REDRESSING THE PROBLEM OF PERSISTENT MARINE DEBRIS THROUGH LAW AND PUBLIC POLICY: OPPORTUNITIES AND PITFALLS

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ABSTRACT

This paper explores a variety of legal and institutional authorities for redressing the problems of persistent plastic debris in ocean environments. A major focus is on the recently ratified Annex V of the International Convention for the Prevention of Pollution by Ships (MARPOL) and its implementing legislation in the United States, the Marine Plastic Pollution Research and Control Act of 1987. The U.S. Coast Guard's new implementing regulations are described and critiqued, and important problems in the initial implementation of these new requirements analyzed.

The discussion of MARPOL and its initial implementation will introduce two related concerns. The first is the potential for solutions to the persistent debris problem to create an entirely different set of environmental problems. For example, the apparent intention of many shipping interests to turn to on-board incineration as the preferred means of complying with MARPOL's prohibition against the disposal at sea of plastics creates potential new problems in the form of hazardous air emissions and disposal of ash at sea. The limited legal authorities for responding to those potential problems under the Resource Conservation and Recovery Act, section 311 of the Clean Water Act, and other laws are described.

A further example is the fact that the enormous public attention to the problems associated with persistent plastic debris in the oceans and elsewhere has stimulated much interest in requiring "degradable" plastics before very much is known about the environmental hazards of the products of degradation and the impact of degradability upon efforts to recycle plastics. Some of the recently enacted laws and pending legislation relating to degradable plastics are reviewed.

The second consideration raised by the discussion of MARPOL is the difficulty of addressing the problem of marine plastic pollution as a problem separate from the larger problem of the

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proliferating use of plastics generally. The paper concludes with an appraisal of opportunities to redress marine plastic pollution by public policy measures that touch upon that problem only indirectly in the context of designing sensible overall solid waste disposal programs. Some of the key public policy issues before Congress and local legislative bodies with important implications for plastics will be addressed.

INTRODUCTION

The first international conference on marine debris (Shomura and Yoshida 1985) was a major catalyst for a startling array of legislative and public policy initiatives to address a suddenly critical environmental problem that few had previously considered to be a problem at all. This paper examines some of the more important of these initiatives, pointing out their potential for reducing the marine debris problem, their limitations, and their possible pitfalls in terms of exacerbating other environmental problems. Finally, while the focus of the original symposium was on plastics in the marine environment, it has become increasingly clear that plastics present a variety of environmental problems, not simply in the marine environment, but elsewhere as well. As a result of this fact, this paper argues that the most significant benefits to the marine environment may come about as a result of measures that are aimed at addressing the broader set of problems for which plastics generally are responsible.

MARPOL ANNEX V

Undoubtedly, the most significant public policy advance since the 1984 conference pertains to Annex V of the International Convention for the Prevention of Pollution from Ships, better known simply as MARPOL. As a result of the subsequent ratification of MARPOL Annex V by the United States, the Soviet Union, and a number of other countries, that international agreement banning the disposal at sea of vessel-generated plastic waste came into force on 31 December 1988. In the United States, legislation to implement Annex V and, in certain respects, to impose duties beyond those of Annex V itself, was enacted in late 1987. Most of the duties imposed by that legislation, the Marine Plastic Pollution Research and Control Act of 1987 (MPPRCA), were to take effect concurrently with the coming into force internationally of MARPOL Annex V. However, the U.S. Coast Guard has thus far published only proposed regulations to implement the new legislation. Until final regulations are promulgated, the duties imposed by MARPOL Annex V and its U.S. implementing legislation are in a sort of regulatory limbo.

Before turning to the issues that have slowed the promulgation of implementing regulations, let us review first what MARPOL Annex V is intended to do. Put simply, MARPOL Annex V, in tandem with the London Dumping Convention, makes unlawful the deliberate disposal at sea of persistent plastics. The MARPOL Annex V picks up where the London Dumping Convention leaves off; the latter prohibits the dumping of plastics from

sources other than the routine operation of the vessel itself; MARPOL Annex V, on the other hand, restricts the disposal of vessel-generated wastes at sea, requiring that certain types of waste be disposed of beyond specified distances from land and prohibiting altogether the disposal at sea of other types of waste, including all plastics. Since, from time immemorial, it has been the nearly universal practice of ships at sea to dispose of their own wastes overboard, and since plastics represent a rapidly growing fraction of the shipboard waste stream, MARPOL Annex V has the potential to reduce a significant source of marine plastic debris. How significant this source is for the most serious environmental problems associated with marine plastic debris and how much of MARPOL'S potential to cut into this source will actually be realized are still very much matters of conjecture.

In retrospect, considering the dramatic changes that MARPOL Annex V was intended to effect in the long established practices of ships at sea, it is remarkable how little controversy attended the U.S. ratification of Annex V and enactment of domestic implementing legislation for it. No significant opposition to either measure was voiced at congressional hearings, there were no contested floor amendments offered in either house of Congress, and both houses approved the legislation by unrecorded voice vote, indicating the absence of any serious opposition or controversy. Either the interests that were to be affected by the legislation had carefully considered its potential impact and concluded that those impacts were acceptable, or those interests simply failed to take notice that legislation with potentially far-reaching consequences was zipping through Congress with uncharacteristic speed. The subsequent anxieties expressed by parts of the shipping industry during the course of Coast Guard rule making incline me toward the latter explanation.

The first noteworthy aspect of MARPOL Annex V is its extraordinary scope. Prior to the coming into force of Annex V, MARPOL affected only a few large ships, the oil and chemical tankers whose operations are subject to regulation under Annexes I or II, the mandatory MARPOL annexes. Annex V, on the other hand, applies literally to "all ships," save for warships and other government-owned or operated ships being used for government noncommercial service. Thus, not just major merchant vessels, but also commercial fishing vessels, cruise liners, recreational craft, and even rowboats and canoes are subject to Annex V's proscriptions. Moreover, the U.S. domestic implementing legislation goes beyond Annex V's already broad scope by requiring military and other government vessels to comply fully within 5 years after MARPOL enters into force (i.e., by 31 December 1993).

The domestic implementing legislation expands Annex V's geographic scope as well. Whereas Annex V applies only to ships at sea, the MPPRCA applies to vessels in U.S. internal waters as well. Both foreign and U.S. vessels are subject to the U.S. law while in navigable waters or the exclusive economic zone (EEZ) of the United States. United States vessels remain subject to the proscriptions of the U.S. law wherever they may be, even beyond the U.S. EEZ. With respect to penalties for violations, MARPOL itself requires only that these "be adequate in severity to discourage violations." The U.S. implementing legislation fixes very high maximum criminal and civil penalties for violations of Annex V; indeed, they are

the same as those for violations of Annex I or II involving oil or noxious liquid substances. A knowing violation of any of the MARPOL annexes, the requirements of the implementing legislation, or regulations adopted thereunder may be punished by a fine of up to $50,000 per offense and up to 5 years in prison. A civil penalty of up to $25,000 may also be assessed for any violation of the above.

Clearly, MARPOL Annex V and its implementing legislation in the United States represent, on paper at least, a major commitment to eliminating at least one source of marine plastic debris. How will it work in practice? MARPOL Annex V does not tell a vessel operator what he should do with ship-generated plastic waste--it only tells him that he cannot dispose of it in the ocean. The Coast Guard, charged with developing regulations to implement Annex V and the MPPRCA, has not sought through those regulations to steer vessel operators in any particular direction. Rather, it too leaves up to each individual operator the decision of what to do with plastic waste.

Implicitly, there is in Annex V a sort of presumption that the best solution is to off-load any plastic waste in port. This is because Annex V not only restricts the trash disposal practices of ships, but also requires that there be adequate reception facilities for garbage at ports and terminals. There is a rather obvious ambiguity here, in that most nonplastic garbage can still be disposed of at sea. Thus, it is unclear whether to be "adequate" a reception facility must be capable of handling only ship-generated plastic waste (the only waste that cannot be disposed of at sea), or whether it must be capable of handling the much larger volume of other garbage that might--or might not--be brought back to port.

On this issue, the Coast Guard's proposed regulations basically punt. The proposed regulations include a recommended "worksheet" for estimating the likely quantity of garbage that a port or terminal may be expected to handle, but then go on to disavow the likely accuracy of the formulas in the worksheet and any intention to rely upon those formulas in determining whether a port or terminal has met its obligation to provide adequate reception facilities. Indeed, the proposed regulations rely upon a system of self-certification, and require such self-certification for only a limited number of ports, principally those that already receive ships subject to Annexes I or II. Moreover, the proposed regulations do not even require that in certifying its reception facilities as adequate, a port or terminal identify what those facilities are.

VESSEL RESPONSE: INCINERATION AT SEA

Now, if you are a ship owner, you might at this point begin to get a bit nervous. The Coast Guard's proposed regulations were published on 27 October; Annex V was scheduled to come into force just 9 weeks later. As of that time it would no longer be lawful to dispose of plastic trash at sea, yet the availability of adequate reception facilities in port to handle any trash brought back to port had to be taken on faith. It was very clear that many of the larger shipping interests did not have that faith. In a number of public and private forums connected with the Coast

Guard rule making, two sentiments were very clearly expressed by these interests. The first was that 31 December 1988, was simply too soon to expect effective compliance with Annex V's new requirements for both ships and ports. The second was that in order to guard against the contingency that ports and terminals might in fact not have the ability to handle ship-generated garbage expeditiously or at all, larger ships would have to take care of their waste disposal problems by themselves by installing shipboard incinerators. It was rather remarkable, given the expense, potential danger, and generally primitive technology of shipboard incinerators, that installation of incinerators was the first alternative many shipping interests chose to explore, while reduction or elimination of optional plastics aboard ship seemed scarcely to have been considered.

It is unclear at this juncture just how much use of shipboard incineration will be stimulated by MARPOL Annex V, but it is very clear that it has stimulated a great deal of consideration of that option as a way of complying with the annex. Whether at-sea incineration of plastics represents a net environmental gain or merely solves one environmental problem by creating another is an open question. The Coast Guard, in its notice of proposed rule making, acknowledged that "proper disposal of incinerator ash has not been fully studied," but advised that for purposes of Annex V, ash is to be treated as operational waste that can be disposed of in the ocean beyond 3 nmi from shore. Rather more cautious advice can be found in the Guidelines for the Implementation of Annex V adopted by the Marine Environment Protection Committee of the International Maritime Organization in September 1988. Those guidelines, which are advisory only, state that the "ash from the combustion of some plastic products may contain heavy metal or other residues which can be toxic and should therefore not be discharged into the sea. Such ashes should be retained on board, where possible, and discharged at port reception facilities."

Even the more cautionary advice found in the guidelines probably understates the likelihood that incinerator ash will contain toxic heavy metals. About half of the tests that have been done of mixed bottom and fly ash, and virtually all of the tests of fly ash alone from municipal incinerators have found levels of lead or cadmium or both that exceed U.S. Environmental Protection Agency (EPA) criteria for designating such material as "hazardous waste" under the Federal Resource Conservation and Recovery Act (RCRA) (Denison and Silbergeld 1988). Plastics, some of which use lead or cadmium as stabilizers and colorants, are believed to be a major source of both of those heavy metals in municipal incinerator ash. Indeed, a recent study indicates that plastics account for 71% of the lead and 88% of the cadmium in the combustible portion of the municipal solid waste stream (Franklin Associates 1989).

The above percentages are all the more remarkable, given that plastics represent only about 7% (by weight) of the municipal solid waste stream. There is every reason to expect plastics to comprise an even greater percentage of the waste stream fed into an onboard incinerator, since it is only plastics that cannot otherwise be disposed of at sea. Thus, while lead and cadmium levels are generally high enough in municipal incinerator ash to be considered hazardous, even higher levels appear quite likely in

ash from shipboard incinerators. If that ash were brought to shore, it might have to be disposed of as hazardous waste under the RCRA. Since RCRA's reach does not extend beyond 3 nmi from shore, however, neither it nor MARPOL prohibits the disposal of the same ash directly into the sea. Section 311 of the Clean Water Act authorizes the EPA to prohibit the discharge of hazardous substances into the contiguous zone of the United States, but incinerator ash is not yet among the substances designated as hazardous under this authority.

Incineration of plastics at sea presents not only the problem of disposing of ash, but also that of controlling atmospheric emissions. Land-based incinerators are typically equipped with sophisticated technology to capture harmful flue gases and reduce particulate emissions. Emissions from land-based incinerators are closely regulated under authority of the Clean Air Act. Onboard incinerators, because of their smaller size, shorter stacks, and other limitations, are unlikely to be equipped with any sort of emission control equipment; in any event, inasmuch as vessels at sea are outside the scope of the Clean Air Act, they will not be required to control their emissions. Yet, the incineration of some plastics, in particular polyvinyl chloride, produces highly toxic, corrosive gases.

Whether widespread conversion to at-sea incineration of plastics will create a new set of environmental problems is open to debate. What is clear is at least the potential for solutions to one problem to become themselves the source of another problem. Just as the long distance transport of acid rain-causing sulphur oxides was the unforeseen result of building higher and higher emission stacks to reduce local air pollution problems, so too might some of the solutions to the environmental problems of plastic debris cause other, largely unforeseen problems.

DEGRADABLE PLASTICS

Let me illustrate this with a discussion of a very hot topic--"degradable" plastics. The concern with the problem of marine plastic pollution has helped trigger what can only be described as an avalanche of interest among public policy makers in the subject of degradable plastics. The MPPRCA of 1987 does not merely implement MARPOL Annex V. It also directs EPA to carry out a study of the adverse environmental effects of plastics generally, and to evaluate the feasibility of making products that present a particular hazard to the environment from "degradable plastics materials." Less than a year later, in October 1988, Congress passed another law, Public Law No. 100-556, requiring EPA, within 2 years thereafter, to issue regulations requiring that "plastic ring carriers" be made of "naturally degradable material" unless doing so is infeasible or will result in byproducts of degradation that present a greater threat to the environment. Only a month earlier, Congress included in the Defense Department Authorization Act, Public Law No. 100-456, a provision (section 352) directing the Secretary of Defense to report to Congress by 1 March 1990 his recommendations concerning the substitution of "degradable plastic items for nondegradable plastic items" used by the military. The Senate also passed Senate Resolution 412, a nonbinding resolution

expressing the sense of the Senate that EPA should encourage the use of biodegradable plastic bags and other items through its regulatory and informational programs.

In addition to these enacted measures, there were also a number of other bills introduced in the last Congress that would have mandated either the study of, or use of, degradable plastics for a variety of purposes. In the new Congress, interest will almost certainly be even higher. At the state level, degradable plastics are required for beverage ring carriers in at least 17 states and for still other products in a number of states. Corn-growing states in particular have an interest in pushing degradable plastic requirements, since at least some of the technologies for producing degradable plastic utilize corn starch as the ingredient that imparts degradability. Thus, it came as no great surprise to me to learn recently that the incoming chairman of the National Governor's Association, the Governor of Iowa, has degradable plastics near the top of the environmental agenda that he wants the association to pursue.

The rush to impose degradable plastic requirements has far outpaced any reasonable understanding of the extent to which degradable plastics are actually likely to contribute to the solution of current environmental problems and the likelihood that they might exacerbate others or create altogether new ones. Some of the promoters of degradable plastics have argued that products that might otherwise entangle marine animals will be so weakened that they will be readily broken. One seldom hears acknowledged, however, that those same products, and others that never presented any entanglement threat, may, by virtue of their gradual breakdown into multiple fragments, be far more likely to contribute to the problem of ingestion than they would have done had they remained intact. As for the chemical products of degradation, the discussions to date have rarely included mention of the fact that heavy metals and other toxic chemicals are commonly used as plasticizers, stabilizers, catalysts, and colorants in a wide variety of plastics. While a plastic product remains intact, these are relatively inaccessible to the environment. As that product degrades into ever smaller pieces and shorter polymer chains, however, these same chemicals are likely to become much more accessible to the environment. My point is not to say that, on balance, degradable plastics represent a greater environmental threat than nondegradable plastics; rather, it is only to say that no one yet knows what trade-offs are involved, yet the rush by many legislators to embrace degradable plastics has nearly become a stampede.

If degradable plastics are an unlikely panacea for the problem of marine plastic pollution, what other measures beyond MARPOL itself offer some hope of redressing the problem? The limitations of MARPOL Annex V are apparent. Even assuming widespread voluntary compliance with, and effective enforcement of, its prohibitions--and such assumptions are not easily indulged--MARPOL Annex V at best only addresses a fraction of the problem. It does not touch at all the problem of lost or damaged fishing gear, or marine plastic waste that can be traced back to beach litter, storm water runoff, sewage disposal, spills associated with marine transfer of municipal waste, factory discharges into inland waters and estuaries,

and other essentially land-based sources. All water runs downhill, and at the bottom of all those hills lies the ocean. Add to this diversity of sources of marine plastic pollution the fact that the incredible penetration of the market by more and more plastic products continues unabated, and it is not difficult to look upon the task of protecting the oceans from plastic debris as a job suited for Sisyphus.

PLASTICS IN THE SOLID WASTE STREAM

What public policy alternatives exist for making additional inroads into the marine plastic pollution problem? At least part of the answer, it seems likely, will derive from the eventual recognition that the problem of marine plastic debris is but one facet of a much larger set of problems stemming from the growing abundance of plastics in the solid waste stream.

Plastics present a number of unique problems, not just for living marine organisms, but for human communities struggling with the growing solid waste crisis. As already noted, plastics are primary contributors of some of the heavy metals in municipal incinerator ash that may cause that ash to be treated--and very expensively--as hazardous waste. In addition, the very low level of plastics recycling frustrates effective solid waste management programs.

Increasingly, many communities are recognizing that the most economical and environmentally sound response to the growing solid waste problem is to include an aggressive recycling component in their solid waste management programs. Yet, plastics in the waste stream are, by and large, replacing the very glass and metal containers that enjoy some of the highest recycling rates. Pressed on one side by the prospect of diminishing landfill capacity and on the other by the high cost of building and operating incinerators, many states and local governments are enacting laws that prescribe some minimum level of recycling of the overall municipal solid waste stream--typically at least 25% and sometimes twice that. Achieving those prescribed rates will be difficult unless either the amount of plastic in that stream is limited or the extent of plastics recycling dramatically increases. A number of communities are already trying to accomplish the former by prohibiting certain types of plastic packaging or by imposing differential taxes on certain products, with a higher tax on those made from materials not readily recycled. Suffolk County, New York, is an example. Its law prohibiting plastic bags and certain fast food packaging is serving as something of a test for how far local communities can go in banning plastic products. The plastics industry does not take this lightly. It has challenged the Suffolk County law in a New York trial court in a case entitled Society of the Plastics Industry v. County of Suffolk; the Environmental Defense Fund and the Natural Resources Defense Council have intervened in support of the county law.

Laws like that of Suffolk County are likely to become increasingly common unless dramatic strides in the recycling of plastics are made very soon. Of the more than 9 million MT (20 billion lb) of plastic in the municipal solid waste stream in 1986, only 68,000 MT (150 million lb), or

<1%, was recycled (EPA 1989). By contrast, more than 26% of paper and paperboard, and more than 50% of aluminum cans are recycled (EPA 1989). Virtually the only plastic product with a more than negligible recycling rate is the PET (polyethylene terephthalate) soft-drink bottle. However, returnable deposit legislation, which currently exists in only 10 states, represents the only significant means through which plastic bottles are currently being collected for recycling (EPA 1989). In Michigan, which has a required 10 cent deposit, the recovery rate is nearly 90%. In states without mandatory deposit legislation, there is virtually no recycling of plastic bottles. Thus, if the plastics industry wanted to give a real boost to recycling, it would break ranks with the bottling industry and support state mandatory deposit legislation.

In the long run, the amount of plastic debris in the marine environment is likely to be a function not merely of the waste disposal practices of vessels at sea, but of the laws and public policy measures that influence how much further growth of the plastics market will occur and how plastics in the solid waste stream generally are treated. Measures to mandate or encourage reusable or recyclable products, to limit product packaging, or to encourage nonplastic alternatives may ultimately contribute as much or more to the solution of the marine plastic debris problem as measures aimed directly at marine industries.

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