 28.7% between 1980 and the turn of the century. In general, it is quite likely that a majority of these new residents will inhabit the coastal region.[2] This hypothesis is consistent with national projections which indicate that 80% of the US population will live within 50 miles of the coast by the year 2000.[3] These residents will have access to a myriad of ocean and coastal resources.

The Development of Offshore Oil and Gas Resources

California has a long history of offshore oil development which made its debut in the United States off the coast of Summerland (south of Santa Barbara) in 1896 when wooden piers and platforms were erected along the shoreline. In the late 1950s new technological capabilities enabled oil companies to extend the range of exploration from nearshore to offshore state waters. In 1958, as a consequence of the new technology, Standard Oil's platform Hazel was built. In 1963, the federal government began leasing offshore lands. However, the leasing and exploration of oil offshore California came to an abrupt halt in 1969 with Union Oil's blowout of Platform A in the Santa Barbara Channel. As a result of this oil spill, a significant decrease in new offshore oil activity in California took place during the first half of the 1970s.

In the early part of the 1980s, several significant discoveries of oil were found to exist in southern and south-central California. The Minerals Management Service (MMS) estimated that approximately two billion barrels of leased and unleased economically recoverable oil exists off southern California. In light of such optimistic estimates for recoverable oil, the Department of the Interior approved a Final 5-Year Oil and Gas Leasing Program on July 2, 1987 which contained six lease sales scheduled for California. In addition to the existing leases

(See Table 1) two lease sales were proposed for 1991: Lease Sale 91 in the Northern California Planning Area and Lease Sale 95 in the Southern California Planning Area.[4] But, whether or not these federal leases[5] will be developed is the object of an intense intergovernmental debate.

California OCS production (mainly in the Santa Barbara Channel and Santa Maria Basin in the south-central coast) was anticipated to reach over 500,000 barrels per day and the Department of the Interior estimated that there would be 22 platforms operating in federal waters by 1992.[6] However, these forecasts have undergone considerable revision. Oil production figures have been revised in 1988 to 225,000 to 400,000 barrels per day[7] in federal waters. Such a revision was primarily the by-product of declining oil prices and delays in the permitting process of large onshore oil facilities in south-central California.

With regard to the projected new federal lease Sales 91 (in northern California) and 95 (in southern California) a coalition of local governments and environmentalists were successful in getting both Presidential candidates during the 1988 campaign to pledge that they would delay these leases until January 1990. Two important federal actions have been initiated. First, a key House committee approved the most sweeping moratorium on offshore oil exploration ever enacted, putting some 84 million acres of U.S. coastline - including the entire California coast - off limits from new drilling until October, 1990.[8] The moratorium would also ban pre-lease drilling activities as well and would cause delays in the Interior Department's drilling timetable. Second, President Bush decided to delay any leasing in Northern California until the year 2000.

Table 1. -- Total Existing leases and acreage in the Pacific OCS Region as of July 31, 1987

Location	Number of Leases	Total Acreage
Southern California		
Santa Barbara Channel		
Leases 0166 - 0241	35	179,656
Leases 0315 - 0367	13	62,924
Leases 0456 - 0479	14	66,686
Leases 0511 - 0479	15	68,487
Total	77	377,753
Outside Santa Barbara Channel		
Leases 0243 - 0311	4	23,040
Leases 0480 - 0490	2	11,386
Leases 0528 - 0535	8	45,880
Total	14	80,306
Central and Northern California		
Santa Maria Basin		
Leases 0373 - 0443	43	231,137
Leases 0491 - 0502	8	45,545
Leases 0503 - 0510	5	28,409
Total	56	305,091
Grand Total, all existing leases	147	763,150

Source: U.S. Department of the Interior, Minerals Management Service, OCS Information Program, "Pacific Summary/Index: June 1, 1986 - July 31, 1987," Outer Continental Shelf Oil and Gas Activities Report, MMS 87-0078, p.29.

The California Coastal Commission has developed a list of major concerns which illustrate the complexity of the intergovernmental problem. These issues and concerns include the following: protection of marine and estuarine sanctuaries; protection of archaeological resources; adequate oil spill equipment; protection of commercial fishing equipment; vessel traffic safety, socioeconomic impacts on local communities; air quality measures; among others.[9] In addition to these concerns, oil companies and the federal government face another major obstacle. During the November 1986 elections in California, voters in four counties (Monterey, San Luis Obispo, San Mateo, Santa Barbara, Santa Cruz, Sonoma) and five cities (Monterey, Morro Bay, Oceanside, San Diego, San Francisco, San Luis Obispo, Santa Cruz) approved measures which restrict new onshore facilities which support offshore oil operations. These local initiatives pose problems for the oil and gas industry.

Offshore oil development represents a significant source of revenue for the federal government which receives over $7 billion per year in revenue from federal leases on the outer continental shelf.[10] In California alone, the Coastal Commission reported that between 1963 to 1985 over $4 billion in OCS revenues from California and between 1929 and 1985 approximately $4 billion in revenues from state offshore oil and gas operations have been generated.[11] Approximately $338 million was paid to the State of California by the Federal Treasury pursuant to the OCS Lands Act Amendments (known as the 8(g) settlements) of 1985.[12] In addition, some estimates hold that in California's south and central coast offshore oil and gas activity will produce some 14,520 jobs between the present and 1996 (although all may not be new jobs).[13] Local communities may also benefit from offshore oil development. For instance, a Chevron publication notes that a single platform requires the expenditure of $30,000 per month in groceries alone; and when this figure is multiplied by twenty or so platforms in the future, the grocery bill will increase to about $600,000. per month.[14] However, the job-related benefits may be taken by skilled oil workers who migrate from other oil producing areas

and the wider economic benefits generated by offshore development may be offset by the additional costs borne by the localities.[15] Thus, some of the benefits attributable to offshore oil development have been disputed.

California Fisheries

The California Constitution declares in Article I, Section 26: "[P]eople shall have the right to fish upon and from the public lands of the State and in the waters thereof...."[16] Fishing in California is divided between both recreational and commercial users. The number of saltwater recreational fishermen in California are approximately 2.2 million and of those about 68% fish in southern California (south of San Francisco).[17] An additional one million recreational fishermen may be fishing without a license.[18] Eighty percent of the fish caught by recreational fishermen takes place within three miles of the shore.[19] Recreational fishing is an important source of revenue for the Department of Fish and Game, bait and tackle shops, and other commercial enterprises.

California's commercial landings account for half of all commercial landings on the entire west coast, and exceed the value of landings in Oregon and Washington.[20] There are important factors which threaten the commercial fishing industry. One factor pertains to marine pollution from the growing urban areas and sewage outfalls which allow pollutants to contaminate fish and shellfish. Also, the oil and gas drilling operations disturb and interfere with the normal operations of commercial fishermen. Third, aquaculture which is moving out of the experimental stage might possible become a competitor to commercial fishermen (especially to those who rely on shellfish). Finally, conflict between commercial and recreational fishermen appear to be on an ever increasing spiral.

Recreational Uses of the Ocean and Coastal Zone

California has long been one of the key tourist states and recreational centers in the United States. Much of its attraction is related to the beauty and recreational opportunities found in the state's 1,072 mile long coastal zone and ocean. Of the California residents surveyed in a Department of Parks and Recreation study (1987) roughly 57% considered themselves to be outdoor persons and 76% strongly agreed that protection of the natural environment is important for outdoor recreation.[21]

Ocean and coastal related recreational activities are a valuable outlet for California residents. Californians spent over 500 million "participation days"[22] in outdoor recreation which were coastal related.[23] The annual economic value from such activity (in 1987) was estimated to be the following: boating - $54 million; water-dependent activities - $96 million; and water-enhanced activities - $674 million.[24]

The number of Californians participating in coastal and ocean related activities is expected to increase with the projected population growth. Arnold et. al., projected that - sunning would increase by 15.9 million participation days; diving would increase by 19.4% per capita participation; board surfing would increase by 1.5 million participation days (or by 12.9%); and body surfing would increase by 7.8 participation days (or by 37.5%) - by the year 2000.[25] Furthermore, with increased use of the ocean and coastal zone has come increase demand for boating facilities. A 1986 survey of the California Department of Boating and Waterways showed that the total number of berths in the state grew from 82,401 in 1977 to 98,467 in 1986 (or an increase of 2 percent per year).[26] The report points out that demand for "more intensive use of the available harbor areas" has occurred because of the drastic decline in the number of moorings.[27] In general, all areas related to coastal activities are projected to increase and this growth is likely to spawn new demands for physical facilities in California's

coastal zone.[28]

Marine Transportation

The California Almanac notes that the state is the "gateway to the transpacific trade ... with the nations of the Pacific Basin whose economies are the most robust in the world".[29] Based on the number of vessels arriving, Los Angeles-Long Beach and San Francisco-Oakland were the first and fifth busiest ports in the United States in 1986.[30] The California Almanac notes that Los Angeles-Long Beach had 7,055 vessels arriving and San Francisco-Oakland had 3,669 vessels arriving.[31] The use of the major ports in California is expected to increase in the coming years. The 1981, the National Maritime Research Center (NMRC)[32] estimated that approximately 12.4 vessels per day traveled through the Santa Barbara Channel in 1980, and the projected traffic for the year 2000 was as high as 21.7 [on a maximum scale].[33] This would mean a 39.5% increase (7,932 per year) might occur by the turn of the century.[34]

Concurrent with an increase in commercial vessel traffic, the County of Santa Barbara's Energy Division released a Marine Emergency Management Study (February 1989) which both revised the NMRC projections for 1990 and 2000 and found that an increase in vessel traffic would increase user conflict in the Santa Barbara Channel. One of the most significant findings was that the risk of a collision between a tanker and a oil platform in the Santa Barbara Channel is increasing. The study found that:

> "[T]he frequency for many accident locations and [oil] spill sizes are fairly high. According to the numbers, significant oil spill were shown to be likely to occur off [Santa Barbara] County in the 1990s. The risk of collision is between that of the platform and the grounding risk."[35]

Such a collision would have adverse effects on ocean users and the marine environment. All in all, such information points to the risk related to the increase in vessel traffic offshore

California especially in and around the Santa Barbara Channel.

Waste Disposal

The ocean off California might very well become the next frontier for the disposal of wastes ranging from highly toxic metals such as lead or zinc to municipal wastes. There is little doubt that as populations near coastal counties increase, the use of the ocean as a dumping area will increase. Significant controversy, however, exists regarding the quantity and types of pollution which should be allowed to enter the marine ecosystem.

Municipal and Industrial Wastes

Municipal treatment needs are only one factor contributing to California's current waste treatment requirements. To date, California maintains 50 municipal waste facilities[36] which have discharged over 1,000 millions of gallons of municipal sewage directly into marine waters.[37] This level is expected to rise as coastal populations grow.

It has been found that continual use of the marine environment as a dumping area for municipal waste poses significant health hazards and is dangerous to living marine resources. The observed effects of waste disposal in estuaries and coastal waters include a variety of impacts, such as: adverse effects on water quality; a loss of submerged aquatic vegetation; on fish, shellfish, and entire marine communities; closure of beaches and shellfish grounds; and accumulation of toxic pollutants in sediments. For example, the disappearance of the giant kelp in some offshore areas as well as the loss of the once abundant fishery found in these beds are by-products of an ever increasing amount of pollution discharged from coastal counties.[38] Furthermore, between July and August 18, 1987 the Los Angeles Times index revealed three separate releases of treated sewage from the Hyperion Treatment Plant and the effect - the

closure of the surrounding beaches. High levels of organotins have been reported in Marina del Rey, Port Hueneme, Newport Bay and San Diego Bay. If future levels match expected increases in population, then levels of such marine pollutants will undoubtedly be higher.

In addition to municipal wastes, industrial effluents for petroleum refining, metal finishing, and inorganic chemicals industries are sizable and pose additional environmental problems. The EPA reported in 1985 that one-fourth of the major industrial waste facilities studied were in noncompliance with Federal standards.[39] Noncompliance, according to an OTA report (1987) was three times higher in southern California than in the San Francisco Bay area.[40] California's Mussel Watch Program (MWP), the state's only coastwide toxic monitoring program, has recently released statistics in Ocean Pollution in California (1989) which show that no fish in southern California oceals of toxic substances.[41] Continued use of the ocean as a disposal site endangers marine life and puts in jeopardy the future use of both living and non-living resources.

Radioactive Waste Disposal

Aside from the disposal in the open ocean of acids or alkaline industrial wastes and sewage sludge (noted above) intentional radioactive waste disposal of low-level radioactive waste (LLW)[42] has occurred.[43] The major ocean dumpsite for low-level radioactive waste off California is located near the Farallon Islands west/southwest of San Francisco. The United States dumped approximately 94,000 curies of low-level waste in several dumpsites.[44] The practice of dumping LLW by the United States in the ocean stopped in 1970 when Congress enacted a moratorium on marine dumping of such wastes.

Whether or not past low-level radioactive wastes are hazardous and pose a threat to the ocean is a debatable issue. In 1981 the GAO claimed that the hazards of past ocean disposal of

LLW had been exaggerated and that the evidence showed that LLW ocean dumping poses no public health or environmental hazard.[45] In contrast, Jackson Davis of the University of California argues that "there now exists a clear potential for significant adverse impact of the existing radioactive contamination on the economy and health of the people of the state of California."[46] Nevertheless, because of the uncertainty surrounding the extent to which LLW will affect the ocean, the ban on dumping continues.

The ocean remains an alternative for the disposal of LLW. In 1981, the Office of Technology Assessment (OTA) noted three issues might affect the potential for future marine disposal of LLW: environmental feasibility; economical, political, and social acceptability; and potential problems in siting land-based disposal facilities.[47] Depending on the viability of these complex issues, the interest in marine disposal of LLW may increase.

Ocean Incineration

The concept of ocean incineration of primarily liquid wastes with low metal content combines the existing technologies of marine commerce in transporting hazardous chemicals and land-based incineration of hazardous wastes.[48] A small amount of unburned wastes are dispersed into the air and remain on the surface water of the ocean.

Ocean incineration is not a routine commercial practice in the United States. Presently there are no proposed incineration sites off the California coast[49] - the only two are in the Gulf of Mexico and off Delaware Bay in the Atlantic Ocean. The OTA finds that incineration at sea could be an attractive alternative to land-based waste management if the technological performance and environmental impacts were fully understood.[50] The fundamental problem with ocean incineration is the potential environmental and economic impacts it may have on state and local communities. Nonetheless, ocean incineration may be a viable policy option for

the disposal of hazardous wastes in the future.

Ocean Mining

To date, the only minerals that have been exploited in the seaward portion of the Pacific coastal zone are petroleum, salt, and sand and gravel.[51] Hard minerals may be mined in the future, but this issue like the future of many other uses of the ocean is debatable.

The world's nonfuel seabed mineral prospects can be classified into: shallow coastal deposits which are generally found in waters less than 200m including aggregates such as sand, gravel and shell; calcium carbonate; phosphorites; placer deposits of heavy minerals or gem stones; barite and subseabed sulfur deposits; and deepsea deposits including the manganese nodules which are found in depths ranging from 3,500 to 5,500m; cobalt-enriched materials found in depths between 1000 to 4000m; marine polymetallic sulfides found between 2000 to 2500m; and marine phosphorites found on seamounts between 1000 to 4000m.[52]

Several types of minerals might eventually be mined which include sand and gravel; placer deposits of precious metals such as gold and platinum; titanium; phosphorite deposits; and polymetalic sulfide deposits containing zinc, copper, lead, cadmium and silver. Costs of offshore mining and the market value of the minerals will determine the competitive position of offshore minerals.[53] There have been some reports that portray the possibility that offshore mining in a positive manner. James Broadus estimates that seabed mining might be profitable in the future (see Table 2). In particular, Broadus believes that substantial progress has been made toward bringing metals from deep-sea manganese nodules into the stream of supply. Since the early 1960s, approximately $650 million have been spent on the development of the technology for deep sea manganese nodules.[54] Also James G. Wenzel who is a representative from industry is optimistic and inclined to believe that opportunities are attractive, especially in the placer deposits associated with precious metals, the black sands and gravel deposits. Yet,

Wenzel clearly notes that industry has some major challenges particularly in establishing a government/industry interface which will encourage industry to take the lead in the highly competitive international economics arena.[55]

Table 2. - Estimates of the Value of Seabed Minerals in the U.S.

Mineral	Value [in millions of dollars]
Sand and Gravel	334
Sulfer	40
Tin	185
Diamond	29
Shell and Calcium Carbonate	100

Source: Broadus, James M., "Seabed Materials," Science, February 1987, Volume 235, p.855

Despite the rather optimistic views expressed by individuals like Wenzel, to date there are no offshore mining industries operating off the California coast. The federal government did propose a lease offering for the Gorda Ridge area located in northern California and Oregon in 1983. Based on the information obtained by the Gorda Ridge Task Force and lack of interest by the industry (as well as the public's negative response to the lease offering), the Gorda Ridge is not a target for commercial development and may not be for several decades. For this reason, the Minerals Management Service decided not to complete the final environmental impact statement on the Gorda Ridge as announced in the Federal Register in March, 1988. In addition, Ocean Science News (September, 1988) reported that private mining companies are economically "holding on by their teeth". The future of seabed mining is conditioned on the "economic accessibility" compared to other onshore minerals, as well as the level of government and public support each endeavor receives.

Aquaculture

In California, aquaculture is one of oldest yet technologically underdeveloped uses of the ocean and coastal zone. Aquaculture began in California in the mid-1800s with the cultivation of trout and oysters.[56] By 1978, the total volume in sales in the industry was approximately $17.5 million.[57] In 1988, there were approximately 350 registered aquaculturists of which near eighty had gross sales of approximately $25,000 per year.[58] California's current aquaculture industry entails the production of trout, trout eggs, salmon, catfish, oysters, oyster seed, clams, mussels, abalone and smaller items such as bait minnows, ornamental fish, tubifex worms, and abalone seed.[59] Note that figures for the value of the various products produced by the California aquaculture industry are not available, but the new Aquaculture Coordinator (created in 1987) is working on developing such information.[60]

Aside from the technical problems which face aquaculture and its progress, there are economic and political problems which have an impact on the industry's development. Aquaculturists point to the California Coastal Commission and the Regional Commissions as a major constraint in "obtaining access to coastal lands for mariculture development".[61] The industry is in competition with land development in the coastal zone, and other offshore users of the ocean for space. There is also the concern that "private capitalization of hatchery activities will endanger funding of public hatchery programs" and that "large companies [might] restrict the fishing activities of the present user groups via management and conservation legislation" putting in jeopardy the user groups' investment.[62] If the industry is to develop and expand, it must construct innovative methods to handle the possible wastewater problems economically.[63] This possible wastewater discharge problem is similar to the problems faced by cities which have their own municipal wastes to dispose. Such problems must be resolved before aquaculture can fully develop as an industry.

Military Activity

In the past, California has played a vital role in providing for our nation's security. A significant part of the Pacific Fleet is based in Southern California. A large part of the Navy's research, development, and testing of new missiles, torpedoes, and other weapons are conducted along the Southern California coast and offshore. The Navy conducts air, surface, and subsurface operations offshore California. Many of these exercises pose certain hazards to other coastal and ocean users.

The Navy's Sea Test Range of the Pacific Missile Test Center (PMTC) which has its headquarters at Pt. Mugu illustrates the extent to which the military uses portions of offshore California. The Navy conducts a variety of tests and training exercises involving air, surface, and subsurface operations utilizing various ships, aircraft, and weapon systems. In central and northern California, a complex system of training and operating areas associated with combat readiness of the Pacific Fleet takes place.

In addition to the Navy's exercises, the military has been conducting a number of activities in and around the Santa Barbara Channel region. The Channel Islands - Santa Cruz, San Miguel and Santa Rosa Islands[64]- have been particularly susceptible to military activities by both the Navy and Air Force. For instance, the Santa Cruz Acoustic Range Facility is used for surface ship and submarine acoustic signature measurement and acoustic research and development by the Naval Oceanographic Systems command. It is important to note that all military operations take priority over any offshore activities.[65] Underwater weapons, electromagnetic sensors, and sonar devices essential to submarine activities are tested in the Hydrophone Array area which extends ten nautical miles from the south eastern end of Santa Cruz Island. The acoustic measurements are ran approximately fifty times a year.[66] In addition, the Navy uses the waters off the southern tip of San Miguel for bombing exercises. Santa Rosa Island is utilized by the Navy for Aerial Mining operations.[67] Such military uses of the ocean area in the Santa Barbara Channel are important for the progress of military technology.

The important benefits provided by military testing in military restricted areas are not without costs. In particular, military restricted areas are closed to other potential users of the coastal zone or ocean. Such space does not generate revenue for commercial enterprises or from recreational users.[68] Naval exercises have been at the center of several conflicts between the military and local fishermen. Facing the loss of income, fishermen and their representatives have met with Navy officials to discuss the use of the Navy of the back side of Santa Cruz Island during key fishing periods. The Santa Barbara News Press (Sept. 19, 1985) reported that fishermen claimed that between 650 to 750 thousand dollars would being lost in revenues because of the Navy exercises near Santa Cruz Island. Clearly, military exercises in the coastal zone and offshore areas have negative impacts on various other users of the ocean.

Ocean Use Conflicts

The coastal zone and ocean offshore California is of limited space. As populations rise, the demand for such space will in all probability rise, and heightened conflict among users will be the result. The extent to which each use will be developed is predicated on the level to which the other uses will be developed. As a consequence, a "zero-sum" game between users is often the result. What follows is a brief review of how the multiple uses of the coastal zone and ocean offshore California are in conflict with one another.

Offshore Oil and Gas Development

There are several conflicts which arise out of offshore oil and gas development. First, during the exploration and productions stage of offshore oil development, environmental effects occur from seismic survey operations, tainted drilling, mud discharges, noise and visual intrusion, and from releases of hydrocarbons into the atmosphere. Such activity can adversely affect fish stocks, marine mammals, seabirds and marine-life support organisms. Second, other users are adversely affected by offshore oil and gas development. In particular, the commercial fishing industry can suffer damage from the loss of important fishing areas and gear damage

which may result from exploratory drilling and development. Ocean transport users can experience navigation-related problems from offshore oil and gas operations as well. The environmental impacts of oil spills such as the Exxon Valdez crises in Alaska may have significant adverse impacts on important habitat such as the Channel Islands National Marine Sanctuary and the various marine communities which live in or near the sanctuary. Such an oil spill can completely destroy long-established marine-life reproduction patterns and cause extensive damage to seabirds, marine mammals, phytoplankton, zooplankton, benthic and intertidal organisms, fish and fisheries. These issues and concerns are important forces which often act as barriers to offshore oil and gas exploration and development.

Fishing

The fundamental conflicts associated with fishing are those pertaining to space. Commercial and recreational fishermen compete for the same resource and spatial conflict inevitably results. In addition to such spatial conflict, commercial "ghost nets" or other fishing equipment lost has adverse impacts on several types of marine communities and can cause damage to boats by fouling propellers or water intakes. Fishing gear can also become entangled with any subsurface oil/gas or mineral mining equipment. Also, fishing boats add large amounts of debris while at sea which can adversely impact both marine life and recreational users. Furthermore, as greater numbers of fishermen employ more effective and efficient means of catching fish, serious stock depletion may occur.

Recreation

Spatial conflict among the various recreational users will more than likely intensify as the number of individuals engaged in coastal and ocean related activities increases. For instance, conflicts between coastal recreational users who are dependent on surf such as board surfing, jet skiing, body surfing and belly boarding will occur. Also, demand for new physical

facilities in the coastal zone is inevitable as boating and other water-enhanced activities continue to increase.

Waste Disposal

Wastewater discharge has negative impacts on many coastal zone and ocean users. For instance, commercial fishermen and recreationists have suffered from the discharge of wastewater. Several beaches have been closed because of the discharge of sewage in both Los Angeles and Orange counties. Waste discharge can bury sensitive marine organisms, increase pathogens (bacteria, viruses, and parasites), increase debris, detergents, and organics which can effect both recreational users and marine life. Other pollutants such as fishing "ghost nets", six pack rings, styrofoam and plastics contribute to significant population declines in fish. In addition, dredged material from ports may be contaminated with PCBs, heavy metals, and petro hydrocarbons which may have adverse impacts on especially benthic organisms. If the ocean off California becomes the next frontier for the disposal of wastes, there is little doubt that important fisheries will be harmed and recreational users will suffer.

Ocean Mining

The several types of minerals which might eventually be mined may have significant adverse impacts on both the marine environment and the various users of the ocean. For example, the removal of benthic habitat may occur from the sedimentation from mining and shipboard operations. In addition, wave pattern alteration which causes sediment-transfer disruptions produced from mining operations can lead to shoreline erosion. Noise activity from shipboard engines and processing equipment could have adverse impacts on sensitive seabird and marine mammal habitat. Furthermore, offshore mining could present spatial conflicts with other users -- in particular, fishermen and ocean transport users.

Aquaculture

There are several conflicts associated with aquaculture. First, aquaculture facilities are often quite large and can pose significant space-related problems with commercial, recreational and industrial users of the state tide and submerged lands. Also, water quality may be adversely affected by aquaculture operations. Aquaculture pollution comes from the fish feces, urine and food pellets deposited in the water which can have adverse impacts on both fisheries and recreational users of the coastal zone and ocean. Aquaculture facilities could have negative impacts on prime habitat areas as well.

Military

Military protected areas are closed to other potential users of the ocean and coastal zone. For instance, the Surfrider Foundation, a non-profit cultural organization established to protect and enhance the quality of the shoreline environment, filed suit against the Air Force's plan to build a launch complex at Vandenberg Air Force Base which would mean the potential closure of Jalama County Park for up to a period of three months. Such a closure would limit the coastal access to Jalama, an area widely used by both wind and board surfers; and camping.

Summary

California is one of the most important ocean and coastal states in the nation and offers an myriad of activities to its residents. The coastal zone and ocean offshore California is of limited space and the demand for such space will intensify. The evidence suggests that there is a tremendous need for California to establish a multiple-use ocean management program.[69]

NOTES

1. California Coastal Conservancy, Urban Edge: Where the City Meets the Sea, 1984, p.1.

2. Note, however, that the rise of anti-growth initiatives at the county level and particularly at the coastal county level may have an impact on the proposed increase in residents near or along the coast. For a detailed study of the rise of initiatives at the county level, see "Trends in Local Growth Control Ballot Measures in California" by Madelyn Glickfeld, LeRoy Graymer and Kerry Morrison in UCLA Journal of Environmental Law and Policy, February 1988. Also, a recent status report released by the National Oceanic and Atmospheric Administration questions the national projections which indicate that 80% of the US population will live within 50 miles of the coast by the year 2000.

3. Report and Recommendation of the Ocean Resource Committee, Western Legislative Conference, Council of State Governments, A Leadership Agenda: State Management of Ocean Resources, January 1988, p.6 (hereafter A Leadership Agenda).

4. Department of the Interior, Minerals Management Service, Pacific Summary/Index: June 1, 1986 - July 31, 1987, Outer Continental Shelf Oil and Gas Activities, OCS Information Report 87-0078, pp.21-28 (hereinafter Pacific Summary/Index: June 1, 1986 - July 31, 1987).

5. There has been no offshore oil development in state waters since Platform A's blowout in 1969.

6. "Outlook by '92: Offshore oil production to double", Santa Barbara News Press, Sept.2, 1988 p.1 (hereafter Outlook by '92).

7. These figures are from projections provided by Terry Covington, Executive Director, California Coastal Operators Group, Santa Barbara, CA.

8. Douglas Jehl and Lori Silver, "Offshore Drilling Delay," Los Angeles Times, June 30, 1989, Part I, p.1, 27

9. Oil and Gas Activities Report, Table 2.

10. Joel S. Watkins, "Petroleum Exploration and Production in the EEZ," in Symposium Proceedings, A National Program for the Assessment of Development of the Mineral Resources of the United States Exclusive Economic Zone, Sponsored by the Department of Interior, 1984, Chapter 4.

11. Oil and Gas Activities Report, p.48.

12. Pacific Summary Index: June 1, 1986 - July 31, 1987, p. 77.

13. "California Offshore Oil: The Myths and Facts," Chevron/Briefing, San Francisco, CA: Standard Oil Company of California, April 1984, p.5. (hereafter California's Offshore Oil: The Myths and Facts).

14. "California's Offshore Oil: The Myths and Facts" p.6.

15. Biliana Cicin-Sain, "Offshore Oil Development in California: Challenges to Governments and to the Public Interest," Public Affairs Report, Bullitin of the Institute of Government Studies, Vol.27, p.6.

16. California State Senate, Constitution of the United States and Constitution of California, 1986, p.89.

17. California Fisheries: Restoring the Abundance, A Study Undertaken by ICF Technology and Knecht, Cicin-Sain and Associates for the National Coalition for Marine Conservation - Pacific Region, San Diego: CA, December 18, 1987, p. 29 (hereafter California Fisheries: Restoring the Abundance).

18. California Fisheries: Restoring the Abundance, p.29.

19. Ibid., p.31.

20. ICF Technology, Robert Knecht and Biliana Cicin-Sain, "Toward A More Abundant Ocean: Improving Fisheries Management in California," for the National Coalition for Marine Conservation - Pacific Region, Volume 1, May 1988, p.4.

21. California Department of Parks and Recreation, Public Opinions and Attitudes on Outdoor Recreation in California, An Element of the California Recreation Plan, Sept. 1987, p.i (hereafter Public Opinions and Attitudes on Outdoor Recreation in California).

22. A participation day is defined by Robert K. Arnold, Stephen Levy, and Victoria Nourse, Recreation Activity in California and Ten Regions of the State 1980-2000 Volume I, California State Department of Parks and Recreation, Center for Continuing Study of the California Economy, June 1982 as "time spent in any single recreation activity during a calendar day". Two or more participation days are registered in a single calendar day if an individual participates in two or more different recreation activities during the day. (herefter Arnold, et. al.).

23. Public Opinions and Attitudes on Outdoor Recreation in California, pp.iii-v.

24. Department of the Interior, Minerals Management Service, Impacts of Outer Continental Shelf Development on Recreation and Tourism, OCS Study 87-0064, Volume I, Executive Summary, p.1-19.

25. Arnold, et.al., pp. 32-34.

26. State of California, Department of Boating and Waterways, Inventory of California Boating Facilities, August 1986, Prepared by Williams-Kuebelbeck & Associates, Inc., p.2 (hereafter Boating and Waterways Survey).

27. Boating and Waterways Survey, pp.2-3.

28. California Department of Parks and Recreation, Recreation Needs in California, Sacramento, California, 1987, p.26.

29. Fay, James; Stephanie Fay and Ronald Boehm (eds.), California Almanac, 3rd Ed., Pacific Data Resources, 1988, p.1 (hereafter California Almanac).

30. California Almanac, p.387.

31. Ibid., p.386.

32. NMRC developed a comprehensive maritime risk management program for general application to maritime areas or projects. This risk management program was developed for the Santa Barbara Channel to identify the possible risks of increased oil and gas platform construction in the Channel as it pertains to the projected increase in vessel traffic in that same

area. Basically, the program attempted to determine what kinds of obstacles oil and gas development may create for ship traffic in the Santa Barbara Channel between 1980 and 2000. It is of some importance for this section because the Santa Barbara Channel is one of the most traveled waterways in California.

33. Summary of the results of this study are on pp.V-IX. in Santa Barbara Channel Risk Management Program Prepared for California Coastal Commission by US Department of Commerce, Maritime Administration, National Maritime Research Center, April 1981 (hereafter NMRC Study).

34. NMRC Study, p.3-1.

35. Santa Barbara County Resource Management Department, Emergency Management Study, Feb., 1989, p.vii.

36. Office of Technology Assessment, Waste in Marine Environments, Washington, D.C., 1987, p.61. (hereafter Waste in Marine Environments)

37. Waste in Marine Environment, p.71.

38. Galbraith, Robert and Ted Bochlern, Subtidal Marine Biology of California (Happy Camp, CA: Naturegraph Publishers, 1974) p.114.

39. Waste in Marine Environment, p.199.

40. Ibid., p.199.

41. Ocean Pollution in California, prepared by Assemblyman Hayden, Santa Monica, 1989.

42. The General Accounting Office (GAO) defines low-level waste as "any radioactive waste that is not high-level or transuranic waste ... [and] the range of waste regarded as low-level extends from materials suspected of being slightly contaminated with radiation to highly contaminated materials which remain radioactive for long periods of time."

43. The OTA in Waste in Marine Environments (p.74) states that no nation has yet used marine waters for the intentional disposal of high-level radioactive wastes.

44. Wastes in Marine Environments, p.68. Note that records on the amount of LLW waste and whereabouts of each minor disposal site are not available.

45. Government Accounting Office, Hazards of Past LLW, 1981, p.11. (hereafter Hazards of Past LLW)

46. As quoted in Hazards of Past LLW, p.14.

47. Wastes in Marine Environments, p.69.

48. Office of Technology Assessment, "Ocean Incineration: Its Role in Managing Hazardous Waste - Summary," OTA-0-313, August 1986, p.9.

49. Ibid., p.36.

50. Ibid., p.27.

51. E.A. Keen, "The Pacific Coastal Zone of the United States," Resource Management and Optimization, Volume 5, Harwood Academic Publishers, 1987, p.309.

52. James M. Broadus, "Seabed Materials," Science, February 20, 1987, Volume 235, pp.853-860 (hereafter, Broadus, "Seabed Materials").

53. Broadus, "Seabed Materials," p.859.

54. Ibid., p.857.

55. Personal correspondence with James Wenzel.

56. Aquaculture Advisory Committee, A Study on the status of aquaculture in California with special recommendations for administrative and legislative actions, Report, California Aquaculture Development Act, 1979-1980, p.3 (hereafter Status of Aquaculture)

57. Status of Aquaculture, p.3.

58. California Department of Fish and Game, Report to the Fish and Game Commissioner, July 1, 1988 - June 30, 1989, p.13. (Hereafter Report to the Commissioner).

59. Status of Aquaculture, p.3.

60. Report to the Commissioner, p.13.

61. Prepared for California Aquaculture Development Act Aquaculture Advisory Committee by Living Marine Resources, Inc., A Study of the Status of Aquaculture in California, August 4, 1980, p.41. (hereafter Aquaculture Advisory Committee).

62. Aquaculture Advisory Committee, p.49.

63. Ibid., p.74.

64. Office of Coastal Zone Management, Final Environmental Impact Statement on the Proposed Channel Island Marine Sanctuary, Washington, D.C., 1980, p.87. (Hereafter Channel Island EIS).

65. Channel Island EIS, pp.88-89.

66. Ibid., p.89.

67. Ibid., p.88.

68. Note that information on the future space which might be used was not available.

69. For further development of this supposition see Biliana Cicin-Sain's "California and Ocean Management: Problems and Opportunities," forthcoming from California Sea Grant and Coastal Zone Management Journal.