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Pollution &(and) Liability Problems Connected with Deep-Sea Mining

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POLLUTION & LIABILITY PROBLEMS CONNECTED WITH DEEP-SEA MINING

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The sanction underlying the threat of liability, especially strict liability, may not provide the only, or even the relevant, deterrent to pollution of the sea. Regulation and control of uses of the sea and of the land, including the outright prohibition of some activities and substances, surveillance, experimentation and the search for antidotes or alternative beneficial uses, and their imposition when proved, are also necessary. In this wider context liability merely becomes a peripheral and incomplete means of enforcement, just as it must always remain a less than one hundred percent satisfactory remedy for the injured. This article is intended to bear upon the liability issue, remembering its standing as a relatively inferior, insensitive and unsatisfactory weapon in the armory of remedies and controls.

Analysis of the problem will be served by identifying some examples of emerging deep-sea mining activities which will increase the hazards of pollution and connected harms, and by identifying other emerging or possible maritime uses which may be more than usually vulnerable to those harms. It will then be possible to indicate liability issues in terms of conduct which operates expropriatively by throwing the burden of risks onto others as contrasted with conduct which is vulnerable to expropriation through the creation of risk by others.[1]

EMERGING TECHNOLOGIES AND INCREASING RISKS OF HARM

A. Examples of Deep-Sea Mining and Related Activities Which Increase Risks to Others

Many large-scale ocean enterprises functioning on the frontiers of science and technology engage in operations with a high degree of cost and risk. They would all appear to have one thing in common. They illustrate how some of the emerging scientific uses of what the ocean has to offer, these being generally justified by man's scriptural

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1. This thought was basic to this writer's *Liability for Damage and the Progressive Development of International Law*, 14 Int'l & Comp. L.Q. 1189, 1222-24, 1254-58 (1965) [hereinafter cited as *Liability for Damage*]. Many of the thoughts in this earlier study will be central in the pages which follow.

mandate to exercise mastery over nature and as serving the general benefit, may greatly threaten the environment and bring waste, poverty, and misery in their train. They may, indeed, constitute not merely a risk of economic loss, but at times a possibility of bodily harm and even of sudden death. Economies which may seem attributable to technological breakthroughs and to size may, on a more careful review, come to be seen, at least in part, as savings made at the expense of third parties or the environment. Such economies will precipitate increased hazards of pollution. These two items, cost and risk, may, furthermore, be seen as reciprocal. The more an enterprise is called upon to shield third parties and the environment from the risks of disasters which may result from its operations, the higher its operating costs tend to become. Conversely, the more such an enterprise is permitted to expose third parties to harm, or the environment to devastation, the more it will be in a position to reduce its operating costs. The costs of protection, however, still remain; they become "social costs"[2] and are merely transferred from the enterprise to the environment or to society. Enterprises which enjoy the privilege of passing on their costs clearly increase the risk of harm to other users. In doing so, the risks they deliberately create effectively expropriate from members of the public the expectations that they will continue to enjoy security of person and property and the environmental amenities of life. Examples of this group of expropriative activities include the winning of minerals from the sea floor and related activities.

1. Mineral Resources from the Ocean

(a) Fossil Fuels under the Seabed

For a considerable time oil has been won from shallow seabed areas. But recent improvements in technology have allowed economically feasible oil drilling to take place beyond the two hundred meter bathymetric contour line[3] (the outer limit of the legal continental shelf as defined in terms of depth[4]). This tech-

2. For a discussion of this issue, and the thesis that throwing the costs of extra-hazardous activities onto the shoulders of those who are exposed to the risk of harm should provide a basis for compensation, *see Liability for Damage, supra* note 1, at 1189 *passim* and *especially* 1212-13. *See also* Goldie, *Responsibility for Damage Caused by Objects Launched into Outer Space,* British Institute of International and Comparative Law, Current Problems in Space Law 49, 54, 56-57 (1966).

3. For an outline of this trend off the coasts of the United States, *see* Goldie, *The Exploitability Test–Interpretation and Potentialities,* 8 Natural Resources J. 434, 434-36 1968), *especially* notes 1 and 2 and the accompanying text and Appendix I.

4. *See* Convention on the Continental Shelf, *done* April 29, 1958, [1964] 15 U.S.T. 471, T.I.A.S. No. 5578, 499 U.N.T.S. 311. The other conventions which the 1958 United Nations Conference on the Law of the Sea at Geneva produced were: Convention on the

nological trend[5] will become intensified as demand increases.[6] Thus *Our Nation and the Sea* tells us:

> Twenty-two countries now produce or are about to produce oil and gas from offshore sources. Investments of the domestic offshore oil industry, now running more than $1 billion annually, are expected to grow an average of nearly 18 per cent per year over the coming decade. Current free world offshore oil production is about 5 million barrels per day or about 16 per cent of the free world's total output.[7]

As claims to develop more offshore oil and gas resources go out into deeper and deeper regions, they will inevitably give rise to even more acute problems of polluting the seas and the coasts.

More injurious to the environment than such dramatic blowouts as those in the Santa Barbara Channel and the Gulf of Mexico, and such massive oil spills from giant tanker casualties as those of the *Torrey Canyon,* and the more recent collisions in San Francisco Bay and the English Channel, are the day-to-day minor spills and leaks of oil from a multitude of activities. Thus:

> Pollution of the marine environment through massive oil spills has received increasing public notice because of several recent dramatic situations involving damaged tankers. These occurrences highlighted

Territorial Sea and the Contiguous Zone, *done* April 29, 1958, [1964] 15 U.S.T. 1606, T.I.A.S. No. 5639, 516 U.N.T.S. 205; Convention on the High Seas, *done* April 29, 1958, [1962] 13 U.S.T. 2312, T.I.A.S. No. 5200, 450 U.N.T.S. 82; Convention on Fishing and Conservation of the Living Resources of the High Seas, *done* April 29, 1958, [1966] 17 U.S.T. 138, T.I.A.S. No. 5969, 559 U.N.T.S. 285.

5. Already experimental drillings have been conducted through over 11,000 feet of water into the sediment beneath. *See, e.g.,* the report of the *Glomar Challenger's* drilling through 11,720 feet of water and a further 472 feet of sediment in the Gulf of Mexico to discover oil in submarine salt domes, N.Y. Times, Sep. 24, 1968, at 44, col. 2. *See also, id.,* Nov. 26, 1968, at 28, col. 2. For a report of discoveries by the U.S. Navy research ship *Kane* of clues to "oil rich salt domes" in the deep ocean off the west coast of Africa, *see, id.,* May 13, 1969, at 29, col. 1. For reports on oil exploration plays on the continental shelf and slopes of the United States and Canadian Atlantic coasts, *see, id.,* Aug. 30, 1968, at 25, col. 6. These include: (1) permits have been issued for the exploration of 260 million acres or nearly 410,000 square miles of seabed; (2) the Shell Oil Company will use a semi-submersible rig, the *Sedco H,* which will drill as deep as 25,000 feet while sitting on the seabed under 100 feet of water, or afloat through 800 feet of water; (3) most of the areas now being explored are within 200 miles of the largest cities of the United States, while other areas are close to major Canadian cities; and (4) like the North Sea, and in contrast with the Gulf and Southern California coasts, most of this area is extremely turbulent.

6. For projections of increases in both demand for and production of offshore oil "twenty years from now," *see* U.S. Commission on Marine Science, Engineering and Resources, Our Nation and the Sea 122-30 (1969) [hereinafter cited as Our Nation and the Sea.] In addition to Our Nation and the Sea, the Commission has published three volumes of Panel Reports: 1 Science and Environment (1969); 2 Industry and Technology: Keys to Ocean Development (1969); 3 Marine Resources and Legal-Political Arrangements for Their Development (1969) [hereinafter cited as Panel Reports and prefixed by the appropriate volume number].

7. Our Nation and the Sea, *supra* note 6, at 122.

> the ease with which natural resources and the economic life dependent upon them could be wiped out by one unfortunate incident, and focused attention on the possibility of other such incidences. Yet the most pervasive pollution comes not from headlined oil spills but from the many activities that take place every day underwater. There are about 16,000 oil wells off the continental United States, and the number is increasing by more than one thousand a year. There is rightful concern that oil well blow-outs, leaks in pipelines, and storm damage can cause pollution that could ruin large parts of commercial fisheries, sports-fishing, and recreational areas.[8]

(b) Surficial Deposits

Some seven years ago Dr. John Mero told us:

> [S]ubstantial engineering data and calculations show that it would be profitable to mine [from the sea] materials such as phosphate, nickel, copper, cobalt and even manganese at today's (1964) costs and prices. And I firmly believe that within the next generation, the sea will be a major source of, not only those metals, but of molybdenum, vanadium, lead, zinc, titanium, aluminum, zirconium, and several other metals as well.[9]

And added:

> But most important, the sea-floor nodules should prove to be a less expensive source of manganese, nickel, cobalt, copper, and possibly other metals than are our present land sources.[10]

Although these minerals may be increasingly won from the sea, they undergo a cycle of constant renewal[11] which, as far as can be foreseen, will continue to add a greater quantity of nodules to the store already on the seabed than will be taken for human use.

These possible future sources of wealth and well-being, however, may, like the winning of oil and gas from the subsoil of the deep oceans, carry risks of polluting the environment[12] if their waste products, including acids and other processing chemicals, should be dumped into the sea by the mobile processing ship.[13] A number of

8. 1 Panel Reports, *supra* note 6, at III-52 to 53.

9. J. Mero, The Mineral Resources of the Sea 275 (1965).

10. *Id.* at 280. *See also* Mero, *Review of Mineral Values on and Under the Ocean Floor*, in Marine Technology Society, Exploiting the Ocean 61 (Transactions of the 2d Annual MTS Conference and Exhibit, June 27-29, 1966) [hereinafter cited as *Mineral Values*]; 1 Panel Report, *supra* note 6, at I-32; 3 Panel Reports, *supra* note 6, at VII-106 to 171; and C. Troebst, Conquest of the Sea 180-93 (B. & E. Price transl. 1962) [hereinafter cited as Troebst].

11. *See, e.g., Mineral Values, supra* note 10, at 76.

12. 2 Panel Reports, *supra* note 6, at VI–184 to 186; Our Nation and the Sea, *supra* note 6, at 134-35.

13. *But see* 2 Panel Reports, *supra* note 6, at VI-188 quoting W. Hibbard, Director of the Bureau of Mines, as saying:

> Research on the problems of waste disposal. . . . [U]nwise dumping of the

such ships could turn sea areas (possibly of no great extent initially) into maritime equivalents of slag heaps, thereby causing very considerable ecological change and deleteriously affecting the food web.

2. Transportation

Winning petroleums and other mineral wealth from the sea floor is but the first stage in the development of the raw materials into the commodities which enhance life; they will need to be transported to centers of population. The logistical means of bringing oil and other maritime resources to shore may remain, at least for this century, giant tankers.[14] Pipelines may well eventually come to provide means of transporting the great bulk of gaseous, liquid and fine-grain materials from seabed operations in the deep ocean,[15] but this mode of transportation faces not only great technological problems, but also problems of the political stability of the coastal states upon whose lands the pipelines encroach. Giant tankers, nuclear-propelled cargo ships,[16] submarine trains and pipelines present international lawyers with hard problems of pollution liability.

The economies of scale these modes of transportation provide also increase the hazards of pollution. These will be commensurate with the increase in the size of the tankers and submarine trains and the diameter and length of the pipelines. As new modes of surface and submarine cargo carriers increase in size and speed, they will create very important problems of safety. The risks their speed and power

tailings, if not carefully planned, could quickly foul a mining operation. Furthermore, the compatability of a marine mining operation with exploitation of the other resources of the sea, particularly the food resources, will depend principally on the effectiveness of the tailings-disposal system.

14. For a projection of the growth of tankers and bulk carriers over the period 1970-2000, *see* Table 4, 1 Panel Reports, *supra* note 6, at III-67. *See also* the textual matter accompanying that Table.

15. *See* Troebst, *supra* note 10, at 97-98, where the author projects the following possible developments in ocean transportation:

> Eventually man will use regular convoys of submarine barges, towing behind them a chain of enormous, sausage-like containers. The United States Rubber Company and several European firms have already designed rubber containers for surface transportation of various liquid cargoes. Bigger versions, 20 feet in diameter and 360 feet long, would be ideal for high-seas traffic. Every "rubber sausage" of this size could hold 182,000 gallons of freight and several of them could be towed by a single submarine tanker. Admiral Momsen is convinced that by 1980 such submarine barge trains will be almost a mile long, transporting some seventy-five different liquids ranging from oil, petrol, alcohol and acids to fine-grained materials like cement or grain. One great advantage would be that no reloading would be necessary if the purchaser was located inland. Tugs could continue to convey the goods by river to the point nearest the final destination.

16. *See Shipping Faces the Rapids*, 235 The Economist, Apr. 11, 1970, at 51.

will create constitute yet another threat to their potential victims and to the environment.

B. Some Examples of Risk-Exposed Activities

1. Development of Biological Resources

Edible fish constitute perhaps the oldest, and certainly the most valuable, of the biological resources of the sea. But, from the most far-off times to the present, mankind has had only one approach, the most primitive, to the winning of this resource—that of the hunter and collector. Mankind may eventually need, in order to survive, to change his means of gathering food from the sea, from the hunter of fish to the herdsman and shepherd of some species and the farmer and cultivator of others, thereby changing fundamentally his ecological, social, economic and legal relations to the sea.[17] It may well become necessary for him to cultivate and process algae and plankton, even if only to feed the fish and animals which he himself will eat. These activities could clearly qualify for a very high level of protection from exposures to harms, since they are especially vulnerable to destruction by pollution and to risk-creating preemptive activities generally.

2. Health, Therapy and Recreation

In addition to winning drugs from the sea,[18] mankind may also use its surface and volume for health, therapy and recreation. Dr. Cousteau has described how cuts and sores, which proved obstinate and hard to cure on account of the heat and other adverse conditions ashore, healed in 48 hours or less under the Red Sea in Conshelf II.[19] Perhaps hospitals for personal injury and accident victims and major surgery cases might be beneficially established underwater. In addition, psychotherapy may develop concepts, arising from the universal symbolism of the sea, calling for restful sanatoria, especially for hypertension and anxiety cases, to be developed in the volume of the oceans or on the seabed.[20]

With the spread of leisure, of education, and of the popularity of scuba diving, underwater activities—no less than such surface recrea-

17. Experiments are already being conducted into fish farming by analogues with battery methods. *See On Flatfish Farm,* 234 The Economist, Jan. 24, 1970, at 51.

18. *See* 2 Panel Reports *supra* note 6, at VI-190 to 197.

19. J. Cousteau, *Working for Weeks on the Sea Floor,* 129 Nat'l Geographic 498 (1966).

20. For an interesting confirmation of this theoretical possibility, *see* Wilford, *Learning from a Sojourn Under the Sea,* N.Y. Times, July 12, 1970, § 4 (The Week in Review), at 10, col. 1.

tions as sailing, surfing, speedboat racing and cruising—may become increasingly popular. The appeal of underwater hobbies and interests may even come to exceed that of the surface, since they offer an intellectual dimension lacking in surface water sports, while they also possess an equally physical dimension in the form of exercise and excitement. Scuba-diving amateur naturalists could become interested in being observers of, reporters on, and important contributors to, the many nascent underwater sciences. Can we not foresee mass production of inexpensive underwater recreation and research vehicles and vessels? What would be the liability of extra-hazardous submarine enterprises such as deep-sea well heads, to those engaging in underwater naturalist and observation activities? What precautions should be demanded?

3. Scientific Research

The marine sciences are developing very rapidly, but their burgeoning may well become a basis for one of the major confrontations of exclusive and inclusive claims by users of the oceans' volume and floor. At a time when more and more countries have scientific research ships flying their flags—whether owned by universities or private or government laboratories[21]—many coastal states are seeking more than ever before to restrict scientific research activities off their shores.[22]

Increasingly, ocean and outer space research activities may become intimately connected in a number of ways. The ocean seems to provide a location for the recovery of space vehicles on their return to earth. Reciprocally, space vehicles have enormous ability in monitoring the state of the oceans. In addition, large floating platforms may well provide valuable links in combined ocean-outer space research and communications activities. However, their functioning is predicated on an environment kept relatively free of pollution.

On the other hand, the freer marine scientific research is allowed to become, the more likely pollution, radiation, eutrophication, ecological imbalance, and other man-made abuses of the sea may be discovered and rectified. Claims made in this connection may well vie with many of the most time-honored uses of the sea—including its treatment as the ultimate depository of all kinds of garbage and as

21. *See, e.g.*, list of scientific research ships registered by the maritime nations of the world in 1 Panel Reports, *supra* note 6, at I-14. For a survey of the growth of marine science research activities, *see, id.* at I-2 to 3 and I-13 to 19.

22. Papers delivered by William L. Sullivan, Jr., Department of State, and Daniel S. Cheever, Director, Department of International Affairs, University of Pittsburgh, at the Law of the Sea Institute's Fourth Annual Summer Conference on National Policy Recommendations (Kingston, Rhode Island, June 26, 1969).

the "ultimate sink." In evaluating a viable system of priorities it will be necessary for international law to determine the protections it will accord to research—an inclusive use of the sea—and to the preemptive, exclusive uses which may curtail it.

POLLUTION AND LIABILITY

A. Absolute Liability—A Proposed Definition

Professor Winfield has pointed out that the exculpating rules which the courts have developed to mitigate the rigour of the defendant's liability under such rules as *Rylands v. Fletcher*,[23] render the adjective "absolute" something of a misnomer; hence the phrase "strict liability" has come to be preferred. I would like, however, to revive the term "absolute liability," not in order to enter any debate with Professor Winfield, but to indicate a more rigorous form of liability than that usually labeled "strict," as for example, that formulated in the nuclear liability treaties.[24]

It would be more exact to say that absolute, rather than strict, liability was imposed in the international agreements on liability to third parties in the field of nuclear energy which have just been indicated. Those agreements utilize the principle of channeling,[25] which traces liability back to the nuclear operator, no matter how long the chain of causation, nor how novel the intervening factors (other than a limited number of exculpatory facts). They also admit of fewer exculpations than does the rule in *Rylands v. Fletcher*[26] and similar rules.

B. Proposed Perspectives for Liability Doctrines

Even though I welcome the advent of strict and absolute liability in international law, I do not look forward to the elimination of the

23. L.R. 3 H.L. 330 (1868).

24. These treaties are: (1) International Convention on Civil Liability for Nuclear Damage, *done* May 21, 1963, Int'l Atomic Energy Agency Doc. CN 12/46, 2 Int'l Legal Materials 727 (1963); (2) Convention on the Liability of Operators of Nuclear Ships, May 25, 1962, 57 Am. J. Int'l L. 268 (1963); (3) Convention on Third Party Liability in the Field of Nuclear Energy, *done* July 29, 1960, O.E.E.C. Doc. C (60) 93, 8 Eur. Y.B. 202 (1960); and (4) Convention Supplementary to the (O.E.E.C.) Paris Convention, 1960, *done* Jan. 31, 1963, 2 Int'l Legal Materials 685 (1963). There is a fifth embryonic agreement, a draft sponsored by the Inter-American Nuclear Energy Commission.

25. "Channelling" in this context denotes the tracing of liability for nuclear injuries back to the operator of a nuclear ship or reactor notwithstanding the length of the causal chain or the intervening acts—except the willful acts of the plaintiff. *See, e.g.*, Vienna Convention Art. 2, § 1, 2 Int'l Legal Materials 727, 730-31.

26. Illustrative of the limitations which its many exceptions place on the rule in Rylands v. Fletcher, *supra* note 23, is the fact that Winfield lists eight. P. Winfield, Winfield on Tort 417-32 (8th ed., Jolowicz & Lewis, 1967).

less stringent doctrines from the areas of their appropriate application. The strictness of the liability to be imposed should depend upon the type of activity causing the harm, the type of activity harmed, and the juxtaposition of the operator and the injured.[27] A scale of liability, reflecting the degree of preemptiveness of the activity to which liability is attached, and exemplified in five social situations and their consequential regimes[28] may be proposed. These have not, it should be emphasized, been developed in order to render the question of liability dependent on the location of the accident (*i.e.*, in exclusive zone of coastal state jurisdiction or on the high seas), but on the activities giving rise to the ensuing injury—that is on the social relations created by the incident. These five exemplifying social situations and their attendant levels of liability are:

(i) When harm to a coastal population or to its livelihood is occasioned by a use of the sea which gains economies from exposing others to increased risks, absolute liability, channelling accountability to the operator (possibly subject to a maximum limitation of liability sum) should be imposed on the risk-creating operator for causing the harm;

(ii) When fish-farming, including intensive or "battery" fish farming activities, health (including submarine therapy), submarine recreation and scientific research activities are harmed by the types of activity indicated in (i) above, absolute liability, subject to a maximum limitation of liability figure, should be imposed;

(iii) When harms caused by activities in (i) above are suffered by other activities in the same category, then the injury calls for no higher level of compensability than that given by fault liability;

(iv) When traditional maritime activities, for example fishing with trawls, lines and nets (including purse seine nets) cause injury to such activities as those in (i) above, for example, submarine pipelines or tankers, or mining activities, then the liability applicable should be in terms of fault; but negligence should be presumed. The actor, for example the fisherman, should be permitted to exculpate himself on such grounds as want of notice and knowledge on his part, due care, or inevitability. When traditional fishing activities are the immediate cause of

27. This concept of the relativity of liability in international law to risk creation, exposure, and social desirability was first outlined by this writer in *Liability for Damage, supra* note 1, at 1220-24, 1254-58.

28. The concept of "regimes" used here and elsewhere in this essay is taken from Goldie, *Special Regimes and Pre-emptive Activities in International Law,* 11 Int'l & Comp. L. Q. 670 (1962). *See also* McDougal, *The Prospect for a Regime in Outer Space,* Law and Politics in Space 105, 106-109 (Cohen ed., 1964).

harm in traditional fishing grounds, or under other circumstances where the operator of the tanker, submarine or other risk-creating activity, knowingly increases the risk to others, the fisherman may show that those facts represent an assumption of risk by the operator of the pipeline, tanker, mine or other technologically advanced artifact involved in the casualty. Indeed, the application of channelling proposed in (i) above may well leave the operator of the risk-creating enterprise as the party liable rather than the fisherman whose net or trawl may have been the immediate cause of the harm;

(v) When traditional maritime activities such as those indicated in (iv) above are the agents of harm to the vulnerable types of emerging activities, for example those indicated in (ii) above, then liability should be strict in the traditional sense; but not absolute.

Each of the five sets of social relations inherent in these different classifications of liability varies from the others in terms of the balance of risk and power to inflict harm while remaining free from physical injury or financial loss, and with the degree of effective expropriation which the creation of risk in each relationship entails. Thus, the regime appropriate to each set of social relations, by adopting the appropriate concept of liability on the total scale from absolute to fault liability, should be viewed as restoring the balance of risk and power, so that one group of interests is not permitted to take risks, or carry on its operations, at the expense of others. On the other hand, those "others," while entitled to protection, should be protected against the consequences of risks, which, as a result of their own prior conduct, they might well be viewed as being under a duty to shoulder. Furthermore, their own protection should be in terms of the risks to which they expose their own operations, their social desirability, their relative immunity from harm, and the risks they create for yet other activities. In this way each set of social relations which is brought into being by the creation of risk is seen as being subject to the degree of liability appropriate to the exposures it creates for others, to its own social value, and to its own vulnerability to harm. This thesis looks to the adjustment of the balance of risk and to the advantage in each special social situation which may be gained by the creation of risk as a form of expropriation.