Attitudes toward off shore oil development: A summary of current evidence

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Abstract

Attitudes toward off shore petroleum have varied widely across both time and place. This paper summarizes the accumulated evidence from around the globe and then examines two regions that represent the polar extremes-both drawn from the same country and the same era-southern Louisiana and northern California, over the past two decades. The comparison illustrates that attitudes toward off shore oil development are best understood through a closer examination of the ways in which the off shore industry has interacted with a given region, over time, in terms of three sets of factors the historical, biophysical, and social factors that shape the people and culture of a given place and time.

1. Introduction

The first "off shore" drilling was actually done from a set of oil derricks along a pier that jutted in to the Pacific ocean off the shores of Summerland, CA, just to the southeast of Santa Barbara, in 1898, and the first off shore oil controversy erupted a few miles a way, the very next year. When an oil company began to construct an oil derrick off the shores of Montecito, CA-the highly affluent Santa Barbara suburb that is adjacent to Summerland and that occupies the few miles of coast line between Summerland and Santa Barbara-a local mob, described approvingly on page I of the Santa Barbara Morning Press the next day as" a party of the best known society men of Santa Barbara, armed to meet any resistance," attacked the rig and tore it down.

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The local ‘‘society men’’ seem not to have suffered any noteworthy legal repercussions from their actions, despite having been so well known, but oil companies did. As noted by Molotch et al. [1], this graphic expression of local attitudes ‘‘proved effective in blocking further expansion up the beach’’ (see also [2]). Elsewhere in the world, however, for at least the next 50 years, most such efforts to find oil—offshore as well as on—were much more likely to be the focus of celebration, not protest. Had this article been written in 1955, rather than in 2005, it almost certainly would have included a discussion of what were known at the time as the ‘‘Tidelands Controversies,’’ but as noted below, those controversies had to do not with opposition to offshore oil, but with the virtual opposite, involving competition over which political jurisdictions would be able to enjoy the accompanying royalty benefits.

Across the intervening years, offshore exploration and production have spread around the world, taking place off the coasts of Africa, Asia, Central and South America, and Europe. In the United States, offshore oil is limited to a handful of rigs off Alaska’s North Slope, and 21 rigs off California—all in the Santa Barbara region, just a few miles away from Summerland and Montecito—and to a vastly larger number of less famous oil rigs, approximately 3500 in number, in the Gulf of Mexico, where a number of platforms are producing oil in water that is more than a mile deep.

As these numbers themselves suggest, public attitudes toward offshore oil activities are far more diverse than once might have appeared to be the case. To understand what has happened in the century or more since the derricks first appeared on the Summerland pier, and to understand the variations in public attitudes toward offshore oil activities, it is useful to begin with a brief history. Following the historical summary, we will present an overview of the variations that can be found in some of the key offshore regions of the world, including those of less-developed nations, and then examining in greater detail what appear to be the two polar cases—the two regions, both in the same country, where attitudes appear to be the most and the least favorable. We will end the article with brief observations about the interplay of policies, publics, and petroleum.

2. A brief history

The original impetus behind the search for offshore oil came just 17 months after the displeasure of the Montecito mob, when the world’s first major petroleum reservoir, Spindeltop, was tapped on 10 January 1901, near Beaumont, Texas. Compared to the petroleum reservoirs that had been found in Pennsylvania and elsewhere during the latter years of the 19th Century, Spindeltop was huge; its discovery transformed the petroleum industry, both in the United States and around the world. The reservoir proved to be located under the limestone cap that covered the top of a salt dome; not surprisingly, this discovery led to interest in other such domes, many of which are located along the costs of Louisiana and Texas.

Despite the early discoveries off the shores of south-central California—or perhaps in part because of the reactions they inspired—it was not until the 1920s that offshore oil development began to be pursued in earnest. The pursuit took place largely under the waters of Lake Maraicaibo, in Venezuela, and more extensively, in the marshes and the shallow, protected waters of the Gulf of Mexico [3,4]. By far the greatest part of the development took place along the Louisiana Deltaic Plain—the lands that were formed by the delta of the Mississippi River—once the development of non-destructive exploratory (seismic) techniques allowed oil companies to locate and to explore the numerous salt domes along the Louisiana and Texas Coasts of the Gulf of Mexico.

At the time, it may not have occurred to many of the oil companies that explored the Louisiana marshes, or for that matter to the people who lived nearby, that they were involved in the early stages of developing what would become one of the great industrial innovations of the 20th Century. What almost certainly did occur to them was that it was no simple matter to drill oil wells through the unstable soils of the region, especially in that the best oil prospects were often situated in marshes, swamps, and the shallow waters of bays and lakes. The initial techniques involved the construction of a platform on pilings that were driven into the coastal marshes, with drilling equipment being brought to the site on barges and installed on the platform. From there, drilling proceeded much as it would have been done on land, except that transportation to and from the site was often by boat, and additional costs were created by the need to build a platform for each exploratory well. In addition, pilings driven into the thick layers of silt have no solid foundation, relying entirely on the friction between the pilings and the mucky bottom. Since drilling machinery produces significant vibrations, up to 250 pilings were needed for a single exploratory platform. As interest grew in deeper prospects, these early techniques became too costly, since the non-recoverable cost of platform construction was a constant regardless of the outcome of the drilling [4].

The technological breakthrough that facilitated large-scale exploration came in 1933, when the Texas Company (later Texaco) introduced the ‘‘submersible’’ drilling barge. A drilling rig was simply mounted on a barge, which could be towed to a drilling site and flooded. Sitting on the shallow bottom, the barge provided a stable base for drilling; once the job was done, the barge could be re-floated and towed to a new location. The coastal estuaries of central Louisiana served as the site of the first successful test of the technology, opening a new era in marine drilling. Within a decade, submersible rigs were in use throughout the marshes and shallow coastal waters in Louisiana and Texas, sparking a growing support sector for marine drilling (see [5]; for a more detailed history of the evolution of the technology, see [4,6]).

Throughout the 1930s and 1940s, the submersible drilling rigs evolved, becoming larger and more powerful, allowing them to tap the deeper oil-bearing formations along the Gulf Coast. Steam engines were replaced by diesel–electric rigs, and the tungsten carbide drilling bit was introduced in 1952. By 1955, inland submersibles were setting world drilling depth records of 22,500 ft [7]. Much of the initial exploration, drilling, and production occurred in eastern St. Mary Parish, Louisiana, and residents of nearby towns—primarily Morgan City and Berwick—appear to have been eager to help provide labor and support to the oil firms that were drilling in the challenging areas nearby.

As inland drilling rigs were evolving, eyes were beginning to focus offshore. In 1946, the Magnolia Petroleum Company (later to become part of Mobil), using pilings driven into the sea bottom, constructed a platform in the open Gulf on a site leased from the State of Louisiana. The site was south of Morgan City, five miles from the nearest land. Although the attempt was an economic failure (a dry hole), it was the key forerunner of what most observers today would consider to be a truly ‘‘offshore’’ effort, and it was a technological success, in that it demonstrated that exploration in the open Gulf was feasible. Following Magnolia’s lead, and using the same type of technology, Kerr-McGee brought in the first producing well in the world in a true marine environment, 12 miles off the central Louisiana coast, almost due south of the mouth of the Atchafalaya River. This sparked additional interest offshore, and by the middle of 1948, in addition to offshore production by Kerr-McGee, 13 locations were in various stages of development off the coasts of Louisiana and Texas, and plans were under way for drilling in 14 others [8]. Within the next decade and a half, production platforms would be found in more than 200 ft of water, although the offshore

bottoms of the Gulf of Mexico sloped sufficiently gradually that these platforms were being put many miles offshore.

3. The ‘‘tidelands controversies’’

The virtual explosion of offshore drilling activities during this era meant that elected officials suddenly had strong incentives to establish sovereignty over—and the right to extract tax revenues from—lands along the ocean bottoms that had not previously been the focus of such attention. The differing points of view came to be known, during the Truman administration and afterwards, as ‘‘the Tidelands controversies.’’ Responding in part to the views of the Secretary of Interior at the time, Harold Ickes, President Truman issued a proclamation in 1945 (Executive Order 9633, Federal Register 12304 (1945); 59 Stat. 885) asserting Federal ownership of the continental shelf—the relatively shallow waters that are found just beyond the margins of most continents, including North America. Ickes also persuaded Truman to initiate a suite against California’s competing policies in the US Supreme Court, and in 1947, the Supreme Court ruled against California. The Tidelands controversies, which continued until the subsequent Eisenhower administration pushed two new laws through Congress, were focused squarely on offshore oil drilling, but contrary to what many present-day readers might expect, the controversies had almost nothing to do with public opposition. Instead, they had to do with what political body would reap the benefits of offshore oil—the states or the federal government.

Within the oil industry, the sentiment ran heavily in favor of the states, given that oil companies believed it would be easier to deal with the states than the Federal government. The companies’ views reflected their experiences at the time not only in the oil-dependent states of Texas and Louisiana, but also in California and Florida—despite the intense opposition that both states would later express toward offshore oil, and despite the opposition that at least some stretches of California had shown a half-century before. As one observer would informally summarize the tenor of that earlier time, looking back from a perspective of some three decades later, ‘‘The basic attitude was, ‘Good luck—hope you find some oil—and if you do, send us a check.’’’ The main concerns of the time, meanwhile, had to do with whether the regulations and the public revenues from offshore oil would be the business of the federal government or the states [9,10].

Contrary to the Truman administration, which had inspired the controversies by favoring federal control, the new Eisenhower administration espoused a ‘‘states’ rights’’ position that aligned well with the preferences of the oil companies and the relevant states. The Eisenhower administration’s first piece of legislation on the subject, the Submerged Lands Act (43 U.S.C. y 1301–1315)1, assigned to the states the title to the offshore lands that were within 3 miles of the shoreline. At that time, the limits of existing technology (and imagination) meant that relatively little attention was devoted to the ocean-bottom lands that were beyond the three mile limit. These lands, however, were the focus of a second piece of offshore legislation that ultimately proved to have far more economic importance, namely the Outer Continental Shelf Lands Act (OCSLA) of 1953 (43 U.S.C. y 1331–1356).

[1]The U.S.C. classification system refers to the volume and location within volume of the U.S. Code. Thus (43 U.S.C. y 1301–1315) refers to volume 43 of the US Code, y 1301–1315. The U.S.C. classification refers to where the law is published. The other way in which federal laws are referenced is by a "Public Law" citation, which is assigned according to the Congress that passes a given piece of legislation, and in what order. Thus, for example, (P.L. 92–103) would designate the 103rd law passed by the 92nd Congress.

This legislation gave the federal government the rights to the undersea lands that were further away from the continent, along what came to be called the ‘‘outer’’ continental shelf, being ‘‘out’’ beyond the 3-mile limit of the states’ jurisdictions [3,4].

Within just a few years, industry interest began to spread further offshore, into the federal waters lying more than 3 miles offshore. If oil industry leaders had originally expected federal opposition to offshore oil development, they would have been pleasantly surprised by what they actually experienced. The Eisenhower administration might have been more favorably inclined toward the oil industry than the prior Roosevelt and Truman administrations, under any circumstances, but the actual circumstances that surrounded the federal leasing of offshore lands included a rapid recognition of the financial advantages that could show up in federal coffers. Although the OCSLA allowed some leeway, the Department of Interior for the next quarter of a century would generally used a cash bonus bid system with a fixed royalty rate of $16^{3/4}$ percent. This meant that bidders would offer a cash amount or ‘‘bonus’’ to lease a tract, combined with an agreement to pay royalties of one-sixth of any subsequent production, giving federal officials a financial incentive to share an important aspect of industry views: More drilling, and more oil production, meant more dollars for the federal treasury. Over the decades that followed, offshore oil revenues grew from zero to being second only to the Internal Revenue Service as a source of US government income [3].

4. The larger world

Throughout the period from the 1940s through the 1960s, most of the world’s technology and the expertise would come from the Louisiana and Texas shores of the Gulf of Mexico. In 1968, for example, the Glomar Challenger, a state-of-the-art drill ship from Orange, Texas, began a series of worldwide trips for the Scripps Institute, taking deep-bottom cores for research purposes, and using technology that would have been inconceivable only a few years before. Before the trips were over, the Glomar Challenger would drill a hole almost 3000 ft deep, in an ocean-bottom location that was itself more than 16,000 ft below the surface of the sea [11]. As the exploration and production continued to expand, however, offshore energy development came to be an increasingly worldwide phenomenon.

By the mid-1960s, in addition to the North Sea, exploratory drilling had moved forward in the Persian Gulf, along the western shores of Africa (especially off Nigeria), in the Far East (Indonesia, Japan, Borneo, Australia), and along the Cook Inlet in Alaska. By 1967, 75 countries worldwide were exploring for offshore oil and gas, and 20 of them were producing oil and/or gas offshore [12]. Yet it was the North Sea experience, in particular, that may have provided the clearest early warnings of what would follow.

Attention to offshore petrochemical extraction from the North Sea had begun in the late 1950s, just a few years after the passing of the Eisenhower-era legislation in the US, and growing significantly in 1959, with the announcement of Groningen gas field off Holland. By 1962, when the size of the Groningen field was better understood, that region saw a multi-million-dollar drilling effort, which was in full swing by the mid-1960s, with the first North Sea production coming ashore in 1967 [13]. As offshore drilling efforts continued to expand, however, the offshore industry found itself in waters that were literally as well as figuratively deeper and more hostile. The loss of the drilling rig Sea Gem in the North Sea in 1965 [14] indicated the dangers associated with the new environments, and increased emphasis was placed on adapting the Gulf of Mexico technology to more hostile conditions.

Particularly after the 1969 Santa Barbara oil spill, just a few miles away from the first offshore oil derricks—in a location where the Nixon administration had insisted on proceeding with oil production in spite of local worries about just the kind of spill that actually occurred—the major oil companies devoted increasing attention other areas of the world, reinforcing the already-aggressive efforts by drilling and support companies that were searching for offshore discoveries [15]. By the mid-1970s, for the first time since the earliest days of offshore drilling, the majority of the world's offshore drilling operations were located in countries outside of the US, with roughly 75% of the activity being in other countries, and with the North Sea being the prime area [16].

As already suggested, however, in testing the waters of the North Sea, oil companies encountered temperatures that were much chillier than they had known in the Gulf of Mexico, politically as well as climatically. Rather than being able simply to ''send a check'' after finding oil, the oil companies—which in the case of Norway included a state-owned oil company—needed to spend years in tough negotiations with the citizens and leaders of the region. In both of the nations exercising political jurisdiction over key areas of the North Sea (Norway and Great Britain), affected citizens expressed a range of concerns, and demonstrated a level of political resolve, that would have been almost literally unimaginable along the Gulf of Mexico in earlier times. In a nation that takes great pride in its long history of Scandanavian distinctiveness, its widespread public participation, and its careful planning for environmental preservation, Norway understandably provided a very different context for operations than did the oil industry's previous experiences in the Gulf of Mexico. Similarly, in Great Britain (particularly in Scotland and in the Shetland and Orkney Islands, which would have had the most to gain or lose from offshore development), there were extensive discussions of the kinds of conditions under which the development of North Sea oil would be allowed to proceed.

The net results of the extensive discussions in both Norway and Great Britain included numerous measures for environmental protection, for local as well as national economic benefits, and for local socioeconomic impact mitigation, that were seen as innovative or even revolutionary by many analysts, especially against the backdrop of previous US experiences (see for example [17–22]). Norway, in particular, emphasized the combining of environmental protection with economic development measures, including a state-owned oil company, but also a number of private enterprises. The innovative policies eventually led Norway to became one of the world's leaders in offshore technology, allowing that nation to emulate the Gulf Coast pattern of selling not only its oil, but also its technological expertise (see e.g. [23,24]). Partly as a reflection of that success, when development began on the giant Hibernia oil field off the coast of Newfoundland, Canada, several years later, most observers saw far more similarity to ''the North Sea model'' than to previous experiences along the Gulf of Mexico (see e.g. [25–27]).

5. The patterns in less-developed nations

It is important to be particularly cautious about drawing many firm conclusions about public attitudes in less-developed countries, in that systematic research into attitudes in most such countries has been relatively rare to date. Far from displaying high levels of concern or sensitivity toward local attitudes, in fact, many of the less-prosperous nations that have developed their oil resources to date have shown tendencies toward political repression that many observers have found disturbing (see e.g. [28–31]). So pronounced is this tendency—onshore as well as offshore—that one analyst was driven to examine cross-national data from

113 nations in asking the question, ‘‘Does Oil Hurt Democracy?’’ The answer, as published in a peer-reviewed journal, appears to be in the affirmative [32].

With these caveats being kept in mind, however, to the extent to which public reactions have been examined in nations beyond the ones noted thus far in this article, the most common focus has involved the financial and to a lesser extent the political implications of offshore development. As a broad if useful simplification, three main patterns have emerged across time. The first and by far the more common pattern has in some respects reflected a combination of the earlier ‘‘Tidelands controversies’’ in the US and the efforts by Norwegian leaders to use planning and politics to extract greater economic benefits from the vast flows of revenue that are involved in offshore oil development. The second pattern has involved an underlying pattern of concern over the kinds of democracy-harming tendencies noted by Ross. The third pattern provides an ironic contrast against the first, involving a problem that is sometimes called ‘‘Dutch Disease’’ [33–35].

In Venezuela, to start with the earliest example from beyond North America and Europe, the discovery of oil under the waters of Lake Maraicaibo in the early 1920s was followed by more than a half-century of economic growth, during which the oil revenues were used to provide a wide range of economic development benefits. For most of the next 50 years or more, in other words, Venezuela was seen by most observers as one of Latin America’s most notable models of democratic stability and social peace, and the common conclusion was that the political as well as the economic benefits could be traced in large parts to oil-based prosperity. Since the oil price collapses of the 1980s, however, Venezuela’s political stability has begun to be seen by some as being as questionable as its prosperity, with clear signs of tension between the middle/upper classes and the ruling political structure By the time this paper was being prepared, assessments of Venezuela’s experiences with oil were becoming more likely to call attention to class warfare than to social stability (see for example [36–38,72]).

A reasonably similar pattern is visible in Indonesia, which provided the lion’s share of ‘‘Dutch’’ oil for Royal Dutch Shell for nearly half of a century—during which time the former colony was generally known as the Dutch East Indies. For a period of several decades after the former colony became an independent nation, in the aftermath of World War II, its leaders were seen by most observers as showing considerable political acumen in their efforts to obtain economic and developmental benefits from indigenous oil resources. Rather than attempting to ‘‘nationalize’’ or take over the oil companies that were operating in Indonesia at the time, Ibnu Sutowo—a close personal associate of Presidents Sukarno and Suharto, and the key force behind Indonesia’s state-owned oil company, Pertamina—emphasized a more gradual approach. One component involved the motto of ‘‘Learn while you work, work while you learn’’ for the Indonesian nationals who continued to work in the oil fields until the old patterns of colonial dominance (and the old colonial ‘‘Mining Law of 1899’’) were finally brought to an end. Another, more tangible component involved the relatively gradual process of ending the earlier patterns, beginning when Article 33 of the new Constitution of 1945 declared all of Indonesia’s natural resources to belong to its people, but not being fully completed until some 20 years later, when the Petroleum Act of 1960 and then the ‘‘production sharing contract’’ arrangement of 1966 ultimately came into effect [31,39].

Even after Indonesia passed its new law in 1960, the major oil companies were not taken over by the Indonesian state; instead, the companies experienced a transition from a previous legal status of ‘‘concessionaire’’ (i.e., enjoying ‘‘concessions’’ that had been granted under Colonial Dutch rule) to a new status of being contractors to the State enterprise, Pertamina. The transition was completed after Sutowo and the Indonesian state instituted ‘‘production sharing contracts,’’ which required foreign contractors to bear the full cost of exploring for

oil, but reserved roughly 40% of the oil for Pertamina and the Indonesian government. Under other contract provisions, most of the lands that were leased to the oil companies reverted back to the government within a decade or less, and the Indonesian share of the profits would go up as world oil prices rose.

Not surprisingly, it appears that at least the financial implications of Indonesia's increasing control over its oil and the associated revenues won considerable praise from most Indonesians for many decades. Indonesia has also been seen by any number of scholars as an exception to some of the threats to democratic development that are of concern to authors such as Ross, including what Evans [40] has termed ''predatory state'' tendencies and what Karl [37] has characterized as ''Petro-state-ness.'' The oil revenues were reinvested in a variety of other enterprises that were widely seen as contributing both to the development of the growing national economy and the integration of what is the most populous petroleum-exporting nation (and the most heavily populated Islamic nation) on the face of the earth. This latter point, incidentally, is anything but a minor one, given that Indonesia actually embraces what most western observers find to be a surprisingly diverse and far-flung collection of peoples, including more than a thousand islands and hundreds of native languages that are spread across a distance of more than 3000 miles of land and water. Through investments in everything from schools to steel factories, it became as true in Indonesia as it ever was in Texas that, in the words of Jones [41], oil and gas were used ''not only to propel cars and heat homes, but also to educate children, build roads, and provide a variety of public services.''

Yet particularly in the later years of the Suharto era, Indonesians became increasingly critical of the ''crony capitalism'' and corruption that appear to have become increasingly pervasive, both in Pertamina and in the broader society, and of the increasing extent to which the income derived from offshore oil and gas fields wound up being used to support military repression. As suggested by the fact that some of the more troubled portions of Indonesia that have come to western attention were also areas that happen to have rich offshore petroleum deposits—Aceh, East Kalimantan, and the now-independent new nation of East Timor, to name just a few—the degree of Indonesian ''exceptionalism'' may be lower than previously thought.

Finally, off the western shores of Nigeria, to note one last example of a less-developed nation that has seen growing extraction of offshore oil reserves, very few observers have seen the kinds of ''exceptionalism'' once thought to exist in Indonesia and Venezuela. Instead, particularly after what the Nigerian government characterized as the ''execution'' of the noted human-rights activist, Ken Saro-Wiwa, there has been extensive international attention to what many have seen as heavy-handed and anti-democratic central government repression of local opposition to offshore oil development and its attendant onshore impacts, particularly among the native people of the area, the Ogoni (see for example [30,42,70]).

As may already be clear, although the vast sums of money involved in offshore oil development often lead to expectations for rapid economic growth in oil-exporting countries, careful analyses by authors such as Ross [29] and Sachs and Warner [35] have tended to find just the opposite, often referring to a so-called ''Dutch Disease'' (for comparable findings from the US and from forms of ''mining'' that go beyond oil extraction, see also [43,44]).

Perhaps in part because of its catchy alliteration, the phrase of ''Dutch Disease'' has sometimes been attached to almost any example of economic weakness in the face of resource exports, but more formally, the phrase is understood to involve the combination of two factors that appear to have led to a generally unexpected slowdown in the economy of the Netherlands, even in the face of the increased revenues that the Dutch derived from North Sea petroleum reserves. First, a sharp rise in oil exports led to a significant increase in the

strength of national currency—a fact that meant other exports from the same country became more expensive for people who lived outside of the Netherlands, reducing international demand for Dutch products. Second, the booming resource sector was seen as drawing people and capital away from other sectors of the economy, such as manufacturing and agriculture, raising the effective production costs in those other sectors over time (see especially [33]).

These concerns led to deliberate efforts, particularly in Norway, to offer increased inducements for investment in non-oil sectors—efforts that may well have been warranted in any case—but subsequent analyses have indicated that ‘‘unexpected’’ combinations of rich resources and poor people appear to be more widespread than can be explained by the ‘‘Dutch Disease’’ hypothesis alone (see e.g. [29,32,34,35,43–47]). Instead, particularly in less-developed nations, the tendency may well be for oil revenues to contribute not to ‘‘development,’’ but to the privileges of small groups of ruling elites—and to the costs of the security forces that are used to protect their continued status of privilege.

6. A closer examination

To repeat an earlier point, there is no one or universal pattern of public attitudes toward offshore petroleum development. Instead, attitudes vary widely, in response to local conditions and to the nature of oil development that is proposed. Of all the places that have been studied systematically, however, it appears that the widest variations in attitudes are found between two different areas of the same country—northern California and southern Louisiana. Given that the variations between these two areas have been found to illustrate the point we are making here, reflecting the historical, physical and social characteristics of the regions in question, a brief summary of the comparison between these two regions would be a useful way to finish this article. The assessment that follows is adapted from a more detailed treatment by Freudenburg and Gramling [3,48] emphasizing three sets of factors associated with the strikingly different patterns of attitudes in the two regions—historical experiences, physical conditions, and social factors.

Historical factors are important both because both because generic historical factors change—and change cultures with them—and because different regions experience an activity such as offshore oil development during different periods of that historical transition, in effect resulting in different local histories. When oil exploration started in Louisiana’s coastal marshes in the 1920s, the prevailing attitude toward the environment almost everywhere in the US was an exuberant one, involving the ‘‘conquest of nature,’’ and the still-fresh legacy that remained from the mythic conquest of the western frontier. Although environmental concern was not completely unknown, it certainly had little of the character or strength that it would have a few decades later. In nearby Florida, for example—where later decades would see a level of organized opposition to offshore oil drilling that would be comparable to that of California [49]—essentially all of the offshore lands that were seen as potential oil-bearing prospects would be leased to oil companies, by the state of Florida itself, well before anyone there had ever heard of ‘‘Earth Day’’ (see [50]).

Yet as may already be clear from the brief historical overview presented above, there were also important aspects of the development of offshore technology that are unique to southern Louisiana. At the time when oil exploration began to move into the coastal marshes, those marshes were viewed not as ecologically vital ‘‘wetlands,’’ but as hostile territory that needed to be subdued for human benefits. Louisiana also had a long history, tracing back to the early 1800s, of resource harvest (fish, shrimp, oysters, fur cypress lumber) in coastal areas. Further, oil and these earlier extractive activities, especially fishing, proved to be

highly compatible in several important ways. First, rather than showing the kind of pattern of conflicts over finite coastal regions that would later come to be seen as a common feature of offshore oil development, the oil companies seeking to develop the waters off Louisiana were well-aware that they had no experience on coastal and offshore waters, but fishers did. When Magnolia Petroleum Company drilled the first offshore well in 1946, boats from the local shrimp fleet were hired for the initial survey and the transportation of workers and supplies. Local captains supplied the navigation knowledge for early offshore oil, and a number of them later became crew and supply boat captains, increasing their incomes in the process [4].

Second, the scheduling of offshore oil work allowed for individuals to maintain traditional coastal occupations. The movement into the marsh and estuaries of the Louisiana Deltaic Plain was large-scale and relatively permanent, but since it involved environments where human settlement was not really possible—and where distances and transportation difficulties meant that commuting would have to be limited— an innovative form of ‘‘concentrated work scheduling’’ soon evolved there [51]. The common pattern for offshore work became one in which employees would meet at a prearranged site to ‘‘go offshore,’’ either by boat or more recently by helicopter. The lengths of time spent offshore have varied, but reasonably typical cycles involve 7, 14, or 21 days. Following the stay offshore, the employees return to the meeting site and have a period of time off, typically the same length as the stay offshore. Given that many such workers who might otherwise have simply thought of the off-duties weeks as a kind of long weekend found themselves too bored, and/or found their wives too tired of having them around the house, many coastal offshore workers chose instead to continue in their traditional occupations. This meant that boats, gear, and knowledge were maintained and did not fall into disrepair as they might have if occupations with more traditional kinds of scheduling had moved into coastal Louisiana. When the oil patch crashed in the mid 1980s, many coastal residents found it useful to fall back on these skills and equipment to feed their families.

In addition, oil development in Louisiana started gradually, and it grew as the product of local innovation—a fact that understandably generated considerable pride. By contrast, when the first offshore development appeared full-blown in California in the late 1960s, not only was environmentalism emerging as a national factor, but the huge rigs that were by that time associated with offshore oil were seen by a the local population as foreign and threatening. When the Nixon administration insisted on moving ahead with offshore leasing in the face of stiff local opposition just a few miles away from the beaches of Summerland and Montecito—and when the Santa Barbara oil spill soon thereafter provided a tangible indicator of the validity of local concerns—Californians’ opposition to further offshore oil activities became all the more intense (see [52]).

Physical factors, or to use the more technical terminology, ‘‘coastal geomorphology,’’ can also be seen to differ quite distinctly between the two states. There are fundamental differences between the Louisiana and California coasts, both in coastal topography and in marine topography. To begin with the coast, there are three main ways in which the coastal regions of Louisiana differ from those of California, as well as from most other areas of the US—the coastal wetlands that limit land-based access to the coast, the estuaries that offer many opportunities for harbor space, and the low relief and low energy levels that characterize most of the coast [3,48]. First, as even a superficial examination of an atlas will show, the distribution of populations and roadways in Louisiana is very different from that found in most coastal states in the US Few of the state’s population lives on or near the coast and, with the exception of Grand Isle, it is often almost impossible to get anywhere near the coast by road. Most of the ‘‘coast’’ is lined with a broad and virtually impenetrable band of coastal wetlands that are far better suited for the abundant fish and wildlife of the region than

for human habitation. In most coastal states of the US, but especially in states such as Florida and California, where proposals for OCS development have met with such intense opposition, the situation is completely different. Most of the population lives on or near the coast, and virtually the entire coast is readily accessible by road. In California, Florida and much of the rest of the coastal US, the coast is seen as a valuable public resource, a thing of beauty, and a source of popular recreation—and in part, this is because the coast is actually ‘‘seen’’ by so many people, so often. Because of the coastal wetlands in Louisiana, not only is the coast rarely seen, but local residents’ descriptions of their state’s coastal regions are more likely to involve alligators and mosquitoes than spectacular scenery.

The second key feature of Louisiana’s coastal topography is the presence of an extensive estuary system. While it is difficult to reach the Louisiana coast from land, it is easy to do so from the water. Louisiana is characterized by numerous waterways that intersect the highway network further inland, and that provide coastal access for marine interests. To those familiar with other coastlines, the concept of ‘‘harbor’’ is probably a common one. A harbor is generally thought of as an enclosed, protected water body, with orderly docks, designed to maximize the number of boats that can be stored in the limited space available. Outside of the New Orleans metropolitan area, the concept is little used in coastal Louisiana, where people simply live among their boats. There is no shortage of places to put a boat in coastal Louisiana. The natural levees of the many bayous that traverse the area provide innumerable places both to dock boats and to live, and people do both. The geomorphology of the Louisiana coast even allows oil field and fishing vessels to use many of the same facilities. There were a few cases, such as Morgan City in the boom years of the 1970s and early 1980s, where the demand for dock space became so intense that the shrimpers were crowded out. By and large, however, fishing and oilfield boats have long coexisted peacefully, and continue to do so today. Along the coast of California, by contrast, most of the available harbors are small, and dock space is already so limited that a 250-ft offshore supply vessel, for example, could represent a considerable threat to local fishing interests.

The third key feature is that Louisiana is a region of extremely low relief and generally low energy. When Louisiana residents do reach the shoreline of their state, they see flat water and flat land, with comparatively low-energy beaches. They see water that is seldom clear because of the discharge of silt by the Mississippi and Atchafalaya rivers. In areas of the country that are further removed from the ‘‘muddy’’ Mississippi, including the areas to the east, in Florida, the waters are generally clearer. In northern California, residents frequently observe the power of the sea where it meets the coast, and they often comment upon it with what they themselves call ‘‘awe.’’ In contrast, the Gulf of Mexico off of Louisiana is generally a more sedate body of water during normal periods of time, and even when the Gulf does inspire awe, as during tropical storms and hurricanes, its displays have rarely been seen in person by people who are alive today. As noted above, only a small percentage of the population lives on the Gulf, and a combination of modern weather forecasting and centuries of experience have led to routine evacuations of coastal and low-lying areas as tropical storms approach.

The distinctiveness of the Louisiana environment, however, also extends offshore, and to what is literally below the surface—that is, to the marine topography. Most people in Louisiana do not see offshore oil as an issue, and many are particularly bewildered by the fact that fishing interests in other locations have expressed so much concern over offshore developments, given that marine use conflicts have been so notably absent in the Gulf. Many fishing boats, both commercial and recreational, will actually tie up to the oil rigs to fish, and in New Orleans, the ‘‘Aquarium of the Americas’’ was built with a large display, complete

with a title of ‘‘from rigs to riches,’’ pointing out the advantages of oil platforms as a form of habitat for many of the fish species of the Gulf.

Given the Louisiana experience, why would there be so much opposition to oil structures from fishing interests in other regions? The reasons are not so obscure as they first appear. In addition to the historical factors just noted, there are two key aspects of the marine environment that have helped to limit the potential for conflicts between OCS development and other marine activities, particularly fishing, off the coast of Louisiana; one has to do with the gradual slope of bottoms along the central Gulf of Mexico, and the other has to do with the presence of silt bottoms that limit the number of obstacles likely to be encountered.

Off the coast of Louisiana, the gradual slope of the continental shelf presents very different conditions from those that are found in areas where offshore oil development has been most contentious. In most areas of the country, but particularly along the Pacific Ocean, the continental shelf drops off much more dramatically into the ocean basin, meaning that it is also much narrower than the shelf that exists in the Gulf.

As a result of this difference in sea-bottom slopes, the available area of the Louisiana continental shelf is far larger than is the case in California, reducing significantly the probability of use conflicts. The gradual slope also reduces the number of problems that are likely to be created by any given obstacle. Even if a fishing boat needs to make a quarter-mile detour around oil operations, for example, there will be little significant impact on the boat’s ability to keep its nets in contact with the sea floor. In areas such as the Pacific Ocean off the California coast, by contrast, the steeper slope makes the Louisiana experience largely irrelevant, and in two ways. First, the actual area available for use is smaller, meaning that even an apparently small loss of area for OCS activities can have proportionately major impact on the area available for fishing in a given region. Second, given that bottom-dragging operations need to work along a contour line, following sea bottoms at a given depth, the presence of an oil platform can mean that fishing boats would need to make a detour that would correspond to a difference of several hundred feet in water depth, effectively precluding the option of ‘‘fishing around’’ many such structures.

An additional feature of the marine environment of the Gulf of Mexico, however, involves the presence of silt bottoms. While the heavy silt discharges by the Mississippi and Atchafalaya rivers mean that the water is seldom clear, further reducing many concerns over esthetic impacts, the nature of the bottom also means that fishing operations encounter few obstacles such as rock outcroppings that would lead to the loss of nets and other gear. In regions such as California, by contrast, the frequent presence of rocky outcroppings can severely limit the ability of fishing boats to change their trawl runs.

One consequence of the difference in bottom types is that—to reiterate a point that often comes as a surprise to the opponents of oil development in other regions—oil rigs actually can provide a significant advantage for fishing operations on silt bottoms of the Gulf of Mexico. Certain types of commercially important fish can only survive in the kinds of habitat known collectively as ‘‘hard’’ substrate—rocky bottoms, reefs, rock outcroppings, and the like. In the central Gulf of Mexico regions of the US where oil development activities have been the most intense, natural outcroppings of this sort are so rare along the predominantly silty bottoms that oil-related structures now make up roughly a quarter of all hard substrate. In effect, the oil rigs thus serve as artificial reefs, concentrating and probably increasing the fish populations, which is precisely why it is quite common to see fishing boats literally tied up to oil rigs in search of fish.

In Louisiana, in sum, the coastline is inaccessible to most land-based populations, and accordingly low in social salience, while offering enough potential harbor space to meet the needs of offshore oil development as well as of potentially competing uses such as fishing

operations. The offshore sea floors, meanwhile, tend to have such a gradual slopes as to offer vast areas of virtually level bottoms, relatively free of obstacles, but also so devoid of natural reefs that the oil rigs provide a valuable service for fishing operations. As was the case for the historical factors, most of these characteristics are almost precisely reversed for the coastal regions of much of the nation, and particularly for the northern California coast; the very considerations that have contributed to the ready acceptance of offshore oil in Louisiana, accordingly, tend to exert just the opposite effect in California. In general, in other words, the less abundant a coastal resource, and/or the greater the competition for access to that resource, then the greater may be the probability for conflict; this pattern shows up repeatedly in conflicts over coastal resources, and as noted by Catton [53], among others, it may well be relevant for non-coastal areas, as well.

Social factors provide a third broad category of reasons why the attitudes toward offshore development can differ so widely, even within the context of a single country. As a useful simplification, four sets of social factors appear to have encouraged the easy acceptance of offshore oil in Louisiana, relative to what might be expected in other areas of the United States. They involve the average educational levels, the patterns of social contacts, the importance of prior extractive industries, and the potential for overadaptation that characterized the coastal regions of Louisiana as offshore activities were first being developed [3,48].

First, we turn to *education levels*. Given that support for environmental protection is quite strong in the United States, as it is in most countries of the world today (see [54] for a summary), very few sociodemographic characteristics show strong correlations with environmental concerns. For example, studies show that blacks are as supportive of strong environmental controls as whites [55], and poor people tend to be as supportive as are wealthier ones (see e.g. [56–60]; for a broader review, see [61]). One consistent exception, however, has to do with educational levels, with better-educated persons generally expressing higher levels of environmental concern [57]. Thus it may be significant that, particularly as offshore development was picking up speed in the 1930s and 1940s, coastal Louisiana had some of the lowest educational levels in the country. In St. Mary parish, the scene of initial offshore activity, only 47.2% of the adult population had 5 years of education in 1940, and only 12.2% had graduated from high school [62]. Other rural areas of southern Louisiana had similarly low educational levels. By way of comparison, over 78% of the adults in the United States had a high school education, or more, by the time of the 1990 Census.

Second, the other industries that most characterized coastal Louisiana at the time of initial offshore development were ones that involved *extractive uses of the coast*. Like oil development, in other words, they involved the extraction of raw materials from nature. Local residents obtained products from the Atchafalaya Basin (cypress lumber, fish, crawfish, water fowl, and moss for furniture stuffing) and from the coastal marsh (furs, shrimp, oysters). The export of such raw materials had provided the mainstay of the economy in coastal Louisiana for almost a century prior to offshore development. In areas where extractive activities are dominant, as they were in Louisiana in the 1940s and 1950s, there is less resistence to another extractive activity. In most coastal regions of the US today, by contrast—and certainly in those regions of California where proposals for offshore oil have been met with the stiffest resistance—the economy has come to be far more dependent on the amenity values of the coast than on its extractive values. The proportion of the population depending on the extraction of coastal resources is small and shrinking, while by contrast, not just tourism but other amenity-related forms of development, including many forms of high-value economic activity that choose to locate in areas having high levels of environmental amenities (see e.g. [1,63]; see also [64]), there is clear economic importance in the retention

of relatively pristine environmental conditions. Thus, in California's coastal areas, and increasingly, in other areas as well, the likelihood of finding support from extractive workers can be expected to continue to decline.

Third, *social interaction patterns* can exert powerful influences on individuals' attitudes. One particularly powerful if often overlooked pattern involves what we have called a ''social multiplier effect'' [3,65]: Even if a given individual does not work in the offshore oil industry, that person's attitudes may be affected by whether or not his/her friends and relatives do. Given the historical, biophysical, and other social factors summarized above, the ''average'' resident of coastal Louisiana in the 1940s would be expected to have known many friends and neighbors who were employed in the oil industry. By the 1980s or 1990s, it was virtually impossible to live in southern Louisiana and not to know someone who was employed in an oil-related enterprise. In addition, Louisiana residents in the 2000 census were more likely to live in the state they were born in than any other state. In most of the coastal regions of the US today, by contrast, the situation is just the opposite. Not only do those regions have few residents who are involved in oil or gas extraction, but they also have high numbers of people who have moved to those coastal regions precisely because of their desire for high environmental quality. This tendency is especially likely in areas such as Northern California, where there is no current base of employment that is directly dependent on local oil and gas development.

Fourth and finally, an additional way to understand the uniqueness of Louisiana's compatibility with offshore development is to look at the degree of adaptation that has taken place. As the various components of the human environment become adapted to a given form of development activity, there is a tendency for new skills, knowledge, tools, networks, and other resources to be built up around that activity. Three potentially problematic results, however, can also occur. First, any type of development narrows a region's options, because time, resources, human capital, are devoted to a particular developmental scenario, sometimes limiting the options for alternative scenarios. We call this process ''developmental channelization,'' [50] while others have used terms such as ''path-dependency'' to denote similar patterns (see e.g. [66]). Second, as part of this process, adaptations to earlier forms of development may be lost (sometimes quickly, sometimes across generations); and third, nearby communities can run the risk of overadaptation to the new development activity [67]. Particularly if that new activity is not a sustainable one, then when it ceases or declines, communities or regions may be left in the position of being less able to survive in their environment than they would have been before the new development came along. Thus, to a large extent coastal Louisiana has become not just ''adapted to'' but ''dependent on'' its offshore petroleum activities—and it is difficult to be too critical in evaluating an activity from which one has benefitted, particularly if the activity is one on which one remains dependent for any hopes of comparable, future prosperity [68,69]. This, coupled with the industry's generally good record in terms of offshore environmental accidents, has tended to bolster the perception of offshore activity in the Gulf as involving relatively low levels of risk. Table 1 summarizes these factors; where more of them are present, attitudes toward offshore development can be expected to be more positive.

7. Conclusion: petroleum, profits, policies, and the public

At the time when the two of us were first becoming involved in offshore oil issues, more than a quarter of a century ago, it was common to find both industrial representatives and governmental officials who would insist that only ignorance could explain public opposition. Taking note of the fact that oil development had tended to be supported in regions that were

most heavily dependent on the oil industry, at least prior to that time, they would argue in essence that ‘‘to know us is to love us.’’ As subsequent years have often shown, however, opponents of oil development are often impressively well-informed about the potential costs and benefits of oil development; the opposition is based not on ignorance, but on their sense that their concerns have tended too often to be ignored in the past.

To repeat the central theme of this review, however, there is no single or universal attitude toward offshore development. Instead, as can be seen from this examination of the two regions that represent the opposite extremes of the cases have been documented in the open literature to date, attitudes in are likely to reflect the specific physical, historical and socioeconomic conditions that are in effect for any given place and time.

Table 1
Summary of factors increasing support for offshore oil in Louisiana

Historical factors
1. Early historical era—‘‘age of exuberance’’
2. Temporal priority of development
3. Incremental onset and evolution of industry
4. Local origins and development of technology

Biophysical factors
(a) Coastal topography
   1. Broad coastal marshes that preclude coastal highways and population concentrations
   2. Estuary systems that include many potential harbors
   3. Low relief and energy levels

(b) Marine topography
   1. Broad, gradual slopes that increase area and decrease significance of conflicts with platforms
   2. Silt bottoms with few outcroppings and obstacles

Social factors
1. Low educational levels
2. Extractive orientation toward biophysical environment
3. Favorable patterns of contact with oil industry personnel
4. Extensive prior adaptation to oil development

Adapted from [3].

To the extent to which there are shared characteristics across locations, most of the main reasons for supporting oil developments in a given locality are economic ones, and most of the reasons for opposing the same developments are environmental ones. Even that generalization, however, is an overly simplified one. Particularly in industrialized nations, as illustrated by the experiences of northern California, the environmental and economic concerns of nearby residents may go well beyond oil spills, having to do instead or in addition with the fact that the onshore activities that support the offshore platforms— ranging from diesel mechanics to suppliers of drilling muds to the many tons of pipes and other supplies that tend to become part of the landscape in an oil-development region— can conflict with other ways of using prized coastal locations. Rather than being ‘‘merely’’ a

matter of esthetics, many of the other activities that local residents may prefer to see in coastal regions, ranging from fishing to high-value homebuilding, can also be quite important economically.

In addition, as noted above, many of the regions that have hosted oil development have enjoyed fewer economic benefits than they expected—although at least in the decades since the Santa Barbara oil spill of 1969, the most often-feared environmental problem of offshore drilling, namely an oil spill resulting from the drilling itself, has also proved to be quite rare, at least in developed nations. It needs to be noted, however, that we are speaking here of the spill-control record of offshore drilling and production itself—as opposed to the far more numerous spills that have continued to be associated with the transportation of oil, as exemplified by well-known spills from oil tankers such as the Exxon Valdez and the Braer.

Part of the reason for improvements in the environmental track record in drilling for oil, at least in relatively prosperous nations such as the US, has had to do with increased industrial innovation and attentiveness in the aftermath of the Santa Barbara spill. In terms of transportation risks, where the record has remained a spottier one, explicit governmental attention may have played a greater role. Primarily in response to the Exxon Valdez spill, for example, the US Congress passed the Oil Pollution Act of 1990, 33 US Code y 2701–2761 et seq., with six major provisions—an expanded Federal role in oil-spill response, contingency planning requirements for vessels and certain facilities, the establishment of the Oil Spill Liability Trust Fund, the increase of liability for spills of oil or hazardous substances from vessels and facilities, the requirements for double hulls on new tankers, and the requirements for increased research and development into spill response technologies. Just two years after the passage of the Oil Pollution Act, however, the tanker Aegean Sea—which did have one of the safety measures required by the act, namely a double hull—spilled an estimated 22 million gallons, or roughly twice as much oil as the Exxon Valdez, in the waters of the La Corun˜ a harbor, along the coast of Spain.

When considering the potential for more effective policy responses to the potential risks and benefits of petroleum development in the future, it needs to be recognized that few oil-exporting nations have the national traditions of commitment to social democracy and of pragmatism that tend to be associated with Norway and the Netherlands. Saddam Hussein is far from being the only ruler of an oil-rich country to have used oil-derived revenues to build an authoritarian state apparatus and to attack and suppress internal opponents, or to have taken other such steps that have scarcely been helpful in spreading peace and prosperity [29,31]. Indeed, according to some of the analysts noted already in this review, the levels and types of repression seen in other nations may well have been as bad or worse.

Still, this is not to say that the petroleum industry's best interests are likely to be served in the future by the relative freedom from government ''restraints'' that the industry has tended to favor in the past. As in the case of the earlier Tidelands controversies in the US, multinational oil companies have traditionally preferred to deal with governmental authorities that encourage oil development and discourage dissent, but in light of the profoundly negative effects that repressive but oil-friendly regimes have created on social or environmental systems in nations such as Nigeria, future historians may well conclude that such preferences in fact amount to ill-advised business practices.

The more extensive and cautious development-control policies enacted in Norway and the Netherlands may well have involved some additional difficulties for the oil companies, at least in the short run, but in light of the fact that oil development in the North Sea took place in a process that was generally orderly, predictable, and efficient—and without requiring massive investment in a repressive military apparatus—the North Sea oil development policies may ultimately prove to have created only minor economic costs, or even net

benefits, for the oil industry. There may be a lesson for all of us in that fact. For the future, requirements for improved environmental protection and a more nearly equitable sharing of socioeconomic benefits of oil production, in addition to doing a great deal to improve the public image of oil companies, might not be such a bad thing for oil companies. In addition for the fact that such policies would appear to be far better for both society and environment, tough and consistently enforced policies might well in the end prove to have an economic cost to the oil companies that would amount to little more than rounding error on the profits being extracted.

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