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2

International Vessel-Source Oil Pollution

Ronald Mitchell, Moira L. McConnell, Alexei Roginko,
and Ann Barrett

Forty-five Years of Oil Pollution Control

Over the past four decades, the international regime seeking to control intentional discharges of oil has undergone dramatic changes. In 1954, concern that oil intentionally discharged from ships was causing environmental and aesthetic harm led thirty-two nations to negotiate the International Convention for the Prevention of Pollution of the Sea by Oil (OILPOL), which was the first treaty to address marine pollution of any sort (OILPOL 54, 1954). Addressed exclusively to reducing coastal oil pollution, the treaty required tanker operators to discharge waste oil far from shore or into the port reception facilities which it required governments to ensure were available. In the regime's first ten years of existence, few governments made any effort to induce operators to change their behavior and most operators ignored the treaty's provisions.

In 1998, a substantially revised International Convention for the Prevention of Pollution from Ships (MARPOL) imposes far stricter limits on all marine and many atmospheric pollutants carried or produced by ships (MARPOL 73/78, 1978). Rules now ban all oil discharges and require all tankers to carry pollution-reduction equipment. Governments and other actors (classification societies, insurance companies, shipbuilders) have extensive programs to monitor and prevent tankers from operating without such equipment. Almost all tankers now have the required equipment, although some operators still make illegal discharges. Total oil discharges appear to have decreased significantly even as total oil transported by sea has increased dramatically.

Much, though not all, of the dramatic change over the past 45 years can be attributed to a regime that learned from initial failures and developed regulatory structures that took advantage of the authority accorded to it, especially by nongovernmental actors, to identify those inclined to violate the regime and prevent them from doing so. Even governments and nonstate actors that opposed the regime's rules during negotiation used the rules, once adopted, to judge the behavior of tanker owners and tanker operators. In this way, the regime altered the opportunities and incentives for violating its proscriptions. Over time, the regime created a legally and behaviorally effective regulatory system (see chapter 1) that also has made progress toward ecological effectiveness in improving the marine environment.

This case study critically evaluates whether the regime can account for these significant changes in treaty rules, monitoring, and behavior, and environmental improvement. It begins by describing the behavioral complex of the environmental problem, the actors involved, and the regime. The chapter then evaluates whether the major changes in the behavioral complex were caused by the regime or by exogenous factors. The chapter concludes by clarifying which of the regime's causal mechanisms best fit the process by which the regime effected such changes.

Behavioral Complex

Why would a ship or tanker intentionally discharge oil at sea? A small fraction of cargo remains in a ship's tanks as clingage after cargo delivery. Two standard practices led to clingage being mixed with seawater during ballast voyages. First, tankers filled empty cargo tanks with seawater as ballast to stabilize the tanker. Second, tankers cleaned their tanks with seawater before receiving more oil. Captains discharged the resultant oil and water mixtures (or "slops") at sea prior to arrival in port. Although clingage is only a small fraction of total cargo, a 100,000-ton tanker could discharge 300 to 500 tons of oil per voyage. Given thousands of tanker voyages per year, such discharges quickly accumulated into a major environmental problem. In the early 1950s, tankers were transporting 250 million tons of oil by sea annually and discharging some 300,000

Table 2.1
Input of oil into the sea

Year of estimate	Million metric tons per year		
	1971	1980	1989
<i>Transportation</i>			
Tanker operations	1.080	0.700	0.159
Dry-docking	0.250	0.030	0.004
Terminal operations	0.003	0.020	0.030
Bilge and fuel oils	0.500	0.300	0.253
Accidents	0.300	0.420	0.121
Scrappings	no est.	no est.	0.003
Subtotal	2.133	1.470	0.569
<i>Offshore production</i>			
	0.080	0.050	no est.
<i>Municipal and industrial wastes and runoff</i>			
	2.700	1.180	no est.
<i>Natural sources</i>			
	0.600	0.250	no est.
<i>Atmosphere—emissions fallout</i>			
	0.600	0.300	no est.
Total	6.113	3.250	0.569
Discharge from tanker operations	1.080	0.700	0.159
Crude traded	1,100	1,319	1,097
Discharge as percent of crude trade	0.098	0.053	0.015

Sources: MEPC 1990c; National Academy of Sciences 1975; National Academy of Sciences and National Research Council 1985.

tons of that into the oceans.¹ Increased transportation of crude oil by sea has led to subsequent estimates of intentional discharges ranging up to five million tons per year (McKenzie 1978; National Academy of Sciences and Council 1985; Pritchard 1978; Wardley-Smith 1983).

Accidents and discharges of bilge oil by nontankers constitute other sources of ship-generated oil pollution. Municipal and industrial wastes and runoff also contribute significantly to ocean oil pollution (see table 2.1). In the 1950s, experts considered intentional discharges as the major source of ocean oil pollution, with other sources representing only a "small part" of the problem (United Kingdom 1953, 9). More recent estimates indicate oil from intentional discharges, despite increases in oil transport, has decreased far more rapidly than from other sources and now constitutes far less of the total.

As an extremely visible pollutant, oil often raises environmental concerns because of its aesthetic impact, even though biological impacts have proved difficult to identify. Scientific understanding of how oil affects the marine environment has developed slowly. Major tanker accidents cause immediate catastrophic biological damage in localized areas, but appear to have few wider and longer-term effects (GESAMP 1990, 2; National Academy of Sciences and Council 1985, 489). Concerns over intentional discharges have been more contentious. Until the 1960s, many scientists and regulators believed that oil persisted indefinitely in the marine environment (Kirby 1965; Pritchard 1987, 19; United Kingdom 1953, 7). This view was contested by studies, some conducted as early as the 1920s, that showed evaporation, decomposition, and bacterial action made oil “unobjectionable” over time (Kirby 1968, 210; Sutton 1964, 9). Intentional discharges that do not dissipate before they reach shore, however, kill seabirds by inhibiting the insulation of their feathers and causing internal damage when ingested. Recurring exposure to such discharges also appears to pose long-term threats to fish, shellfish, and other marine life in coastal zones along major shipping lanes (Camphuysen 1989; National Academy of Sciences and Council 1985; Patin 1979, 22–23).

Traditional international law has viewed the oceans as a global commons from which no state may be excluded. Like any public good, creating a clean ocean requires that a regime overcome free-riding problems. But oil pollution also constitutes an externality. In this case, the concentrated few who can provide for the public good (and must incur costs in so doing) do not benefit from it, while the diffuse many who benefit from a cleaner environment cannot provide it. Unlike a fisher, even after accounting for long-term interests, an oil transporter has no economic incentives to reduce pollution. The cleaner ocean is only a “good” at the socially aggregate level (Mitchell 1999). Ensuring that oil transporters reduce their discharges therefore poses particularly difficult problems that require an imposed order, at least vis-à-vis the polluter (Young 1983).

International efforts to regulate oil pollution have arisen from the interplay of several sets of actors: publics and nongovernmental organizations (NGOs) in a few activist coastal states pushing for international controls to reduce oil pollution, affected industries lobbying to avoid the costs of regulation, governments seeking to reconcile pressures at a national and

international level, and intergovernmental organizations seeking to foster negotiation and implementation of international agreements.

Unlike acid rain (see chapter 4), science has rarely placed the issue of oil pollution on the international agenda. Even without clear evidence of environmental harm, oiled seabirds and soiled beaches from frequent intentional discharges and from large, dramatic accidental spills have usually been the stimulus for calls for action. Most studies have justified action based on the costs of cleanup, decreased tourism, and deaths of birds (GESAMP 1990, 2; United Kingdom 1953, 2; United Kingdom 1981).

NGOs have also wielded less influence than in many other environmental problems. Domestic NGOs did pressure the British and U.S. governments to take leadership positions on intentional oil pollution control. From the 1920s through the early 1960s, campaigns by the Royal Society for the Protection of Birds (RSPB) and complaints from resort owners and local cleanup authorities focused on the small but continuous problems of oil from intentional discharges (Pritchard 1987, 12–13; United Kingdom 1953, 1–2). In the 1950s and 1960s, the British Advisory Committee on Oil Pollution of the Sea (ACOPS) sponsored several conferences that drew international attention and produced proposals for amendments to international agreements. The Committee on Law and Social Policy brought pressure on the United States in the 1970s to take action. In general, however, oil pollution has not been a major focus of NGO activism.

Rather, growing tanker traffic and increased environmentalism strengthened general public concern. Widespread media coverage of accidents led to calls in Europe and the United States for international regulation of intentional as well as accidental discharges (Cowley 1988, 3). The 1967 Torrey Canyon disaster—though not the first major tanker accident²—initiated a “we-must-be-seen-to-do-something” syndrome, prompting amendments to OILPOL in 1969 and 1971 and the 1973 MARPOL Conference (O’Neil 1990, 2). Thirteen tanker accidents (including eight near the United States) during the winter of 1976–1977 prompted the 1978 Tanker Safety and Pollution Prevention Conference. The Amoco Cadiz accident in 1978 prompted negotiation of a European Memorandum of Understanding (MOU) to enhance pollution

enforcement. The European MOU—and four more-recent MOUs in other regions (Plaza 1997)—involve intergovernmental agreements to cooperate in inspecting and enforcing existing International Maritime Organization (IMO) regulations, without promulgating additional ones. These regional organizations work closely with the IMO and are considered as part of the IMO regime in this analysis.

Two groups transport oil: oil companies and independent tanker owners. Many tankers register in developing states, such as Liberia and Panama. Major oil companies based in the United States and United Kingdom directly own and operate one-third of the world's tankers, control many more through long-term charters, and own the oil transported in both. Independents, based mainly in Norway, Sweden, Denmark, and Greece, own and operate the remainder but do not own the oil they transport. Not surprisingly, then, these groups differ in their preference for conserving oil by reducing intentional discharges. The equipment and operational costs of reducing discharges falls on tanker operators but the benefits of less wasted oil accrue to cargo owners. The economic incentives of oil companies to reduce the discharges of the cargo they own coincide with environmental goals whenever oil prices are high enough to offset recovery costs. By contrast, charter agreements generally pay independents for oil loaded rather than oil delivered, thus passing through few incentives to conserve oil.

Being fewer in number, oil companies have organized—through the International Chamber of Shipping, the Independent Tanker Owners Association (INTERTANKO), and Oil Companies International Marine Forum (OCIMF)—and influenced international rules more readily than independents. Oil companies supported international rules whenever such rules promised to derail unilateral U.K. or U.S. rules that threatened their competitive advantage. Among independents, the absence of a similar unilateral threat at home has produced resistance to most international regulation. Indeed, some analysts interpreted U.S. initiatives as aimed at achieving competitive advantage by excluding tankers bearing “undesirable” flags, putting smaller companies out of business with equipment retrofit costs, and providing work for stagnant shipyards (Glazov 1979, 278; Moguilevkin 1982, 194; Primakov 1986, 314).

Oil transportation also involves relatively small numbers of shipyards, classification societies, and insurers. Tankers are ordered directly from shipyards as new ships or bought used from previous owners. Industry-created classification societies, such as Lloyds of London and Det Norske Veritas, inspect and classify vessels to ensure conformance with specified criteria that generally reflect relevant international requirements. Insurance costs, in turn, depend on classification. The economic interlinkage of these actors in the oil transportation industry creates an infrastructure rich in information about tankers and their operators.

Any state's interest in and ability to control oil pollution depends on several factors. State positions depend on the political strength of environmentally concerned activists and publics relative to oil transportation interests. Developing states often lack strong environmental constituencies pushing for environmental control because other welfare issues assume greater national priority. Accidents near developing states have generally not led those states to push for greater pollution control. Traditional international law gave flag states exclusive jurisdiction to prescribe and enforce law over vessels registered in that state. Port and coastal states had to weigh the benefits of increasing their rights against the precedents it established in other issue areas, especially during periods when the Law of the Sea negotiations were occurring.

A state's ability to threaten unilateral legislation and to enforce international rules depended on its position in world oil markets. The United States and United Kingdom could prompt international action through credible threats of unilateral action because major oil companies were based there. Coastal states experiencing oil pollution could not act on their incentives to regulate and sanction it because they lacked legal jurisdiction over tankers flagged in other states. In contrast, flag states had the authority to detect and prosecute discharge violations but lacked incentives to do so. For example, 15 to 30 percent of all tankers register in Liberia which, being located off major transportation routes, receives little coastal pollution and has few incentives to regulate it. Similarly, oil exporting states could monitor compliance with rules regulating maximum discharges during the ballast voyage, tank inspections, and provision of reception facility but lacked incentives to do so. Importers and exporters of oil can monitor equipment, certification, and record-keeping

rules, and importers that experience pollution also have incentives to do so.

The oil pollution regime has developed through action at diplomatic conferences and within an international organization. The OILPOL Conference of 1954 established the Inter-Governmental Maritime Consultative Organization (IMCO) as a specialized U.N. agency. IMCO had a mandate to address all international shipping issues, including safety, working conditions, loadlines, and pollution. In 1982, IMCO was renamed, but not fundamentally restructured, as the International Maritime Organization (IMO). IMCO organized diplomatic conferences in 1962, 1973, and 1978. Amendments have also been negotiated within IMCO subcommittees. Creation of the Marine Environment Protection Committee (MEPC) as a full committee accompanied procedures for “tacit acceptance” of MEPC amendments that automatically enter into force unless more than one-third of the parties object.

Intentional oil discharges have remained the exclusive purview of IMO and MEPC. Regional organizations have consistently elected not to establish standards that differ from IMO rules. States and nonstate actors such as classification societies view IMO as the sole legitimate source for international shipping regulation.

Since its inception in 1954, the regime has maintained the constant goal “to take action by common agreement to prevent pollution of the sea by oil discharged from ships” (OILPOL 54, 1954). The MARPOL agreement currently in force still calls for “the complete elimination of intentional pollution of the marine environment by oil and other harmful substances” (MARPOL 73/78, 1978). This superficial consistency in goals, however, overlooks two deep changes in the regime: a broadening of its goals and a dramatic improvement to its regulatory structure that allowed it to achieve the goals it set for itself.

From its inception, this regime has been regulative in nature. The regime has followed a strategy of adopting the most restrictive rules possible given political constraints, allowing a period for actors to implement them, and revising the rules to reflect experience with earlier rules whenever politically feasible. Nonregulative strategies, e.g., technical and financial assistance, education, scientific and technical research programs, were possible but have played only minor roles in the regime. Unlike

acid precipitation (see chapter 4), negotiators considered oil pollution’s sources and deleterious aesthetic, if not environmental, impacts to be obvious. Unlike fisheries (see chapter 3), setting oil pollution standards did not require feedback on the environmental health of the ecosystem. Fixed rules, including a ban, could be entertained because oil pollution was an unnecessary externality. Rules could restrict the means without restricting the level of the environmentally harmful activity. Unlike in a fishery, the goals of immediate economic growth and long-term environmental protection could be met simultaneously, albeit at some expense. Negotiators could aspire to design rules that fixed, rather than processes that managed, the problem. Steady progress has been made at promulgating rules that covered more pollutants, had a better chance of achieving regime goals if actors complied with them, and were likely to lead actors to comply.

The 1973 MARPOL agreement defined the environmental problem in far broader terms than had the 1954 OILPOL agreement. MARPOL strengthened OILPOL’s rules on discharges, added expensive equipment standards and restrictions to reduce accidental pollution, and incorporated annexes to address four other vessel-source pollutants. Since then, the MEPC has continued to broaden the regime’s scope, regulating air pollutants from ships, noxious solid substances, and organism-contaminated ballast water.

Three Distinct Subregimes

The following discussion provides brief histories of the regime’s three subregimes that have sought to limit discharges in designated zones, and subsequently, oceanwide; to require equipment that reduced the oil-water mixtures created; and to provide alternative means of oil-water disposal.

The Discharge Standards Subregime After unsuccessful negotiations to regulate intentional discharges in 1926 and 1935, attention to the problem resurfaced in the early 1950s, driven largely by domestic concerns within the United Kingdom. In 1953, a British panel recommended the government impose strict discharge limits on U.K.-registered ships and host an international conference. The British convened the OILPOL Conference in 1954. The resultant agreement sought to reduce coastal

pollution by requiring tankers to refrain from discharges within “prohibition zones” extending fifty miles off the coast of member states. The logic was that discharges mixed with enough water and made far enough from shore would dissipate before causing coastal pollution. The agreement allowed discharges below 100 parts of oil per million parts of water (ppm) within even these prohibition zones.

Amendments in 1962 extended these zones to 100 miles for several countries and, more significantly, prohibited new tankers from exceeding the 100 ppm limit anywhere in the ocean (OILPOL 54/62, 1962). This latter rule was the first to require any tankers to reduce, rather than merely redistribute, their discharges. Although existing tankers could comply simply by discharging outside prohibited zones, new tankers would need equipment that could measure oil content if they were to even appear to comply. This implicit equipment requirement prompted British-based Shell Oil to develop the Load on Top (LOT) method to reduce discharges by combining deballasting and tank-cleaning slops in a single tank, discharging water from underneath the oil as it separated out, and recovering the remaining oil by combining and delivering it with the next load of cargo. LOT required more time and effort from tanker operators than did discharging, but benefited oil companies by reducing wasted cargo and allowing tankers to address pollution concerns without buying new equipment. Unfortunately, although the total discharges of a tanker using LOT would decline, the oil content of its discharges would often exceed the 100 ppm standard unless it also installed expensive oil content monitors. Oil companies, therefore, lobbied for a revised standard that would legalize LOT.

The 1969 amendments, which took effect in 1978, did legalize LOT but also—over the objections of oil companies—expanded the 1962 principle of reducing discharges to all tankers, new and existing. Within coastal zones, tankers could discharge only “clean ballast” that produced “no visible traces of oil” (OILPOL 54/69 1969). Outside these zones, tankers had to keep the rate of discharge below 60 liters of oil per mile (l/m) and the amount discharged per voyage below 1/15,000th of a tanker’s cargo capacity. These new standards could all be measured with equipment that tankers already had on board. In 1973, MARPOL incorporated all existing discharge standards and tightened the total discharge

limit to 1/30,000th of cargo capacity for new tankers. These discharge standards took effect when the MARPOL Convention and its 1978 Protocol (MARPOL 73/78 1978) entered into force in 1983 with a minor reduction in the legal rate of discharge to 30 l/m in 1993 (Anonymous 1993).

All these regulations targeted the actions of tanker operators and relied on deterrence to influence behavior. Detecting violations of the 100 ppm and 60 l/m limits entailed costly wide-area naval or aerial surveillance or port inspection of oil record books in which captains were to record all discharges, whether illegal or not. The clean ballast provision remedied the problem that violations of the 100 ppm and 60 l/m criteria could not be independently verified. The total discharge provision went further by allowing port inspections to identify violations by confirming that essentially all expected slops were still on board. Because tankers only produce slops on the ballast voyage, however, only oil loading ports could conduct such inspections. If they did so, international law required they turn over prosecution and penalization to the ship’s flag state. The 1962 and 1969 amendments developed clauses requiring states to detect, prosecute, and stiffly penalize discharge violations in an effort to improve enforcement.

The Equipment Standards Subregime By the early 1970s, the United States had grown concerned that compliance with the 1962 discharge standards in force at the time was “spotty, at best,” and doubted industry claims that compliance with the 1969 amendments would be significantly higher (M’Gonigle and Zacher 1979, 227–228). Increasing environmental concern had already prompted Congress to pass legislation in 1972 requiring all American tankers and all tankers entering American ports to install segregated ballast tanks (SBT) and double hulls unless other nations accepted comparable international rules. SBT involves configuring a portion of a tanker’s tanks and piping so it never carries oil, thus eliminating the oil and water mixtures created by traditional ballasting. SBT-equipped tankers generated far fewer slops than a comparable tanker practicing no pollution control, and their ability to reduce discharges was roughly equivalent to that of a tanker complying with the discharge standards. In response to the American threat, IMCO convened

the MARPOL conference in 1973, which promulgated the first requirements for equipment to reduce the amount of slops a tanker generated. Several countries accepted the United States' argument that the monitoring, enforcement, and compliance problems of discharge standards could not be remedied through further refinement; more fundamental changes were needed. Garnering reluctant support from American oil companies seeking to avert unilateral regulations, the United States modified its proposal to require only large tankers built after 1979 to install SBT. This modification ignored the many small tankers and allowed a long phase-in period before it applied even to all large tankers, but it constituted a proposal most countries could support.

By 1977, growing environmentalism at home again forced the U.S. government to place intentional oil pollution on the international agenda. A spate of accidents led President Carter to propose requiring all existing ships to retrofit with SBT and double hulls. As in 1972, the United States also threatened unilateral action if international rules did not meet its concerns. IMCO convened the 1978 Tanker Safety and Pollution Prevention Conference. Having concluded from the 1973 MARPOL negotiations that new equipment requirements were inevitable, oil companies and maritime states developed and proposed crude oil washing (COW) as an alternative to SBT. Spraying down tanks with crude oil during delivery (rather than water during ballast voyages) increased cargo delivered while reducing waste oil. The 1978 protocol produced a compromise between the industry and American positions. It required all ships, large and small, built after 1982 to install both SBT and COW, but allowed older ships to retrofit with either option. Once an owner installed COW or SBT, that tanker's captain (even if unconcerned about pollution) would discharge fewer slops. The environmental promise of the 1978 Protocol lay in requiring all tankers—new and existing, large and small—to retrofit with at least one of the technologies.

Equipment regulations provided the foundation for a subregime based on a more effective strategy that would prevent, rather than deter, violations (Mitchell 1996; Reiss 1984). Responsibility for compliance shifted from tanker captains to tanker owners, and the site of violation shifted from the open ocean to the shipyard. MARPOL required flag state surveyors, or classification societies nominated by them, to conduct surveys dur-

ing construction and retrofit, then periodically thereafter. Classification societies often have both a greater capacity and greater incentives to conduct surveys than do flag states. Inspectors would certify equipment compliance via an International Oil Pollution Prevention (IOPP) certificate (MARPOL 73/78 1978, Annex I, Regulation 4). Port states could then, under MARPOL, verify that required equipment was on board and operating properly. These inspections piggybacked on existing classification society and government inspections for safety, customs, and other domestic and international regulations.³

Equipment rules induced compliance in two ways. Although a tanker captain faced no constraints in discharging illegally, a tanker buyer needed cooperation from a builder, a classification society, and an insurer to get a tanker built without the required equipment. These actors had few incentives to assist in such violations. Thus, even buying a non-compliant tanker became next to impossible. This aspect of the regime was reinforced by a tanker owner's knowledge at the time of construction that resale of an illegal tanker would be lower because it would have access to fewer oil markets. Thus, equipment standards were harder and less attractive for tanker owners to violate, reducing the subsequent need for programs to monitor and enforce.

MARPOL also created the structure needed to make such regulations work. The convention explicitly authorized port states to bar noncompliant ships from their ports or detain them until they no longer posed "an unreasonable threat of harm to the marine environment" (MARPOL 73/78 1978, Art. 5(2)). Developed port states, which were significantly more environmentally concerned, could monitor and respond to equipment violations without the assistance or approval of reluctant flag states.⁴ The ease of identifying violations and linking them to violators, coupled with the authority to detain tankers or bar them from entry, if caught in violation, provided a strong deterrent, reinforcing the elements of the compliance system that prevented violation in the first place. Notably, this deterrent threat has rarely been used in response to an equipment violation.

The Reception Facility Subregime Although LOT, SBT, and COW all reduced the quantity of slops that a tanker needed to discharge, in many circumstances tankers still generated some slops that could not be

discharged within treaty limits. Addressing this required oil-loading ports to provide reception facilities as an alternative to disposal at sea. The 1954 convention required that states “ensure provision” of reception facilities for nontankers in “major” ports, but it allowed each state to define which ports these were (OILPOL 54 1954, Art. VIII). Facilities for tankers were recommended but not required. The United States and Liberia both did not ratify the convention because of this article, objecting to making governments responsible for the costs of providing facilities (Okidi 1978, 33). The 1962 conference reflected these concerns, rejecting proposals for tighter obligations and rewriting the article, requiring only that governments “take all appropriate measures to promote provision” and recommending that industry provide reception facilities “as a matter of urgency” (OILPOL 54/62 1962).

In 1973, MARPOL reverted to the requirement that states “ensure provision” of reception facilities, expanding its application to both non-tanker and tanker ports, as well as clearly defining such ports. These facilities had to avoid causing delay to tankers using them. IMO designated “special areas” for greater environmental protection and established more stringent requirements for them, including requirements that states ensure reception facilities in ports in the Mediterranean, Black, and Baltic Seas special areas by 1 January 1977 regardless of when the treaty entered into force, in other special areas “as soon as practicable,” and elsewhere within one year of the treaty’s entry into force (MARPOL 73/78 1978, Annex I, Regulations 10 and 12).⁵ Many states have interpreted the language that governments must “ensure the provision” rather than “provide” reception facilities as requiring oil companies and port authorities, not governments, to pay for the facilities (M’Gonigle and Zacher 1979, 116). This language papered over what has become a continuing debate over whether governments or industry must provide facilities.

Making reception facilities available in more ports was necessary, but by no means sufficient, to assure fewer discharges. Even adequately sized and efficient facilities involved additional time and expense in port for a tanker operator compared to discharging at sea. Requiring facilities in more ports and on a designated timetable in special areas represented improvements. Unfortunately, MARPOL was signed and ratified by only

four of the thirteen Organization of Petroleum Exporting Countries (OPEC) states where facilities were most needed.

To encourage ports to provide facilities, IMO has periodically surveyed existing facilities and studied the need for facilities in particular regions, but it has made few efforts to fund facilities where needed or to sanction governments that failed to ensure their provision (Anonymous 1996). Although OILPOL and MARPOL encouraged captains to report inadequate facilities to IMO through their governments, few such reports have been submitted.

Causal Narrative

The regime has clearly experienced considerable change over the past four decades. Do improvements in the rules and the shape of the rules reflect the regime’s influence or simply exogenous changes in the interests of powerful actors? Did any of the regime’s rules, especially those aimed at altering tanker operators’ and tanker owners’ behavior, have their intended effects? Did behavior change, and, for those changes that did occur, was the regime responsible? This section depicts “snapshots” of the behavioral complex to identify such changes and assess their causes. This regime’s concern with compliance makes it appropriate to evaluate the regime predominantly on legal effectiveness, but the following section also evaluates the regime with respect to the other definitions of effectiveness delineated in chapter 1.

Environmental Improvement

Despite empirical obstacles, one can assess the environmental or problem-solving effectiveness of the intentional oil pollution regime with some confidence. In the 1950s and 1960s, estimates suggested that a typical tanker discharged 0.4 to 0.5 percent of each voyage’s cargo as slops, producing a world total of about 1 million tons per year (IMCO 1965, 6; Moss 1963; National Academy of Sciences 1975). A later National Academy of Sciences’ study estimated the total was down to 750 thousand tons per year, despite significantly higher tanker traffic, and reestimated in 1989 that this figure was down to 159 thousand tons per year (MEPC 1990c; National Academy of Sciences and National Research Council

1985). Estimates of the percent of transported crude discharged at sea also declined from an estimated 0.4 percent in the 1960s to 0.098 percent in 1971, to 0.053 percent in 1980, and to 0.015 percent in 1989 (table 2.1). Other independent estimates made between 1960 and 1990 confirm a consensus that intentional oil pollution decreased over time, especially after MARPOL's signature in 1973.

Such estimates, however, must be treated with caution. Most rely on assumed rates of oil clingage to tanks, actual tanker traffic levels, and judgments regarding how oil companies and independent tankers were discharging their waste oil. Trends can reflect changes in analytic assumptions as much as, if not more than, changes in the real environment.⁶ Although experts have traditionally underestimated intentional discharges and overestimated improvements, intentional discharges—both in total quantity and per ton transported—have most likely decreased (Khristenko 1983, 24).

Data on environmental quality do lend some support to the view that discharges have decreased. Data from the U.S. Pollution Incident Reporting System for 1973 through 1986 show major decreases in intentional discharges as a result of bilge pumping and other operations by tankers and nontankers, but only small declines in ballast discharges. Marine tar surveys show ship-source oil pollution decreasing between 1969 and 1980 (Holdway 1986; Smith and Knap 1985). Russian data indicate North Atlantic tar concentrations peaked in 1980, dropped in 1982, stabilized at low levels in 1983–1986, and increased slightly from 1986–1988 (Simonov 1984; Simonov and Orlova 1987; Simonov and Orlova 1989).

Many analysts have not only claimed that intentional discharges have declined, but have linked the decline to the OILPOL/MARPOL regime. As early as 1965, oil companies claimed that LOT had eliminated 60 percent of all intentional discharges (IMCO 1965, 6). The evidence of behavior change presented below also supports the conclusion that compliance with regime requirements decreased intentional discharges over time. By adopting LOT, many tankers undoubtedly reduced their average discharge, even if they violated specific limits on total discharges. The high level of compliance with MARPOL's equipment requirements and the reduced discharges when such equipment was used also suggest that

total oil inputs declined. The continuing adoption of these technologies by the fleet should be producing further reductions. In 1990, one IMO official concluded that uncertainty regarding compliance levels meant that intentional discharges "could lie between 6 and 0.1 [million tons], but the author optimistically assumed that it would be much nearer to the latter" (Sasamura 1990, 3–6). A more impartial GESAMP study concluded that MARPOL "regulations have resulted in a major reduction of intentional pollution" (GESAMP 1990, 21).

These data clearly require cautious interpretation with respect to both trends in intentional discharges and assertions that the regime caused such trends. None of the data sources are individually robust. Taken together, however, environmental quality data, expert estimates, and compliance evidence reinforce arguments that oil pollution from vessels "is now less serious than it was a decade ago" (IMO 1989, 12). The data are consistent with a view that discharges have declined and that compliance with the regime's discharge and equipment standards account for some share of this. Because some tankers continue to discharge illegally, however, and because tankers are only one among many sources of oil pollution, environmental improvement proves hard to discern. Oil pollution remains a problem, but probably a smaller one than experienced previously. Without putting much faith in precise estimates of levels of intentional discharges, it appears that the regime has had some degree of problem-solving effectiveness, moving toward, if not completely achieving, the goal enshrined in OILPOL's preamble: "to prevent pollution of the sea by oil discharged from ships" (OILPOL 54 1954).

The poor quality of available data suggests one more conclusion. Given that this regime is one of the oldest environmental regimes and that it has had a consistent goal for over forty years, the lack of any program systematically to collect and analyze data on environmental quality is a distressing failure. Such a program would allow better evaluation of whether the regime was having its intended effect of solving the oil pollution problem. The studies cited here have involved ad hoc government or independent efforts that lack any of the coordination needed to make results comparable across studies and over time. As the long-range transboundary air pollution regime (see chapter 4) suggests, such programs are

difficult to coordinate and are by no means sufficient to unambiguously identify trends in environmental quality or the causes of those trends. Collecting such data is a necessary first step, however, in evaluating whether the regime is helping to resolve and manage the problem that motivated its creation.

Scope and Stringency of Regulations

If the regime has had the strategic goal of reducing intentional discharges since its inception, it has sought to achieve this goal through the more immediate, tactical goals of

- (1) increasing the activities regulated,
- (2) developing rules that would improve the environment if complied with, and
- (3) eliciting compliance with those rules.

In 1954, OILPOL rules dealt exclusively with intentional oil pollution from vessels and achieved only low levels of compliance. Even had compliance levels been higher, these rules would not have significantly mitigated the environmental problem. By 1998, the regime regulated intentional discharges from offshore oil rigs, accidental spills from tankers, most other hazardous cargo, as well as sewage, garbage, and most air pollutants produced by ships. Compliance is now higher than in 1954 and more likely to produce the desired environmental improvement.

Can the regime take credit for the change between these two snapshots? Certainly most of the impetus to expand the scope of regulations came from exogenous forces, not from processes set in motion by the regime. Governmental and industry agreements on liability for and responses to accidental spills were negotiated only in the wake of disasters such as the Torrey Canyon and Exxon Valdez.⁷ MARPOL included non-oil pollutants in response to growing environmental concern, especially in the United States. In almost every case, new regulations were responses to external stimuli, such as major accidents and threats of unilateral U.S. action, not to IMO initiatives or activism.

The regime facilitated regulation of these new arenas. As new problems arose, the lower transaction costs of negotiating new agreements within a single, existing forum had obvious advantages (Keohane 1984). The international nature of the shipping industry and of oil pollution made

a single forum useful. Furthermore, both governments and industry preferred unified rules to a patchwork of regional and unilateral measures. Although such exogenous interests may explain why IMO has exercised "sole proprietorship" over these issues, they do not explain the speed and shape of regulatory progress. MARPOL preparation and negotiation of stringent standards on five major categories of pollution took less than two years. Requirements for equipment to reduce oil dispersed during accidents and limiting air pollution from ships were quickly adopted as minor amendments to MARPOL. In contrast, LRTAP (see chapter 4) has taken years to negotiate each of its protocols on individual air pollutants. The speed of negotiation suggests that MARPOL benefited from the structure and diplomatic experience gained in negotiations of OILPOL and its amendments. Placing OILPOL under a UN specialized agency responsible for all maritime issues created the experience, expertise, and legitimacy needed to justify regulating all vessel-source pollutants within the same regime. Indeed, this single framework provides a striking contrast with the separate regimes for acid precipitation, stratospheric ozone protection, and climate change, or the species-specific approaches to fisheries (see chapters 3 and 4, Peterson 1993).

A single legitimate forum also averted unilateral and regional remedies. The United Kingdom in 1953 and the United States in 1972 and 1977 were ready and able to take unilateral action, but refrained from doing so after less stringent international rules were adopted. European states channeled their concern over oil pollution after the 1978 Amoco Cadiz disaster into an agreement to more rigorously enforce existing IMO regulations instead of, as one might have expected, into more stringent tanker requirements. Latin American, Asian and Pacific, Caribbean, and Mediterranean states have channeled environmental concern into enforcing existing MARPOL standards rather than promulgating new ones (Plaza 1997). Thus, the regime has made cooperation far easier to negotiate and implement than if these countries were faced with having to develop new international agreements. It appears highly unlikely that such nested enforcement regimes as now exist, or such comprehensive regulation of air pollution from ships (which contributes only a small share to the global problem), would have developed at all in the absence of the existing regime.

The regime's standards have also increased in stringency over four decades. Even assuming perfect compliance, the 1954 rules required only that tankers discharge farther from shore. The 1962 rules limiting discharges throughout the ocean would have taken decades to have environmental effects as they applied only to new tankers. The 1969 limits on total discharges corrected this by requiring all tankers to reduce discharges effective upon entry of the rules into force. MARPOL's restrictions on new tankers limited total discharges still further for new tankers. And the rules also improved the likelihood of enforcement and compliance. Even a conscientious captain could not monitor compliance with the 1954 and 1962 limits, because the technology needed to measure oil content at 100 ppm did not yet exist. Detecting violations required sighting large and blatant spills or the unlikely possibility of port inspectors identifying a crew that had incriminated itself by logging its illegal discharges in the Oil Record Book (ORB). The 1969 "no visible trace" rule facilitated detection of violations by ships and aircraft, although linking detected slicks with the responsible tanker remained a problem. The total discharge rule went further and made it possible for oil loading states to unambiguously identify violations and their perpetrators through in-port inspections.⁸

MARPOL continued this trend toward more stringent regulation. MARPOL's 1973 requirements for equipment on large new tankers cost industry more than discharge standards and also improved environmental protection by increasing the likelihood of industry compliance. The 1978 protocol extended these rules to all tankers. MARPOL also set fixed dates for industry compliance with provisions concerning equipment and reception facilities. Few states entered the 1973 and 1978 negotiations supporting SBT requirements, and powerful states including Japan and France actively opposed their adoption. States that were home to large independent fleets—Denmark, Germany, Greece, Norway, and Sweden—opposed SBT requirements in 1973. Even when, in 1978, they supported SBT retrofits as a means of reducing global tanker capacity and increasing transportation prices, they had no incentives to actually apply those requirements to their own tankers. Laggard states accepted these more stringent rules because they involved few immediate costs and because of U.S. threats of even costlier unilateral requirements. More stringent rules clearly depended on these threats but the United States would

have been less successful at getting other countries to accept such regulations. If, counterfactually, no regime had existed, laggard states would **have** accepted unilateral action as unpreventable but unfortunate, and **they** would have been unlikely to adopt such regulations themselves. The regime thus altered their perception of their alternatives: laggards **accepted** regulations more stringent than they desired as a quid pro quo for **activist** states to forego even more stringent unilateral measures.

Did this increasing stringency merely reflect increasing public concern or hegemonic pressures? This appears unlikely, as the rules adopted have **been** more stringent than many governments or industry would have **adopted** unilaterally. Even the rather weak 1954 rules exceeded what **most** countries would have done otherwise. The United States believed **its** own rules had obviated the need for international action (International Conference on Pollution of the Sea by Oil 1954, 4). Denmark, France, Japan, Norway, Sweden, and most developing states also opposed regulation as unnecessary (Pritchard 1987, 98–99; United Nations 1956). The 1962 amendments were accepted despite the opposition of oil and shipping companies and of the United States, Japan, Norway, and the Netherlands (M'Gonigle and Zacher 1979, 95–96). The 1969 amendments to **apply** more stringent discharge limits to all tankers were accepted even though few states had similar legislation pending and despite calls by **Shell** to eliminate OILPOL's requirements altogether in favor of voluntary industry adoption of LOT (Kirby 1968). The regime allowed the **United Kingdom** and the **United States** to induce far more states to incorporate stringent regulations into national law than would have been possible through unilateral action or diplomatic pressure outside the regime forum.

Lastly, the regime established rules that no state could have promulgated unilaterally. International law limited state jurisdiction over territorial seas out to three miles, and OILPOL regulated actions of foreign tankers out to fifty miles. International law gave flag states the exclusive right to inspect a ship's tanks; the 1969 amendments established this right for port states. International law forbade detaining foreign tankers for pollution violations, while MARPOL established the right to do so. International legal norms consistently inhibited states from taking unilateral action considered to **infringe** on other states' sovereignty, yet MARPOL made such actions possible.

The regime has had negative effects as well. Pollution control regulations are now so numerous that tanker operators find it difficult to know which rules apply to them. The regime has tended to overregulate, restricting pollutants from ships even in cases in which ships constitute a minor portion of the problem. One may even fault the regime for underregulating the land-based sources that constitute the primary share of marine pollution. These sources have been addressed through a piecemeal approach that leaves many pollutants uncontrolled in some regions. From an economic perspective, the regime has not achieved ecological improvement as efficiently as possible, resorting to inefficient command-and-control approaches while rarely determining whether the benefits of control exceed the costs.

In summary, the regime provided a forum within which the preferences of dominant states and the pressures resulting from dramatic tanker accidents and larger environmental concerns produced international regulations broader in scope, more stringent, more rapidly adopted, and acceptable to more states than if those same preferences and pressures had operated without the benefit of the regime. The regime could not have achieved these changes without pressures from dominant states and publics, but neither would those pressures have produced such extensive regulation without the regime.

Eliciting Behavior Change: Deterrence, Prevention, and Compliance

Differences among the discharge, equipment, and reception facility sub-regimes offer an opportunity to evaluate the relative effectiveness of their methods of eliciting behavior change (see chapter 1). Equipment standards led tanker owners to install expensive equipment despite its costs, classification societies and flag state governments to adopt new standards for monitoring ships, and some port state governments to detain non-compliant tankers. In contrast, the discharge and reception facility sub-regimes have been far less successful at eliciting new behaviors.

Discharge Standards In 1954, most tankers could and did discharge oil slops wherever their captains saw fit. By 1998, although rules constrained the rate, location, and amounts of legal discharges, which appeared to have declined, intentional discharges remained common among some of

the tankers that did not yet face equipment requirements. Various efforts to increase this subregime's influence failed to cause fundamental changes in the behavior of tanker operators. Why? Relying on a deterrence-based model of compliance, discharge standards required extensive and effective enforcement to alter tanker operators incentives, and hence their behavior.⁹ Before tanker operators would adopt new ways of discharging their waste oil, governments would have to adopt policies that would detect, prosecute, and penalize noncompliant operators at rates sufficient to offset any gains from violation.

Under OILPOL's initial rules, government authorities could detect violations either by inspecting the oil record book or by aerial and naval surveillance. A 1961 IMCO survey, however, documented that the difficulty of conducting such inspections made them quite rare.¹⁰ Not unexpectedly, states identified numerous reasons for the lack of enforcement. The oil record book relied on self-incrimination, could be easily falsified, and initially did not even require recording of the information relevant to identifying violations. Surveillance was costly, difficult at night and in high seas, and plagued by the low ratio of surveillance area to potential violation area.¹¹ Finally, most violations had to be referred to recalcitrant flag states for prosecution (Pritchard 1987).

The 1969 Amendments began to remedy these enforcement problems. Its "clean ballast" rule was hailed as a remedy to both detection and evidentiary problems, because "any sighting of a discharge from a tanker within fifty miles from land would be much more likely to be evidence of a contravention of the convention" (IMCO 1977, Annex, Par. 5). MARPOL went further and required states to practice "all appropriate and practicable measures of detection," and many developed states began aerial surveillance programs in the 1970s (Anonymous 1990b; Cowley 1990; McLoughlin and Forster 1982; MEPC 1978; Peet 1992, 11-12; Omit-Kroes 1988). The growth in government monitoring of discharge violations, however, appears unlikely to have been a response to international rules. Some monitoring began before the requirements took effect, others began more than five years after the requirements, and many were small and later discontinued (Collins 1987, 277). Almost all programs, including that of the United States, focused close to shore despite the 60 l/m limit on discharges beyond the fifty-mile zone. Aerial surveillance

appears to have been more responsive to domestic environmental pressure than to international regulation.

The clean ballast and 60 l/m standards also did not remedy the difficulties of linking vessels to illegal discharges with evidence adequate for prosecution. The 1961 survey had shown that successful prosecutions almost always involved discharges in port, not at sea where evidence was far harder to collect (IMCO 1961). Port and coastal states still fail to refer more than one-third of all violations to flag states for lack of evidence, and one-fifth of the cases that have sufficient evidence are never prosecuted (Peet 1992, 14). Aerial surveillance photographs often fail to convince port state prosecutors to pursue a case, let alone prosecutors in flag states (Cowley 1990). Governments are not required to accept photographs of slicks as evidence of a violation, despite the clean ballast language (IJlstra 1989).

Even the total discharge standards failed to induce more enforcement because, although in-port inspections could now detect violations, initially only flag state officials and oil company representatives had the legal authority to conduct such inspections. The former were rarely present in a port of call and the latter had few incentives to report the results of such inspections. MARPOL remedied this by giving port states the right to inspect ships and their tanks (MARPOL 73/78 1978, Art. 6(2)). Since discharges could only be calculated after the ballast voyage, however, such inspections had to occur in oil loading states. Only four such states signed MARPOL, and no oil loading state had incentives to expend resources to keep other states' coasts clean, while placing their own ports at a competitive disadvantage relative to states with less burdensome inspections (Burke, Legatski, and Woodhead 1975, 126).¹² Total discharge limits failed because they placed new rights and obligations on governments that had little logical, and had shown little historical, incentive to undertake enforcement.

Prosecution of any discharge violations was rare because customary international law and OILPOL relied on the principle of flag state jurisdiction. States had to hand over evidence of violations outside their territorial seas to flag states who often were reluctant to prosecute their own tankers. For flag states, prosecution benefited others and entailed immediate costs and threats to revenues derived from ship registry fees. The 1961

IMCO survey revealed that flag states did not successfully prosecute any of the 128 violations referred to them. National reports to IMO show that, from 1967 to 1983, only 16 percent of referrals were successfully prosecuted by flag states and that this figure has decreased since MARPOL took effect in 1983 (Mitchell 1994, 163).

With such low detection and prosecution rates, deterring discharge violations required states to impose stiff penalties in the few cases of conviction. Indeed, treaty clauses and IMO resolutions have consistently tried to induce states to impose stiff penalties (MARPOL 73/78 1978, Art. 4(4); IMCO 1968; IMCO 1979; IMCO 1981; M'Gonigle and Zacher 1979, 222; U.S. Congress 1963, 40). Neither authorized nor imposed fines, however, have ever been high (M'Gonigle and Zacher 1979, 228; Mitchell 1994, 168–169).

Given these enforcement problems, it is not surprising to find that initially low levels of compliance have not improved. High quality time-series data on compliance are unavailable, but a wide array of evidence suggests that noncompliance with discharge standards was frequent early on and remains common. IMO experts and governments have often cited continuing discharge violations to justify their calls for greater enforcement effort (Anonymous 1990a, 12; MEPC 1989a; MEPC 1991d). Industry representatives admit that tankers frequently must violate discharge standards because governments fail to provide reception facilities and because charter arrangements often require tankers “to arrive with clean ballast at loading ports” (Anonymous 1990c; MEPC 1989b; MEPC 1991c). U.S. tanker crews have claimed that illegal discharges are “the norm on the high seas” (Curtis 1985, 707). German port authorities found that half of all tankers “were unable to declare where oil residues had gone” (Second International Conference on the Protection of the North Sea 1987, 14).

Specific data on compliance with the total discharge limits reinforce the conclusion that tankers frequently fail to comply with discharge standards. Reports to IMO of total detected violations and average detected violations per country have decreased since the 1969 Amendments entered into force in 1978 (see table 2.2). These data, however, include significant differences in the number of countries reporting and do not allow adjustment for the amount of enforcement effort involved. More

Table 2.2
Alleged violations of discharge provisions of OILPOL 1954/62/69 and MARPOL 73/78

Year	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
<i>Number of reports of alleged discharge violations</i>																
Port and coastal states reporting	3	4	4	7	10	13	5	NA	10	10	13	12	10	15	15	15
Reported violations	145	185	166	397	497	570	91	NA	87	185	199	191	113	163	181	125
Avg. violations per reporting country	48	46	42	57	50	44	18	NA	9	19	15	16	11	11	12	8
<i>Number of reports of referrals of alleged discharge violations to flag states</i>																
Countries reporting	1	1	2	4	6	8	1	1	10	10	12	12	8	12	13	13
Reported referrals	6	9	23	115	139	180	5	10	40	150	131	170	97	144	157	98
Avg. referrals per reporting country	6	9	12	29	23	23	5	10	4	15	11	14	12	12	12	8

Sources: Dempsey 1984, 487 and 511; Peet 1992, annexes 4, 5, and 11.

consistent data from ongoing Dutch surveillance programs and from oiled seabird surveys suggest that oil slicks detected in the North Sea have not decreased significantly since the early 1970s (Camphuysen 1989). States participating in the European Memorandum of Understanding have detected oil record book violations at a relatively constant 3 percent rate of all inspections since the early 1980s. There are still “many cases of unlawful discharges of oil into the sea” (Second International Conference on the Protection of the North Sea 1987, 14).

A 1976 Dutch survey found only sixteen of seventy tankers using Load on Top (MEPC 1976). A 1981 National Academy of Sciences study assumed that 50 percent of the world tanker fleet was violating the 1/15,000th limit (MEPC 1981). Although they updated this figure in 1989 to 80 to 85 percent compliance, they supplied no supporting evidence for their greater optimism (MEPC 1990c, 15). Several studies have found that tankers discharged far fewer slops at reception facilities than they were estimated to generate (den Boer, Havinga, Hazelhorst, Holsink, Meijer, Splint, van Spronsen, and Zwijnenberg 1987; Vanhaecke 1990). Even oil company surveys in the 1970s found “a long-suspected indifferent compliance by LOT tankers”; one-third of them were not using LOT at all and another third were using it poorly (M’Gonigle and Zacher 1979, 110–111; Pritchard 1987, 214). Oil company tankers had reduced their discharges significantly by 1975 but were still averaging three times the legal limit of 1/15,000th while independent tankers were discharging thirty times this limit (U.S. Congress 1980, 5). The timing of discharge reductions that did occur, however, and the fact that oil company tankers—who owned the cargo—changed their behavior far more than independents—for whom pollution reduction involved only costs—suggests that the behavior was responding to increasing oil prices in 1973 rather than entry into force of OILPOL requirements in 1978.

This evidence suggests the discharge subregime has not significantly changed tanker operator behavior. Attempts to make the subregime more effective have consistently failed to induce the desired behavioral changes by either governments or nonstate actors.

Reception Facilities Most developed states today have many more facilities to receive oil wastes than they did in 1954. Many of these ports still

lack adequate facilities, however, and most ports in developing states lack, or have inadequate, facilities. Especially disturbing is the absence of facilities in ports in oil-loading states and in special areas where reception facilities are most needed. If the discharge subregime illustrates a case in which initial ineffectiveness led to numerous, if unsuccessful, efforts to improve subregime rules, provisions on reception facilities illustrate a case in which states have been reluctant to agree on any measures that had a chance of making the subregime effective. The reception facility subregime has explicitly rejected sanctions for noncompliance and positive incentives for compliance, relying exclusively on the stigma of public knowledge of noncompliance to induce behavioral change. The subregime has largely failed, however, to establish the system needed to implement even such a minimal strategy.

The subregime has consistently faced a conflict between the need for efficient reception facilities as a viable alternative to discharging at sea and the unwillingness of governments to incur the costs of providing such facilities. Initially, reception facility requirements did not clarify whether governments or industry were responsible for providing them.¹³ Even MARPOL language that specified dates for ensuring provision of reception facilities failed to specify who must provide them. Tanker owners and operators continue to contend that providing facilities is a government, not industry, responsibility (MEPC 1983a; MEPC 1989c).

The system established to induce provision of facilities also reflected the lack of commitment to ensuring their provision. This subregime relied on a system of national self-reporting that consistently failed to identify ports that lacked adequate facilities. Irregular compilations of national responses to surveys by the UN, IMCO, and IMO have been published in formats that help tanker captains identify and use reception facilities in ports that have them. The publications do not, however, assess the adequacy of facilities to meet tanker demand without undue delay, as required by the treaty, nor do they identify ports without facilities. In short, the system fails to identify any noncompliant ports. Recognizing this, amendments in 1962 and provisions in MARPOL required that governments annually identify noncompliant ports in other countries (OILPOL 54/62 1962, Art. VIII). While the reporting system for ports providing facilities evoked relatively high numbers of responses but did

not identify noncompliant ports, the reporting system for ports with inadequate facilities has produced very few responses. Before the late 1970s, not a single report was received. A 1984 survey of inadequate facilities received responses from only twenty-five countries (Sasamura 1984, 10–11). Between 1985 and 1992, only four of the seventy-five responses to IMO's required annual implementation reports have contained any information on inadequate facilities.

Reliance on government reporting clearly failed to identify ports lacking, or having inadequate, facilities. Independent evidence demonstrates that this nonreporting, whether intentional or not, masked significant noncompliance. The International Chamber of Shipping (ICS) surveyed ship masters in 1983, 1985, and 1990, and it found numerous ports where reception facilities were absent, had limited capacity, were costly to use, or involved long delays (MEPC 1983b; MEPC 1985; MEPC 1990d). As recently as 1996, the International Association of Independent Tanker Owners (INTERTANKO) was producing similar information while noting that the information "should have been made available" to IMO by governments and that "many countries, industrialized as well as developing, are in breach of MARPOL by having oil ports which do not provide these essential facilities" (MEPC 1996). IMO and various regional organizations have also identified ports in need of facilities, especially ports in special areas and in developing states (Montfort 1984; Placci 1984; Sadler and King 1990). The difference between the government reporting system and these other efforts confirm that governments have neither the incentives nor ability to check up on reception facilities in other countries' ports. Tanker operators have the ability to identify noncompliant ports; however, they "are reluctant to risk losing the goodwill of a harbour authority by making an adverse report on the reception facilities" (Hambling 1984). The obvious means of getting such information to IMO involved offering anonymity. Yet, governments had no incentive to offer such anonymity since doing so required them to put their credibility at risk when forwarding information provided by tanker operators. In contrast, shipping companies incur unnecessary costs when their ships enter ports with inadequate facilities, costs that led them, through the International Chamber of Shipping surveys, to offer anonymity to those reporting such facilities.

Even had noncompliant ports been identified, no response system existed to induce compliance. When ICS surveys or regional studies identified noncompliant ports, neither positive nor negative responses ensued. Early on, governments recognized that ports might not provide facilities because they could not afford, or had no incentives to incur, the costs involved.¹⁴ Moreover, although states that would incur these costs could fund facilities from oil revenues or port charges, they have few incentives to do so (Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea 1991). Various proposals have been made to have developed states fund facility construction, including imposing an international tax on oil imports (MEPC 1977), but the MEPC has yet to adopt any such program.¹⁵ Developed countries have often failed to fund facilities in their own ports and have been unwilling to finance them in developing countries.¹⁶ IMCO/IMO has hosted seminars to increase understanding of cheaper ways to provide reception facilities. After forty years, however, it seems unlikely that developed states will finance the compliance of developing states, as they have done with other environmental treaties (Keohane and Levy 1996).

IMO's rejection of positive incentives for providing reception facilities has been paralleled by a failure to sanction ports for not providing them. Some governments have penalized their own port authorities for not providing facilities, but none have sanctioned other ports or governments for failing to do so (Davison 1984; Hambling 1984; Powles 1984, 156–157). Governments have the ability but lack incentives to sanction one another for failing to make facilities available; in contrast, shipping interests have incentives but lack the authority “to penalize ports that neglect their obligations” (MEPC 1989c). IMO regularly exhorts countries to provide more and better facilities but has never blacklisted or otherwise shamed noncompliant countries. In short, the subregime has done a poor job of identifying ports lacking adequate facilities, and it has failed to fund or sanction, or get others to fund or sanction, governments whose ports lack facilities.

The costs of facility provision and the absence of deterrents or incentives to incur those costs predict low compliance levels. The regime nevertheless may have increased the number of available facilities. In 1935, only seven of thirty-four states had port reception facilities (Pritchard

1987, 60–61). Table 2.3 summarizes data from IMCO/IMO surveys between 1956 and 1990 on the fraction of ports reported without facilities.¹⁷ Most new facilities are in developed countries. Organization for Economic Cooperation and Development (OECD) countries, including the United States, have increased their number of facilities, number of ports with facilities, and percentage of ports with facilities. The sharp increase between 1973 and 1980 reflects reporting on more ports, installation of some new facilities, and the relabeling of some existing facilities. In contrast, OPEC oil loading states and other non-OECD have not provided the reception facilities needed to foster tanker compliance with discharge standards. Independent studies have estimated that 8 percent of U.S. ports and 18 percent of other OECD ports lack reception facilities, while 44 percent of non-OPEC, non-OECD states and 62 percent of OPEC states lack reception facilities (Sadler and King 1990).

Table 2.4 shows that reception facilities have been provided only, at best, by developed states. The oil exporting regions and special areas that MARPOL designated as most in need of environmental protection have few, if any, facilities. MARPOL established a January 1977 deadline for provision of facilities in the special areas of the Baltic, Black, and Mediterranean Seas but this deadline had no noticeable influence on behavior. The Red Sea, Persian Gulf, and Gulf of Aden special areas—which were to provide facilities “as soon as possible”—remain unimplemented twenty years after MARPOL was signed precisely because reception facilities remain unavailable.

The U.S. experience demonstrates how the regime influenced provision of reception facilities in developed states. Under OILPOL, the United States strongly opposed international calls for governments to provide reception facilities. Few facilities were added before 1960, and no new facilities were “constructed between 1962 and 1967” (Okidi 1978, 33). While negotiating MARPOL in 1973, a more environmentally concerned United States pushed for more stringent facility requirements but still left it to oil reclamation companies to provide them (Okidi 1978, 33). By the time MARPOL took effect in 1983, the United States explicitly required port authorities and terminal operators to provide facilities; more importantly, it required the Coast Guard to certify facilities as adequate and prohibited tankers from entering uncertified ports (Davison 1984,

Table 2.3
IMO surveys on reception facilities in port

Year	1956	1964	1973/1976	1980/1984	1990	1990
Source	IMO	IMO	IMO	IMO	IMO	SADLER
<i>All reporting countries</i>						
(No. of)						
Countries reporting	40	31	27	40	37	129
Ports	162	189	353	508	993	478
RFs	402	475	654	847	1,765	NA
Ports without RFs	37	31	37	22	104	151
Percent of ports without RFs	22.8	16.4	10.5	4.3	10.5	31.6
<i>United States</i>						
(No. of)						
Ports	14	14	55	39	325	49
RFs	217	232	266	59	948	NA
Ports without RFs	0	0	0	0	36	4
Percent of ports without RFs	0.0	0.0	0.0	0.0	11.1	8.2
<i>OECD (non-U.S.) countries</i>						
(No. of)						
Countries reporting	19	18	17	18	18	22
Ports	121	149	260	390	575	212
RFs	169	217	345	635	739	NA
Ports without RFs	27	22	36	14	48	38
Percent of ports without RFs	22.3	14.8	13.8	3.6	8.3	17.9
OPEC countries						
(No. of)						
Countries reporting	3	1	1	2	1	13
Ports	9	0	4	2	1	76
RFs	8	0	4	1	0	NA
Ports without RFs	1	0	0	1	1	47
Percent of ports without RFs	11.1	NA	0.0	50.0	100.0	61.8
Non-OPEC/non-OECD countries						
(No. of)						
Countries reporting	17	11	8	19	17	93
Ports	18	26	34	77	92	141
RFs	8	26	39	152	78	NA
Ports without RFs	9	9	1	7	19	62
Percent of ports without RFs	50.0	34.6	2.9	9.1	20.7	44.0

Sources: IMCO 1964; IMCO 1973; IMCO 1976; IMCO 1980; IMCO 1984; MEPC 1990b; Sadler and King 1990; United Nations 1956.

Table 2.4
Reception facilities in ports bordering special areas

Year	1956	1964	1973/1976	1979	1980/1984	1984	1988	1990	1990	1990
Source	IMO	IMO	IMO	MED	IMO	MED	MED	IMO	IMO	SADLER
<i>Special area countries</i>										
(No. of)										
Countries reporting	15	11	12	—	16	—	—	16	41	
Ports	43	79	139	—	246	—	—	304	204	
RFs	30	70	153	—	413	—	—	381	NA	
Ports without RFs	25	20	25	—	6	—	—	18	63	
Percent of ports without RFs	58	25	18	—	2	—	—	6	31	
<i>Nonspecial area countries</i>										
(No. of)										
Countries reporting	25	20	15	—	24	—	—	21	88	
Ports	119	110	214	—	262	—	—	689	274	
RFs	372	405	501	—	434	—	—	1,384	NA	
Ports without RFs	12	11	12	—	16	—	—	86	88	
Percent of ports without RFs	10	10	6	—	6	—	—	13	32	
<i>Mediterranean countries</i>										
(No. of)										
Countries reporting	9	5	5	16	8	11	7	8	17	
Ports	32	50	52	79	67	59	46	97	103	
RFs	20	32	66	NA	84	NA	NA	145	NA	
Ports without RFs	22	18	3	16	6	16	10	17	29	
Percent of ports without RFs	69	36	6	20	9	27	22	18	28	

Sources: IMCO 1964; IMCO 1973; IMCO 1976; IMCO 1980; IMO 1984; IMCO 1984; MEPC 1988; MEPC 1988; MEPC 1990b; MEPC 1990b; MEPC 1990b; Placci 1984; Sadler and King 1990; United Nations 1956.

47 and 65). These stringent domestic rules might have been instituted even in the absence of MARPOL, but the regime's ongoing pressures undoubtedly helped to channel the expressions of more inchoate domestic pressures for environmental protection into specific policy actions.

Although governments have provided fewer facilities than desired and their actions surely reflect growing concern over marine pollution, treaty requirements and ongoing MEPC discussions regarding the need for reception facilities appear to have helped motivate financially capable and environmentally concerned states to provide them. Unfortunately, these same requirements and discussions appear to have had little, if any, impact on those developing or oil-loading states where reception facilities are most needed. The subregime established requirements for the provision of facilities that have become more specific over time, but never established an enforcement or compliance-management strategy to dramatically alter the behavior of the most important actors.

Equipment Standards In 1954, no tankers had separate tanks for seawater ballast nor did any tankers use crude oil to clean their tanks after delivery. Since 1982, every new tanker built has come with both technologies already installed and earlier tankers have been retrofitted with at least one of the technologies. Most classification societies, insurers, and port authorities have made evidence of these pollution-reduction technologies a prerequisite to being classified, being insured, and being allowed into port. Much, although not all, of this dramatic change in the structure of the tanker fleet can be attributed to the direct influence of this third subregime's effective management of compliance through encouraging efforts designed to deter violation.

Requiring flag state and classification society inspectors to issue IOPP certificates and port state inspectors to check equipment against those certificates involved monitoring that readily fit the standard operating procedures of actors in the oil transportation industry. IMO and MOU data document that the IOPP certificate discrepancy rate was less than 10 percent immediately after MARPOL entered into force, and dropped to below 3 percent within a few years. These data confirm not only that most flag states and classification societies were issuing certificates but

that IOPP/equipment verification quickly became part of the standard inspections of many developed states. Although classification societies have incentives to certify ships that do not meet MARPOL standards, these are countered by port state inspections and the involvement of some governments in the certification process.¹⁸

These actors would not have undertaken such efforts to monitor pollution equipment were it not for MARPOL's requirements: none of these actors checked for pollution control equipment prior to the MARPOL requirements, nor would they have done so if only a few activist states had adopted such requirements. Unlike aerial surveillance, adding pollution prevention criteria required only small changes and added only marginal costs to surveys and inspections already being conducted for safety and customs reasons. Also unlike naval or aerial surveillance, certification and inspection programs could be comprehensive, making it highly likely that illegally equipped tankers would be identified. These factors produced the surprising result that nine European states that opposed the 1973 and 1978 proposals requiring SBT were, by 1984, actively engaged and committed to inspecting IOPP certificates and SBT equipment. Other states have added pollution equipment to in-port inspections and begun establishing inspection agreements modeled on the European MOU (Anonymus 1993; Secretariat of the Memorandum of Understanding on Port State Control 1992). These monitoring efforts would not have arisen without MARPOL. Consider an alternative possibility in which European states, for example, sought to cooperate to enforce a varied array of domestic oil pollution regulations. Doing so would have been far more difficult without MARPOL's international system of IOPP certificates and equipment requirements. The equipment subregime thus succeeded in inducing monitoring not by placing requirements on those who would be reluctant to monitor them, but by providing rules that fit easily and cheaply into existing surveillance activities targeted at nonpollution policy concerns, such as safety and customs.

The equipment regime also facilitated information gathering and evaluation of the regime. Governments could more easily report on equipment enforcement than on discharge or facility enforcement. Annual government reports to IMO contain no data on ship or aerial surveillance ef-

forts—such information is not even requested—but do contain data on equipment and certificate inspection efforts. Most countries, however, do not report to IMO at all. In contrast, the MOU reporting system has proved remarkably successful. Member states input daily inspection results to a central computer by modem or telex. Since 1982, all fourteen member states have reported most, if not all, of their annual inspections to the MOU, while less than half have provided annual enforcement reports to IMO (Mitchell 1994, 178–179). The European MOU database facilitated enforcement by allowing states to avoid reinspections and to focus inspections on tankers with recent deficiencies. The European MOU reassured states that they were not enforcing alone, helped states deploy enforcement resources more effectively, and focused attention on enforcement through regular meetings and reports. MARPOL's equipment standards provided a rule, compliance with which developed port states—that is, the states that had shown themselves to have incentives to conduct oil pollution enforcement—could monitor inexpensively and effectively.

Theoretically, by requiring states to respond to noncompliant tankers, either by detaining or barring them from port, MARPOL's equipment subregime made sanctions more likely and more potent. Port states were more likely to use these administrative sanctions because they eliminated the long delays common to legal proceedings, relied on less stringent standards of evidence, did not rely on prosecution by the flag state, and imposed “opportunity” costs on tanker owners (that is, lost business opportunities) far greater than the usual fines imposed. Thus, enforcement by even a few oil importing states put the noncompliant tanker owner at risk of detention or of the even more costly consequence of foregoing those oil markets altogether. In practice, however, very few states have detained tankers. Between 1984 and 1990, only seven states reported having ever detained a ship for MARPOL-related reasons.¹⁹ Most states clearly do not feel obligated by MARPOL's requirement to detain tankers that threaten the marine environment. Those states that have detained ships, however, only began doing so after MARPOL took effect. We can exclude the possibility that domestic environmental pressures would have led these states to begin using detention even in the absence of MARPOL, as fines imposed for discharge violations stayed constant over this same

period (Dempsey 1984; Peet 1992). Thus, detention provided a potent legal option for states that were inclined to enforce, but it created few new incentives or behaviors among states not so inclined.

The equipment subregime's response system was redundant, creating obstacles to buying a noncompliant tanker in the first place—because most classification societies would not classify and most insurers would not insure such a ship—and reinforcing these obstacles with the threat that, if one did own a noncompliant ship, it would be difficult to use it. These legal pressures for compliance were offset by economic pressures for noncompliance. SBT increased a tanker's capital costs by 5 percent and reduced its cargo-carrying capacity, with some minor offsetting benefits in reduced time spent in port (Waters, Heaver, and Verrier 1980, 124–25). In contrast, the capital and maintenance costs of COW were far less than those of SBT and these costs were offset by the capacity to deliver a higher percentage of cargo loaded. Comparisons of the three available technologies estimated LOT as saving \$17,000 per voyage, COW as saving \$9,000 per voyage, and SBT as costing \$1,500 per voyage (Cummins, Logue, Tollison, and Willett 1975; Pearson 1975; Waters, Heaver, and Verrier 1980, 124–25).

Industry positions reinforce this assessment of the relative economic merits of each approach. Oil companies and shipping interests resisted SBT requirements until U.S. unilateralism made some regulation inevitable, oil companies pushed COW in 1978 as a more economical alternative than SBT,²⁰ and shippers have more recently opposed broadening the application of SBT requirements to older ships on economic grounds (Bergmeijer 1990, 13; MEPC 1991b; M'Gonigle and Zacher 1979, 134). As representatives of Shell and Lloyds noted in 1990, "left to himself, no owner will, understandably, wish to be placed at a commercial disadvantage to his competitors by introducing segregated ballast on his ships if the whole industry is not doing likewise" (Osborne and Ferguson 1990, 62). Indeed, some analysts in 1978 were predicting that compliance would be lower with COW requirements than with discharge standards and that "the degree of compliance with this new [SBT] requirement may be negligible" (Okidi 1978, 34).

Compliance patterns contradict such predictions based on economics, thereby confirming that SBT adoption was a response to MARPOL while

COW was a response to both economic and legal factors. Many oil companies installed COW before MARPOL required it, installed COW instead of SBT on all tankers allowed to do so, and pressed for COW's installation by independents (Drewry Shipping Consultants 1985, 21; Gray 1978, 12 and 92; MEPC 1981, 11; M'Gonigle and Zacher 1979, 262; Osborne and Ferguson 1990, 62; Waters, Heaver, and Verrier 1980, 95). Although COW was preferable to SBT, given the lower cost and greater future flexibility of LOT, tanker operators should have preferred LOT and hence deferred or refrained from installing COW (Drewry Shipping Consultants 1985, 21; Waters, Heaver, and Verrier 1980, 95). Independents have also installed COW as required even though, as tanker owners and operators, they pay the costs of installing and operating COW while cargo owners reap the benefits.

Tankers appear to have installed the lowest cost alternative that met MARPOL's equipment requirements. Available data confirm that they have installed SBT only when required, but have done so despite its costs. Few tankers had installed SBT in 1973 but industry analysts soon found tanker owners beginning to build to the new international standards (Drewry Shipping Consultants, 1981 25; Zacher 1978, 208). Two research groups document that almost all tankers have met both the SBT and COW requirements. A 1981 analysis found that most tankers did not install these technologies before they were required to do so by MARPOL, and those that were retrofitting tended to install COW rather than SBT (Drewry Shipping Consultants 1981, 25). By 1991, however, 94 percent of tankers built prior to 1980 had installed SBT or COW as required, 78 percent of tankers built between 1980 and 1982 installed SBT as required, and 98 percent of those built after 1982 installed both SBT and COW as required (Clarkson Research Studies 1990; Mitchell 1994). Government and industry experts concur that virtually all new tankers required to have SBT do have it, despite its expense and lack of cost-effectiveness (Bergmeijer 1990, 13; MEPC 1990c, 8; Sasamura 1990; Second International Conference on the Protection of the North Sea 1987, 17). These high percentages clearly indicate that essentially all tankers, whether registered in nations that supported SBT during negotiation or not, are complying with MARPOL's requirements. Most experts view SBT compliance as motivated by legal concerns and COW compliance

as motivated by economic concerns, an assessment reinforced by the fact that most older tankers, given the choice, have chosen to retrofit with COW rather than SBT (MEPC 1990c, 8; Mitchell 1994).

This evidence undercuts an economic explanation of SBT installations and suggests that they and, to a lesser extent, COW installations were motivated by MARPOL requirements. Two rival hypotheses other than economic incentives, however, might more plausibly explain SBT adoption: hegemonic pressures and public opinion. Despite claims by some analysts, SBT adoption cannot be attributed to U.S. hegemony (Grolin 1988). Certainly, U.S. threats in 1972 and 1977 motivated the incorporation of SBT requirements into MARPOL and the United States has required tankers to retrofit more quickly than MARPOL has (Drewry Shipping Consultants 1985, 11). But available evidence suggests that American action alone would not have produced the all-but-universal compliance observed. The United States has never wielded hegemony in world oil markets. The U.S. share of new tankers launched, tanker registries, and oil imports has always been below 20 percent (Mitchell 1994, 278–279).²¹ Countries with larger shares of these markets opposed SBT requirements in many cases. Given its position in the oil transportation market, the United States could effectively control, at most, one-third of the world tanker market. To produce observed SBT rates, it would therefore have had to force other states unconcerned about oil pollution to legislate and enforce SBT requirements in the absence of international agreement, but no evidence exists that the United States brought such pressure to bear. Other states would not have required COW or SBT, and certainly not both, on new tankers in the absence of MARPOL. Thus, without MARPOL, we might well expect some adoption of SBT, perhaps on the order of 30 or maybe even 50 percent to ensure the oil industry access to the lucrative U.S. market. U.S. unilateral action alone, however, would appear unlikely to have produced the 98 percent SBT adoption rates observed.

Paths by which increasing public concern could have led tankers to install SBT and COW without MARPOL also seem implausible. Oil companies might have perceived some political benefits in reducing their discharges. As environmental consciousness grew, companies undoubtedly became more concerned about having intentional pollution soil their rep-

utations as well as birds and beaches (Moss 1963, 46). Without MARPOL's requirements, however, it appears unlikely that tanker operators would choose to "prove their environmental credentials" by adopting SBT, the most costly alternative for reducing intentional pollution. Public concern often tells actors to do something, but agreed-upon rules and laws provide an important standard and focus in deciding what to do.²²

In summary, the equipment subregime has caused a dramatic behavioral change by tanker owners and by the government authorities and classification societies that monitor the behavior of these owners. While MARPOL could not have produced such changes without facilitating factors such as existing infrastructures for monitoring behavior, U.S. hegemonic pressures, and environmental concern, neither could these factors by themselves have produced the same change in behavior in the absence of internationally agreed-upon rules delineating specific equipment requirements and deadlines.

Analytic Assessment

Exactly how did the regime cause these changes in the behavioral complex? Using the causal pathways delineated in the first chapter, this section evaluates which ones proved important, which proved unimportant, and how much interplay there was between mechanisms.

Oil pollution control represents a hard case; adoption of stringent rules, enforcement of those rules, and compliance with those rules were all unlikely. Collective action theory predicts that the powerful and concentrated oil transportation industry would resist the imposition of large pollution control costs to provide diffuse, nonquantifiable benefits to the public at large (McGinnis and Ostrom 1992; Olson 1965; Snidal 1985). Yet, industry efforts to oppose international regulation have proved surprisingly unsuccessful at preventing progress toward broader and more stringent rules.

Given the theoretical disfavor of command-and-control regulation as inefficient, one would expect movement away from, rather than toward, adoption of equipment standards. Collective action theory would also predict more monitoring and enforcement of discharge standards than equipment standards. The benefits of conducting coastal surveillance for

compliance with discharge standards could be limited to the enforcing country; in contrast, all coastal countries benefited from any government that conducted equipment inspections (Axelrod and Keohane 1986). Nor were the economically more efficient discharge standards inherently difficult to monitor. Analysts at the time proposed placing international inspectors on all tankers to achieve the same level of environmental improvement as equipment regulations at significantly less cost (Cummins, Logue, Tollison and Willett 1975; Pearson 1975). Yet, naval and aerial surveillance programs are few and small while national and regional efforts to conduct and improve port state inspections for equipment are widespread and increasing in number.

Finally, compliance with any oil pollution control was unlikely, especially with equipment requirements. Claims that oil pollution involves a "low incentives to defect" coordination game (Ausubel and Victor 1992) are contradicted by the observed noncompliance with discharge standards, clearly demonstrating the continuing incentives that tanker owners and operators have to violate the rules. To the extent compliance did occur, it should have been more common with the discharge standards because of the availability of a cheaper and more cost-effective technology—LOT—than the SBT or COW required by MARPOL.

Against this backdrop of forces making regime impact unlikely, stringent rules were adopted over objections of powerful interests, governments and nonstate actors have monitored and enforced less efficient and less privatizable rules, and tankers have complied with more expensive regulations while often violating cheaper ones. This section evaluates each of the causal pathways in turn to assess their ability to explain the experience of this regime.

The Regime as a Utility Modifier

Although the success of the regime as a whole has been mixed, much of the success the regime has had can be attributed to its success at modifying the utility that state and substate actors placed on different alternative behaviors. In particular, the equipment subregime proved more successful than the discharge and reception facility subregimes because it modified the utilities of tanker owners in ways that the other subregimes failed to do. The equipment subregime convinced tanker owners that the

expected costs of violation, that is, the likelihood of being detected without the equipment and the cost of being barred from or detained in port in response, exceeded the economic benefits of not installing the equipment. Such an analysis suggests that the equipment subregime more effectively deterred violation than did the discharge or reception facility subregimes.

Closer examination shows, however, that the equipment subregime changed behavior by reducing opportunities to violate rather than reducing the expected utility of violation. If the equipment subregime's primary causal mechanism had involved deterrence, we should expect to see either frequent detention of tankers by states and high compliance rates or an absence of detention and ongoing violations. In fact, however, available evidence confirms that tankers complied with MARPOL's 1980 and 1982 equipment compliance schedule even though no state detained a single tanker prior to 1983 (Mitchell 1994, chapter 8).

The equipment subregime restructured the behavioral complex to remove the MARPOL compliance decision from the exclusive purview of a single entity. Unlike the autonomous decision making of a captain considering whether to discharge illegally or a government considering whether to install a reception facility, a tanker owner deciding whether to install SBT and COW needed the cooperation of a builder, a classification society, and an insurer in an admittedly illegal act. After MARPOL adopted equipment rules, even ordering a tanker without SBT and COW became difficult. Tankers complied with MARPOL's equipment rules because private transactions prevented them from doing otherwise. In effect, the equipment subregime altered tanker owner behavior by removing noncompliance from their choice set. This alteration, however, demonstrates the interplay of various causal mechanisms. The equipment subregime's success at changing choice sets stemmed from its ability to alter the roles played by classification societies, insurers, and builders and the ability to alter these roles stemmed, in turn, from these actors' view of the subregime as a legitimate authority for international regulation.

We can attribute the contrast between the increasingly vigorous efforts of governments to inspect for equipment with the ongoing absence of surveillance for illegal discharges to the regime's altering of utilities.

States enforced the former because it was far more cost-effective, providing greater behavioral and environmental impact at lower cost because it involved only minor modification to existing port inspection programs. In contrast, even a government that expended the resources necessary for a large surveillance program had no assurance that discharges would be either detected or deterred. Equipment standards also increased enforcement by decreasing the cost and difficulty of imposing sanctions. Any port authority could detain a noncompliant tanker or bar it from port much more quickly and cheaply than they could prosecute, convict, and collect fines from a tanker caught discharging illegally. Even though few states have detained ships, those that did, including the United States, have controlled significant fractions of the oil import market. This led even Soviet ships—which could have been built, classified, and insured without required equipment—to comply because of the fear that they would be unable to trade outside the Soviet Union. Discharge standards relied on flag and oil-loading state governments with few incentives to expend resources to deter discharge violations. Both activist governments as well as classification societies, insurers and builders that could either prevent or deter equipment violations lacked any similar power to prevent or detect, penalize, and hence deter, discharge standards. In the case of governments, those uninterested in pollution control did not become enforcers, but rather those with exogenous interests in enforcement enforced the most cost-effective rules of the convention. In the case of nonstate actors, the acceptance of international rules as legitimate, even when undesirable, produced constraints on the behavior of the actors whose behavior the regime targeted.

The reception facility subregime proved especially weak at altering the utility governments attached to ensuring facilities were available. Even when tanker captains revealed noncompliance with requirements for reception facilities, governments had few incentives to, and rarely did, criticize other governments for such failures. Nor were options available to force compliance, and governments never seriously considered providing a collective funding mechanism to pay for their installation. The failure to provide reception facilities would tend to lead tankers to discharge just prior to entering port, oiling nearby beaches. States concerned about such discharges would provide their own facilities but had no incentive to pay

for their provision elsewhere. Those not concerned about such discharges had no incentive to provide them. The current distribution of reception facilities—primarily in developed countries—reflects a coincidence of the interests and capacity to provide facilities similar to what one might well expect even absent any international regime of pollution control.

Taken together, the efforts of these actors either altered the choice sets or utilities of tanker owners to make equipment installation, while expensive, the behavior of choice. In contrast, such modification of utilities was simply less feasible with discharge and reception facility standards.

The Regime as an Enhancer of Cooperation

Utility modification played an important role in the regime's success at altering behavior. The ability of the regime to enhance cooperation has had little impact on state or tanker operator behavior but, instead, has largely been evident in the adoption of numerous regulations that one would not otherwise have expected to be adopted, or certainly not as rapidly as they were. The regime has generated progressively more stringent regulations by providing a ready-made forum that enhanced cooperation. The Marine Environment Protection Committee and its predecessors kept the attention of a body of experts focused on issues of marine pollution from ships. When exogenous forces, such as dramatic tanker accidents, a growing consensus for environmental protection, or unilateral regulatory threats from a powerful state arose, the regime provided the capacity to respond quickly and knowledgeably to channel such pressures into new policies. And new regulations could readily be added to the existing regime structure.²³ Activist states also regularly proposed amendments that would not otherwise have reached the international agenda, as evidenced in recent proposed amendments to regulate air pollution from ships. Enhancing cooperation among tanker owners and operators was unlikely to influence behavior, since these actors had few exogenous incentives to alter their behavior. The ease of cooperation, however, did facilitate and even encourage governments to promulgate more environmental regulations.

Proposals to broaden or strengthen regime rules, if backed by sufficient environmental concern, resonated with the regime's and MEPC's mandate and were adopted as new regulations. Since these rules were not

revoked as environmental concern waned, the regime provided a one-way ratchet by which (1) stronger rules were adopted during periods of high issue salience, (2) regime norms of precedence and legitimacy prevented subsequent revocation or weakening, and (3) adoption of more effective rules prevented actors from simply ignoring the rules during periods of low issue salience. Proposals to retreat from existing environmental protection received little serious consideration.²⁴

This causal pathway is not easily isolated. The institutional capability to facilitate cooperation would have gone unused if member states had not accorded the regime the legitimacy and authority to act as the only appropriate forum for international discussion of vessel-source pollution. IMO gained legitimacy over time by being responsive to both economic and environmental concerns, and because it had responsibility for all areas of international shipping, creating linkages that reduced incentives for parties to leave the table in response to regulations they opposed.

States have raised issues of vessel-source pollution in IMO for two reasons. First, all vessel-source pollution poses collective action problems that no state can solve alone. A state facing domestic political pressures to address such a problem must collaborate with others, but would have found this difficult had no regime existed. Second, governments facing domestic pressures to address pollution generally face countervailing pressures against regulation by industries that seek to avoid being placed at a competitive disadvantage. As the experiences of the United Kingdom in the 1950s and 1960s and of the United States after the mid-1960s show, industries choosing between regulation and no regulation prefer the latter, but industries choosing between international regulation and unilateral regulation prefer the former. Given the structure of the incentives in this behavioral complex, the regime altered the ease with which states could achieve cooperative arrangements. The regime enhanced cooperation by reducing transaction costs that would otherwise have inhibited the frequent amendment and revision of regime rules. Indeed, without the regime, it would have been more difficult and more unlikely for more stringent and broader regulations to have been adopted.

In the absence of the 1954 OILPOL treaty, an international regime on intentional oil pollution or marine pollution certainly could have been

created. The UN Conference on the Human Environment in 1972 and growing environmentalism in the 1970s, especially in the United States, would surely have produced some form of international marine pollution regulation. The preexisting regime for intentional oil pollution and the forum of the IMO for negotiation, however, made those efforts bear fruit much faster and produced more stringent and effective rules, thus avoiding pitfalls that would have plagued a new regime.

The one area in which the regime enhanced cooperation with impacts on behavior is in the realm of transparency (Mitchell 1998). Violations of equipment standards, more so than of discharge or reception facility standards, were inherently transparent and were made more so by the explicit granting of survey and inspection rights to classification societies and port state governments. This transparency made accurate and comprehensive monitoring of a fleet's compliance far easier than it was with respect to discharge standards. The transparency also reassured each owner that others were complying. Conscientious operators who desired to comply with the discharge standards faced the classic free-rider fear that others would gain competitive advantage through undetected and unsanctioned violations, a fear not faced under the equipment standards because violations were so transparent.

The Regime as a Bestower of Authority

The regime's success at modifying utilities, particularly of tanker owners and operators, depended in large part on the authority and legitimacy accorded to the regime and its regulations. Thus, the regime's ability to influence behavior by modifying utilities depended, in part, on authority the regime already had within the maritime community. States' perceptions of IMO as the only authoritative voice in regulating maritime policy in general gave IMO rules on marine pollution more rapid and broader legitimacy in the shipping community. Counterfactually, a separate, strictly environmental secretariat administering OILPOL and MARPOL would probably have produced greater efforts to address marine pollution from sources other than vessels, particularly land-based sources, an important task that IMO has consistently considered as beyond its mandate. Such an organization, however, would have faced more industry resistance than did IMO in response to stringent rules because it would

have had less legitimacy with the industry, and the linkage with other maritime issues would have been reduced.

As already noted, classification societies based their classification criteria on IMO rules. Shipbuilders incorporated IMO rules into ship designs. This was true for all IMO requirements that addressed safety, labor, and other regulatory areas as well as pollution. The legitimacy accorded such rules folded into a routinization of behavior among classification societies and shipbuilders that created an institutional and market context in which noncompliance became less of an option. Insurers as well had few incentives to establish premiums along lines contrary to those established by international law.

The power of the regime as a bestower of authority is evident in the higher levels of port state control than of aerial surveillance. The European, Latin American, Asia-Pacific, and Caribbean Memorandums of Understanding have all been agreements to increase port state inspections for violations of all IMO agreements. IMO rules facilitated and encouraged this “nested cooperation” by providing ready-made and legitimate rules that nations could agree to enforce without having to negotiate their content. Governments concerned about a problem find it difficult to enforce rules other than the existing international standards. Once a government became concerned about intentional oil pollution, it enforced MARPOL’s rules. Had MARPOL’s equipment provisions been developed outside of the IMO context, they might well not be so automatically included in the inspections mandated by these regional agreements.²⁵ The subregime did not cause reluctant states to institute inspection procedures but it did structure what things they looked for in an inspection once exogenous factors led them to institute such a program. Governments found they could monitor and respond to equipment violations more easily than discharge violations or reception facility violations.

The Regime as a Learning Facilitator

Given the facilitation of learning that the Barents Sea and acid precipitation regimes have produced (see chapters 3 and 4), the oil pollution regime is remarkable for the lack of evidence of such a pathway of influence. Ideas and perceptions of the environmental problem have been driven by exogenous political and social forces that the regime has not,

and probably could not have, created. The regime has sought to directly influence material conditions rather than to influence them through altering ideas (see chapter 1, figure 1.1). The regime has rarely collected data to identify trends in marine environmental health. The regime has not even sought to improve its economic effectiveness.²⁶

The absence of changes in values and perceptions of the environmental problem is evident in the lack of much improvement beyond that required by the regime’s explicit rules. Nothing like LRTAP’s “overcompliance” is evident (see chapter 4). The regime failed to internalize a concern for the marine environment, as evident in the unwillingness of existing tankers to install SBT technology when not required and the continuing violation of discharge standards.

The regime has, indirectly, induced oil companies to develop and promote processes and technologies that met the environmental goal of reducing oil pollution while reducing costs. Oil companies only developed and promoted the 1950s-era LOT procedure in response to the 1962 amendments requiring equipment on all tankers unless pollution was reduced. Similarly, they began touting the environmental benefits of COW, though developed in the late 1960s, only after MARPOL required SBT on large new tankers. Thus, regulation induced technological developments that led to enhanced ecological effectiveness. In contrast to the LRTAP story, however, learning has been largely limited to developing solutions rather than understanding the problem and has largely reflected indirect efforts to reduce the costs of regulatory compliance.

Although the regime has not moved toward better understanding of the problem, it has learned from experience with past operation of the regime to produce more effective regulations. Put in the causal language of this volume, a regime initially focused on intentional oil pollution has developed rules that (1) applied to more sources of oil and other marine pollutants, (2) promised greater environmental protection if industry complied, and (3) were more likely to be enforced and obeyed.²⁷ Although the power of unilateral threats by activist states explains the fact of regime progress, the past experience with the regime explains the shape of that progress. Consider the counterfactual: without evidence that tanker operators were often disregarding discharge standards, pressures for oil pollution control would have been unlikely to lead to strict equipment

regulations. Even if stricter controls were adopted, the command and control approach of equipment standards would have been an unlikely first step. Acceptance of such a regulatory approach depended on the knowledge that less costly and more efficient operational approaches had failed to achieve results. Regime learning is also evident in MARPOL's detention provisions, specified compliance dates for SBT installation and reception facility provision, and provisions for tacit acceptance of amendments, all of which sought to remedy failures of earlier treaty provisions.

The Regime as a Role Definer

Little, if any, of this regime's success can be attributed to a process of defining actors' roles. The oil pollution regime has taken advantage of the incentives of actors in existing roles, rather than defining those roles. The regime played on existing relationships, interests, and standard operating procedures among classification societies, insurers, and shipbuilders to transform them into regime monitors and enforcers with powers that differed from and, in many ways, exceeded those of governments. Classification societies, for example, have more access to information about tankers than governments do, but must build reputations for high standards to recruit new business. At the same time, neither classification societies nor insurers had to change their behavior significantly to support the subregime.

The discharge and reception facility subregimes proved highly ineffective at redefining states' roles. The regime failed to convince oil loading states to conduct the inspections needed to monitor the total discharge limits of 1969. Governments have proved remarkably reluctant to assume the role of reception facility providers in their own countries, let alone the role of reception facility financier in developing countries. The regime also tried, without success, to induce flag states and oil-loading states to enforce discharge provisions. Flag states and oil-loading states would not enforce aggressively enough to deter discharge violations. Yet, jealous guarding of flag state sovereignty prevented the regime from bestowing those responsibilities on port or coastal states.

Modifying the roles of classification societies allowed the regime to avoid encroaching on flag state jurisdiction and sovereignty while skirting the problems raised by the lack of resources in many flag states with large

tanker registries. Equipment standards succeeded by giving monitoring duties to classification societies, who incorporated such standards into their inspections, not because of a conscious calculation of the benefits of these provisions, nor from any fear of penalties for not doing so, but because most classification societies' inspection standards match international law as a matter of course and standard operating procedures. For them, agreed-upon international rules set a standard, deviation from which required explanation.²⁸ In turn, insurance companies decided whether to insure a ship based on its being classified. MARPOL essentially "deputized" classification societies and insurers to monitor and enforce its equipment standards.

The Regime as a Source of Internal Realignment

The oil pollution regime's effectiveness also owes little to inducing domestic political realignments. In activist states, like the United Kingdom early on and the United States more recently, the regime provided politicians facing domestic pressure for marine pollution control with an alternative to unilateral regulation. International policies could achieve better environmental protection and the attendant political benefits without imposing economic costs on domestic industries. For oil companies in such countries, the regime provided a forum whose existence could be pointed to as a reason not to impose unilateral domestic regulation but, failing that, provided a second chance to shape shipping regulations. Oil companies proposed and supported COW and SBT because they provided economic benefits relative to existing alternatives. Yet, economics alone would not have led them to support international requirements, as evident in their consistent resistance to mandate these techniques. Only in the context of threats of unilateral action and an environmental regime that was promulgating increasingly stringent regulations did industry see international regulation as an attractive alternative.

In nonactivist states, the regime appears to have had little influence over domestic political alignments. Most governments enforced IMO rules over time because the regime provided an available and authoritative guideline for enforcement in response to growing environmental concern at home rather than because the regime prompted that growing environmental concern. Exogenous factors, rather than the regime,

prompted governments to want to “look green.” Once this concern developed, the regime’s rules had the legitimacy necessary to make them one of the standards against which “looking green” was assessed.

Overall Assessment

This regime’s successes and failures demonstrate an interplay of several of the six causal mechanisms proposed (see chapter 1). The regime enhanced cooperation by providing a forum that made promulgating regulations to combat vessel-source marine pollution easier and quicker. Although the regime did not “bestow” authority, it did use the legitimacy and authority that states and nonstate actors accorded it to develop international regulations. The regime eventually developed equipment regulations that succeeded at modifying the utilities of tanker owners and, thereby, tanker operators after earlier discharge regulations had failed in the effort to influence tanker operators directly. The regime did not so much “define” roles for different actors as it took advantage of the regime-compatible incentives of relevant actors’ existing roles. The regime showed some learning in devising new regulations and strategies for implementation, but the pathways of learning facilitation, role defining, and internal realignment contribute far less to our understanding of the success of the oil pollution regime than those involving utility, authority, and roles.

Attempting to analyze the regime within the structure of the six causal pathways of this volume also points up some difficulties with the framework. The equipment subregime operated primarily by changing the alternatives available to tanker owners by taking advantage of the existing roles and procedures of classification societies, who adopted the regime’s rules into their standard inspection programs because they saw these rules as authoritative. The resultant unwillingness of builders, classification societies, and insurers to assist an owner interested in building and operating a noncompliant tanker essentially removed the option of buying such a tanker. This pathway can be viewed as modifying tanker owners’ utilities. This case suggests, however, that there may be some value in distinguishing between regimes that raise the costs of an option so that it is not chosen from those which effectively remove the option from the

available choices.²⁹ A secondary, supporting pathway for the regime provided authoritative, but low-cost, methods of implementing the agreement, thereby facilitating effective monitoring and sanctioning by governments inclined to do so. The effectiveness of the equipment subregime relative to the discharge subregime reflects the lessons learned by the regime from the failure of many efforts to improve the discharge subregime.

Several characteristics of the behavioral complex appear to have conditioned the success of this regime. In some ways, this complex limited regime effectiveness. The ability of oil companies to resist stringent regulation and the weakness of public concern in most states before the 1970s clearly slowed regime progress. The deference given to flag states under international ocean law hobbled and delayed efforts by those few states concerned with intentional oil pollution to gain the legal authority needed to combat it.

In other respects, however, the behavioral complex fostered regime success. Progress made when strong concern arose in powerful states, such as the United Kingdom and the United States, would not have occurred had strong concern arisen among developing states. Because oil pollution involves private international trade, the opportunities for inducing behavioral change were greater than they are in other issue areas. Imagine if all tankers were government-owned: equipment violations would have been more prevalent because transporting governments would have been more likely than industries to consider international rules as infringements on their sovereignty and enforcing governments would have been more wary about detaining noncompliant tankers. Market characteristics such as the private information infrastructures of classification societies and insurers also proved crucial to the effectiveness of MARPOL’s equipment requirements, but are not paralleled in many other issue areas. The fact that tanker accidents produce high-visibility, catalytic political events also made regulatory progress easier than it would have been otherwise. The short-lived outcries following catastrophic accidents have placed the issue on the international agenda with enough force to override objections by powerful states like France and Japan.

Finally and fortunately, IMO’s relatively slow pace of progress toward ineffective regulation does not appear to have irrevocably harmed the

marine environment. As has been noted in regard to depletion of the stratospheric ozone layer, a regime that appears quite effective at changing behavior may be created too late to prevent the environmental damage that motivated its creation (Parson 1993). The ocean has absorbed and biodegraded significantly more oil than the world's population to date has discharged, allowing time for the regime to learn how to become more effective.

Conclusions

Has the intentional oil pollution control regime been effective? Yes and no. On the positive side, despite a slow start, the regime adopted quite effective rules in MARPOL 73/78. MARPOL has restructured the tanker fleet so that it is far less likely to discharge oil intentionally. The new regulations led classification societies, insurers, port state governments, and tanker owners to undertake actions they would not have undertaken in the absence of the regime. The regime can take some credit for increasing the number of reception facilities available today and for expanding its regulations to include accidental oil spills, oil platforms, and a wide array of other marine and air pollutants from ships. The regime has been most effective when targeting the actions of nonstate actors in ways that take account of the existing incentives and abilities of governments and corporations. Progress, when it has occurred, has required the coupling of pressures from powerful states with evaluation of previous experience to direct efforts toward successful new policies.

On the negative side, for three decades the regime relied on discharge standards that remained largely ineffective at altering tanker operations. This ineffectiveness resulted from poor choices of policy strategies as well as from constraints imposed by the larger regime of ocean law that circumscribed the roles of port, coastal, and flag states. The limitation of IMO's regulatory mandate to ships has undoubtedly delayed attention to land-based and other sources of ocean pollution. Even today, reception facilities remain uncommon in precisely the areas where they are most needed—special areas and oil-loading states. Reporting on enforcement, compliance, and environmental quality also remain poor.

This case highlights two concluding insights about how regimes influence behavior. First, the case has brought to light an important variant of the causal mechanism of regimes modifying utilities, namely that regimes also can alter the alternatives available to actors. Regimes can act to prevent violations of their provisions as well as to deter such violations. Regimes, during negotiation, can also structure debate about alternative policies to exclude those that backtrack while facilitating discussion of those that move the regime forward. Second, the case has highlighted that regimes often influence behavior through a complex of causal mechanisms rather than a single one. The experience in vessel-source oil pollution cautions that accurately understanding how a regime achieved its aims requires careful attention to the variety of potential causal pathways to assess how much influence each has, and how the different causal pathways interact to contribute to regime success.

Notes

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Ronald Mitchell is an assistant professor of political science at the University of Oregon. He can be contacted at rmitchel@oregon.uoregon.edu.

Moira McConnell is a professor of law at Dalhousie Law School and is director of Dalhousie Law School's Marine Environmental Law Programme. She is also a member of the Negotiation and Conflict Management Programme. She can be contacted at mmcconnell@kilcom1.ucis.dal.ca.

Alexei Roginko is a research associate with the Institute of World Economy and International Relations, Russian Academy of Sciences. He can be contacted at alexair@netfinitv.cig.ru.

Ann Barrett has been an attorney with the Nova Scotia Government Employees Union since 1996. Prior to that she was an attorney in private practice in Halifax, Nova Scotia. She can be contacted at annb@nsgeu.ns.ca.

1. These figures adjust James E. Moss's 1963 estimate to account for the smaller amount of oil transported in 1953 (Moss 1963, 51; Pritchard 1987, 76).
2. Norway had seen a major oil spill in 1958 (Kirby 1968, 217). Many "fairly large-scale oil pollution incidents" in 1960 prompted U.K. research on cleanup methods (Wardley-Smith 1969, 27). One survey reported 91 tanker groundings and 200 collisions between June 1964 and April 1967 (Kirby 1968, 218).

3. Further improvements to enforcement were opposed by maritime states, including the Soviet bloc, European states, and flags of convenience, who sought to protect free navigation and developing states who sought to strengthen their rights as coastal states in the Law of the Sea Conference (M'Gonigle and Zacher 1979, 233).
4. Many port states added pollution control equipment to normal inspection procedures and began coordinating inspections with other countries, even though they specifically refrained from cooperating to detect discharge violations. Flag states accepted port states barring their ships from port or detaining them because such administrative sanctions did not directly infringe on flag state legal prerogatives.
5. A "special area" involves IMO-designated areas deserving special environmental protection, and facing more stringent pollution control requirements.
6. As one example, estimates of discharges from tanker operations decreased 35 percent between the National Academy of Sciences' 1971 and 1980 estimates, but even larger decreases occurred in their estimates of offshore production (38 percent), municipal waste and runoff (56 percent), atmospheric fallout (50 percent), and even natural sources (58 percent).
7. These include private industry conventions—The Tanker Owners Voluntary Agreement Concerning Liability for Oil Pollution (TOVALOP 1969), and the Contract Regarding an Interim Supplement to Tanker Liability for Oil Pollution (CRISTAL 1971)—and intergovernmental conventions—the International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties (1969) and its 1973 protocol, the International Convention on Civil Liability for Oil Pollution Damage (1969) and its 1976 protocol, the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage (1971) and its 1984 protocol, and the International Convention on Oil Pollution Preparedness and Response (1990).
8. Given the average slop generated by a tanker, authorities could assume any tanker returning for a new load of cargo with completely clean tanks had discharged slops in excess of the 1/15,000th limit.
9. As early as 1926, experts had noted that enforcing discharge standards was simultaneously difficult and essential (IMCO 1977; Pritchard 1987, 23).
10. Although states had detected 705 violations, 80 percent were within three miles of shore, despite the agreed upon fifty-mile zone, and most of the enforcement effort came from just two states, Britain and Germany (IMCO 1961).
11. Authorities could not even assess a discharge's oil content after it entered the ocean and so had to forego prosecution of all cases that did not clearly involve discharges well in excess of the 100 ppm standard.
12. Germany is the only state to report having referred violations to a flag state based on the absence of "proof of the whereabouts" of oil wastes (MEPC 1990a, MEPC 1991a).
13. Some states rejected even weak language requiring states to "ensure the provision" of reception facilities because they did not want to assume "any financial

responsibility" for building and operating such facilities (Okidi 1978, 33; U.S. Congress 1963, 19; Pritchard 1987, 128).

14. Analysts have estimated costs at \$3 to \$20 million per facility, \$140 million for needed Mediterranean facilities, and over \$500 million for all developing countries (Montfort 1984, 249; Placci 1984, 296–302; UN 1992).

15. In 1984, European states had only begun "looking into the possibility of eventual financial support for the development of reception facilities" (MEPC 1984). By 1996, IMO had yet to do more than urge member states to submit proposals for "financing schemes for reception facilities" (Anonymous 1996).

16. The IMCO secretary-general responded to a Tunisian request for assistance by reminding "delegations that the financial burden for the installation of facilities should be borne by the countries concerned" (MEPC 1980).

17. Systematic analyses of the complex and often inconsistent IMCO/IMO data are difficult. Available figures probably overestimate the percentage of ports with reception facilities. U.S. statistics are isolated to prevent its 1990 report of major increases in numbers of ports and facilities from skewing the data. Other countries have also changed the detail of reporting over time—e.g., Norway reported on nine ports in 1963, four ports in 1973, twenty-two ports in 1980, and ninety-six ports in 1990—but have never identified a port that lacked reception facilities.

18. The committees of shipowners that run classification societies have a vested interest in ensuring that their vessels are not kept out of operation by unfavorable reports (M'Gonigle and Zacher 1979, 331).

19. Most states have done so only rarely, and only states with traditions of rigorous enforcement—the United States, United Kingdom, and Germany—have used detention often.

20. Mandatory and immediate SBT retrofitting made economic sense for independent tanker owners in Greece and Scandinavia who were hardest hit by the tanker market slump after 1973's oil price rise: it would have helped reactivate much of their laid-up tanker tonnage by reducing the active fleet's capacity by 10 to 25 percent (M'Gonigle and Zacher 1979, 123 and 135). Most oil company fleets remained fully employed during this period and, not surprisingly, opposed calls for retrofitting as being unnecessary and expensive.

21. Indeed, the U.S. share of new tankers launched and tanker registries was both low and declining at the time the United States became concerned over oil pollution.

22. Whatever the impact of these public pressures, they would have had almost no impact on independent tanker operators who had little public reputation to lose (Drewry Shipping Consultants 1981, 35).

23. For example, MARPOL controlled intentional pollution from offshore oil rigs simply by defining them into the regime as a form of vessel, an unlikely outcome in the absence of an existing set of regulations for vessels.

24. For example, a 1960s oil industry proposal to replace mandatory discharge rules with voluntary industry use of LOT was rejected in favor of even stricter

constraints on discharges, and such a proposal has never surfaced again (Kirby 1968). Similarly, actors who opposed all equipment requirements in 1973 restrained themselves to calls for requiring COW instead of SBT in 1978, and even then they were forced to accept both technologies on new tankers.

25. As with classification societies, governments appear to have decided to enforce all IMO treaty provisions that can be inspected through in-port procedures, rather than to enforce only those provisions they supported during negotiation.

26. Indeed, at least one analyst has argued that the regime has been inefficient, too costly, and has expended too many resources for too few environmental benefits (Pearson 1975).

27. For example, the United Kingdom's 1962 proposal for an oceanwide discharge ban on all new tankers could have been accepted only in the context of existing zonal prohibitions on all tankers. The 1969 requirement for total discharge limits was a conscious, if unsuccessful, attempt to "fix" the increasingly obvious difficulties of monitoring existing discharge rules. The United States' 1973 proposals for equipment requirements directly responded to the failure of OILPOL's discharge standards. The 1977 Carter Initiatives merely extended existing SBT requirements from new tankers to all tankers.

28. Although some inspections might well certify ships not meeting these standards, the baseline inspection included and complied with them.

29. For example, the nonproliferation regime's technology denial program seeks, however unsuccessfully, to *prevent* states from acquiring nuclear weapons because, at least in cases such as Iraq, it appears that *detering* states from doing so would be unlikely to succeed (Mitchell 1997).