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Export of Hazardous Waste and Hazardous Technology: Challenge for International Environmental Law*

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I. INTRODUCTION

The hard questions concerning industrial safety raised by the Seveso accident in 1976, the disaster in Bhopal, India, in 1984, and the Chernobyl catastrophe in the spring of 1986, were again pushed to the forefront of public attention in the wake of the Basel fire and chemical spill into the Rhine River in November 1986. The heightened interest and awareness in safety is reflected in Europe, the United States, and the Soviet Union. The subject is of special concern to developing countries which rely upon imported industrial technology to enhance the pace of their economic development.

Notwithstanding recent attempts to address situations involving the import or export of hazardous technology, there still remain unanswered questions. The world community has yet to undertake adequate measures to meet this formidable challenge.

The issue of dumping of hazardous wastes is of even more immediate concern to developing countries. Increased public consciousness of the environment in the developed countries led to the passage of stricter legislation with regard to disposal of hazardous wastes. As a result, producers of these wastes have sought cheaper alternatives to domestic disposal and turned to developing nations as disposal sites. A combination of misinformation and the need for foreign currency has enticed many nations to

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accept such wastes. However, developing nations are reconsidering these policies as a result of public pressures in the developing nations and international public opinion. Additionally, efforts to remove already dumped wastes raise liability questions. Thus, in some ways, the dumping of hazardous wastes involves similar issues to the export of hazardous technologies. This is particularly true when the transfer is from a developed country to a developing country.

This article will explore the considerations that must be taken into account in any international efforts to address the problem. Although the focus in this article is on the export of hazardous technologies, related issues involved in the export of hazardous wastes will also be addressed.

II. THE PROBLEM OF WASTE DUMPING

The current revelations of waste dumping in Africa are distinct from the disasters in Bhopal, Seveso, Chernobyl, and Basel: as of yet, massive environmental damage and loss of life have been avoided (though injuries have been reported by some workers who have come into contact with the substances).[1] However, these incidents are worth noting because they serve as a stimulus to international action to avert potential disasters.

Between September 1987 and May 1988, several ships unloaded cargo from Italy in the small port of Koko, Nigeria. The cargo consisted of hazardous waste packed in steel drums, some of which was reported to be poisonous PCBs and highly radioactive materials.[2] The cargo was "stored" in a vacant lot in a residential area of Koko for approximately $100 a month.[3] Until June, the presence of these materials was undetected by Nigerian newspapers, although it had been reported in the Italian press in March. In June of 1988, reports began appearing in the Nigerian media.[4]

When the presence of the material became publicized, the Nigerian government reacted by jailing one of the Italian partners responsible for importing the waste and demanding that the waste be removed.[5] The Italian government sent experts to Koko and arranged to have the waste removed. The Italian government planned to bill the cost to companies that exported the waste from Italy.[6]

The *Karin B.*, a West German ship, left Koko at the end of July carrying the toxic waste. Protestors prevented the ship from docking in Ravenna, Italy, the source of the alleged exportation. The ship subse-

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1. Brooke, *Waste Dumpers Turning to West Africa*, N.Y. Times, July 17, 1988, at 1, col. 2 [hereinafter cited as *Waste Dumpers*].

2. *Id.*; *Italy Recalls 'Karen B.', Introduces Remedial Steps*, 11 Int'l Env't Rep. (BNA) 469 (Sept. 14, 1988) [hereinafter cited as *Italy Recalls 'Karin B.'*].

3. *Waste Dumpers*, *supra* note 1, at 7, col. 1.

4. *Id.*

5. *Id.*

6. *Italy Recalls 'Karin B.'*, *supra* note 2, at 469-70.

quently was denied permission to dock in Spain, France, the Netherlands, and the United Kingdom. Finally in mid-September, the Italian government reportedly arranged for the ship to dock at an unspecified Italian port in mid-September.[7]

The incident at Koko was not unique. In March 1988, a Norwegian company dumped hazardous waste on a Guinean resort island. When tourists noticed the withering vegetation, it was discovered that the material was incinerator ash from the United States.[8] The government of Guinea imprisoned Norway's Honorary Consul, but the Norwegian company removed the waste by July.[9]

American and European companies also reportedly sought to dispose of hazardous waste by contract with African governments. In several instances, African leaders repudiated these existing contracts when the contracts became public.[10] In some cases, the contracts failed to specify or misrepresented the nature of the waste, while others reportedly contained kickbacks to government officials who approved the contracts. The existence of the contracts became a political issue in most reported cases.[11]

The recent awareness of these incidents produced strong reactions not only in developing nations, but also in developed nations and relevant international agencies. Both Nigeria and Guinea have imprisoned individuals who were determined to have "masterminded" the illegal importation of the wastes.[12] Nigeria even prescribes execution for individuals convicted of illegally importing hazardous waste.[13] Other nations have enacted fines, lengthy imprisonment, and the assessment of removal costs upon individuals convicted of dumping toxic wastes.[14]

Among developed nations, Italy, in September 1988, was considering a decree that would place an embargo on all exports of hazardous wastes to developing countries.[15] The United States Environmental Protection Agency currently enforces a policy of "prior informed consent" and is reportedly seeking approval of a policy allowing the agency to prohibit exports when "they might present a serious risk of harm to the importing

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7. *Id.*

8. *Waste Dumpers*, *supra* note 1; Shabecoff, *Irate and Afraid, Poor Nations Fight Efforts to Use Them as Toxic Dumps*, N.Y. Times, July 5, 1988, at A22, col. 4 [hereinafter cited as *Irate and Afraid*].

9. *Irate and Afraid*, *id.* at A22, col. 4.

10. Brooke, *African Nations Barring Toxic Waste*, N.Y. Times, Sept. 25, 1988, at A8, col. 1 [hereinafter cited as *African Nations Barring Toxic Waste*].

11. *Id.*

12. *Waste Dumpers*, *supra* note 1.

13. *Id.*; *Irate and Afraid*, *supra* note 8; *African Nations Barring Toxic Waste*, *supra* note 10.

14. Gambia, Guinea, Liberia, Togo, Ivory Coast, and Ghana are all reported to have enacted some type of legislation upon the issue. *See African Nations Barring Toxic Waste*, *supra* note 10.

15. *Italy Recalls 'Karin B.'*, *supra* note 2, at 470-71.

country."[16] A bilateral agreement between the U.S. and the importing country may be required as evidence of consent.[17] Other developed nations also are reassessing their export policies concerning hazardous waste.

International organizations also are active in the area. In June 1988, the Organization of African Unity condemned the dumping of waste material in Africa as "a crime against Africa and African people."[18] The European Community ("E.C."), is considering a resolution to implement EC Directive 86/279, calling for prior informed consent and proof of capacity to handle the waste in a safe way by the importing country before export is permitted.[19] In March, 1989, a proposed conference is set for the signing of a convention regulating the shipment of hazardous waste.[20] While work on this convention began before the most recent revelations of dumping of waste in Africa, UNEP has reported increased interest in the convention during the course of 1988.[21] In September 1988, the International Maritime Bureau established a "hotline" to compile information on unregulated dumping of hazardous waste.[22] It is hoped that such a hotline will enable shipowners to examine the background of agents who present potentially hazardous cargo which may be rejected at the destination port.[23]

All of these actions indicate a new awareness of the problems posed by hazardous waste disposal, particularly when the wastes are exported to developing countries which may lack the technology to adequately handle dangerous materials.

III. TRANSNATIONAL RESPONSES TO WASTE DUMPING

Principle 21 of the 1972 Declaration of the United Nations Conference on the Human Environment is relevant to the issue of export of hazardous wastes. This principle imposes responsibility on states to ensure that activities within their control do not harm the environment of other nations.[24] Greenpeace calls for a total ban on the export of hazardous waste under this principle.[25] However, there are several factors that complicate a blanket ban based on this principle.

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16. *See Irate and Afraid, supra* note 8.

17. *U.S. Would Tie Waste Exports to Bilateral Agreements*, 11 Int'l Env't Rep. (BNA) 472 (Sept. 14, 1988).

18. *Irate and Afraid, supra* note 8.

19. *U.S. Would Tie Wastes Exports to Bilateral Agreements, supra* note 17, at 469.

20. *Id.* at 471-72.

21. *Id.* at 471.

22. *ICC's Maritime [sic] Bureau Establishes Hot Line to Collect Unregulated Waste Dumping Data*, 11 Int'l Env't Rep. (BNA) 473 (Sept. 14, 1988).

23. *Id.*

24. Report of the United Nations Conference on the Human Environment, U.N. Doc. A/CONF. 48/14 & Corr. 1, *reprinted in* 11 I.L.M. 1416 (1972).

25. *Greenpeace Calls for World Ban on International Traffic in Waste*, 11 Int'l Env't Rep. (BNA) 433-34 (Aug. 19, 1988).

First, it is clear that developing countries do not intend to request such a ban.[26] Instead, developing countries desire fuller disclosure by the exporting nations on the nature and hazards of the waste. They also request transfers of technology to aid in the safe handling of the waste.[27] Developing nations also request that transit nations, through which the waste will pass en route to its destination, should be permitted to prohibit transport of wastes in transit if they deem it unsafe.[28]

Although the need for recourse when the failure to respect established international standards is clear, there is no consensus as to the nature of such recourse. In the recent cases of dumping in Africa, the countries and companies involved resolved the disputes bilaterally and provided reasonably swift clean-up and removal of the hazardous waste. Still, the issue of punishment for scofflaw nations and companies remains.[29] This raises the difficult question of when a state is to be deemed responsible for the actions of its multinational enterprises. This question is especially difficult when the waste may be produced in one state and shipped by a company based in another state aboard a ship owned by a company in a third state. The complexity increases if the waste is shipped through intermediate points, especially if this is done to circumvent regulations of the state of production.[30]

Harmonization of international standards is another issue. Currently, at least two U.N. groups, as well as the Organization for Economic Cooperation and Development ("OECD"), are considering rules concerning hazardous wastes.[31] Harmonization of standards may simplify the regulatory tasks of both exporting and importing nations by standardizing terminology as well as disclosure and handling requirements. In the absence of international standards, corporations are urged to meet the highest national standards.[32] However, if disparate international standards are set, corporations might be tempted to meet only the minimal requirements of an international agreement.

State responsibility in related areas may serve as a reference point with regard to responsibility for export of dangerous technology and hazardous wastes.[33] In *The Corfu Channel Case*,[34] the International Court of

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26. *Supra* note 17, at 471.

27. *Id.* Developing nations probably would not favor the idea of a supranational police force to regulate hazardous waste, as this would be seen as an invasion of their sovereignty. *Id.*

28. *Id.*

29. *Id.* This issue may be addressed by UNEP conferences in November 1988 and March 1989.

30. Fears of such circumvention have deterred the European Community from insisting on a total ban of hazardous waste exports. *Id.* at 469.

31. The U.N. Committee on the Transport of Dangerous Goods and UNEP are reported to be coordinating their work. *Id.* at 492.

32. *Id.* at 493-94.

33. In this sense, responsibility can be said to be generally equivalent to liability. For discussion of state responsibility, *see infra* notes 340-364 and accompanying text.

34. [U.K. v. Albania] 1949 I.C.J. 4 (Judgment of April 9).

Justice affirmed the principle that a state is responsible, under customary international law, for conditions of which it knows, or should know, within its territory, that cause harm to another state. The state must know that such a danger exists,[35] but with respect to export of dangerous technology or hazardous waste, the danger is obvious. If the danger can be treated safely with appropriate methods and technology, and the harm is caused by dereliction of these standards in the importing state, a different situation arises. However, if the exporting state *knew* that the receiving state lacked adequate facilities and technology, fault would lie with the exporting state.[36]

The recent trend seems to be for developed countries to "assure themselves" that appropriate safeguards exist, at least with respect to disposal of hazardous waste. This solution is not satisfactory to developing nations, which may resent such judgments as infringements upon their sovereignty.

A system under which developing countries are fully informed of the risks associated with dangerous technologies/wastes and the importation of appropriate technologies to safeguard against such risks might be more acceptable. While importation of protective technology may indeed incur added expenses, the developing nations could decide for themselves if they should incur such expenses. The intensified awareness of the public to such dangers in both importing and exporting nations also could act as an additional constraint on reckless transfers of dangerous wastes or technologies.

The International Law Commission, in its study on the law of the non-navigational uses of international watercourses, proposed an analogous solution. The provisional articles provide for "equitable and reasonable utilization" of watercourses as well as for exchanges of information on the condition of the watercourse (including future plans which may have an effect on the watercourse).[37] Relating such a system to export of hazardous waste or technologies, an exporting nation could be required to disclose information on the nature and dangers of the waste, as well as to act in a "reasonable" manner. This might include sending technicians to check on the storage techniques as well as providing access to technologies for safely disposing of the waste or employing the hazardous technology.

A recent OECD proposal for its Code of Good Practice suggests that informed consent and cooperation between neighboring nations is an effective way of dealing with the export of hazardous technologies. The group recommends the development of emergency preparedness proce-

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35. *Id.* at 18.

36. This is not to say that some liability would not also arise to the importing state for allowing importation of such technology or waste.

37. *See International Law Commission Takes Key Steps Toward Watercourses Pact*, 11 Int'l Env't Rep. (BNA) 468-69 (Sept. 14, 1988).

dures and response plans. However, the group reached no conclusion on the issues of liability or sanctions against nations which do not comply with the proposed Code.[38]

IV. FACTUAL SETTINGS OF THE RECENT MAJOR ACCIDENTS RELATED TO THE EXPORT OF HAZARDOUS TECHNOLOGY

A. *Seveso, Italy*

On July 10, 1976, an explosion occurred in Meda, Italy at the Icmesa plant owned by Givaudan, a subsidiary of the Swiss-controlled Hoffmann-LaRoche chemical combine. A thick whitish cloud of trichlorophenol gas with a pungent, medicinal odor containing approximately four and one-half pounds of the substance 2, 3, 7, 8 dibenzo-paradioxin, know as TCDD or dioxin, was released into the atmosphere surrounding the plant. A northerly wind moved the cloud to the south over an area some four and one-half miles long and a third of a mile wide before dispersing a half an hour after the initial release.[39] The cloud eventually dispersed as droplets over parts of seven towns. The three most affected towns were Meda, Seveso, and Cesano Maderno.

The Icmesa plant, located about thirteen miles north of Milan, produced mainly trichlorophenol gas, a chemical used primarily to make hexachlorophene, an ingredient in cleansers and germicides, and 2-4-5, a defoliant employed by the American armed forces during the Viet Nam War.[40] On July 10, 1976, for an unknown reason, temperatures within the plant's system rose, causing pressure to build up. Production at the plant usually took place at a temperature of 180 degrees centigrade, while temperatures of 230 degrees centigrade caused the process to go out of control.[41] On that Saturday in 1976, the temperature in the system rose to 300 degrees centigrade, even though the controls were set for cooling. As a consequence of the pressure build-up, a safety valve burst, and the cloud of trichlorophenol gas was released into the atmosphere.[42]

The head of Givaudan, Guy Waldvogel, stated that the plant had two cooling plants built into its security systems, although these may not have been put into action soon enough.[43] As in Bhopal, the Icmesa plant was the subject of safety complaints prior to the accident. These complaints included assertions by plant workers that security measures for handling toxic substances were inadequate and that the plant lacked a dump tank

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38. *Hazardous Installation Measures Adopted by the OECED Member Countries*, 11 Int'l Env't Rep. (BNA) 465 (Sept. 14, 1988).

39. Davis, *Under the Poison Cloud*, N.Y. Times Mag., Oct. 10, 1976, at 20, col. 1 [hereinafter cited as *Poison Cloud*].

40. *Poison Cloud's Effects Still Baffle Italy's Officials*, N.Y. Times, Aug. 13, 1978, at 3, col. 1 [hereinafter cited as *Still Baffle*].

41. *Poison Cloud*, *supra* note 39.

42. *Still Baffle*, *supra* note 40.

43. *Poison Cloud*, *supra* note 39.

or vapor recovery system.[44] This latter defect meant that, once the safety valve burst, the vapors were released directly into the atmosphere.[45] A medical survey of workers at the plant also indicated many that had suffered from nausea and vomiting, burns, blisters, intoxication and vertigo.[46]

The Icmesa plant also exhibited the Bhopal pattern of company management failing to inform local authorities of the type of products being generated during the chemical production processes, the exact nature of the production processes, and the plant's high-risk potential. Initially, plant officials kept quiet about the release, hoping that rain would wash away the pollution. Finally, they informed local authorities twenty-seven hours after the explosion took place.[47] It then took the plant managers seven days to inform local authorities that dioxins were present in the released vapor cloud.[48] This delay occurred in spite of the fact that it involved a substance of which three ounces could injure or kill most of New York City's population.[49] Local authorities magnified these delay errors by taking five days to place some of the areas contaminated by the dioxin off-limits to workers and residents. In addition, the superhighway through the area remained open, and clean-up crews wore their contaminated protective clothing into non-contaminated neighboring areas.[50]

Once the magnitude and nature of the accident were realized by the local authorities, three zones were established around the plant with the most contaminated area designated as Zone A. This zone, which initially encompassed about 285 acres,[51] was sealed off, and the 730 inhabitants were evacuated.[52] The 175 children of the residents living in this zone were sent to state-subsidized summer camps. All agricultural, industrial, and commercial activity in Zone A was halted, including the sale and consumption of locally produced foodstuffs.[53] Zone B, which included about 451 acres, was classified as slightly polluted, and the 4,280 residents were allowed to remain at home, although they were urged to send their children away and pregnant women were asked to submit to medical examinations. A larger area, Zone C, was designated as a safeguard zone where the residents were advised not to eat produce grown in the area.

The accident's immediate human medical effects were primarily in the form of more than 500 cases of chloracne and other forms of skin disease. Some of these cases persisted for more than two years after the

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44. *Id.*; *Still Baffle*, *supra* note 40.

45. Graham, *How Are We Fixed For Toxic Clouds?*, 79 AUDUBON 137, 138 (1977).

46. *Poison Cloud*, *supra* note 39.

47. *Commission Reports on Causes of Seveso, Makes General Suggestions for New Rules*, 1 Int'l Env't Rep. (BNA) 246 (Aug. 10, 1978).

48. *Id.*; *Poison Cloud*, *supra* note 39.

49. *Poison Cloud*, *supra* note 39.

50. Harnik, *The Lessons of Seveso*, 64 SIERRA 77 (1979).

51. *Still Baffle*, *supra* note 40.

52. *Poison Cloud*, *supra* note 39.

53. *Id.*

time of the accident.[54] The most severe biological impact was the loss of produce and domestic animals raised in the contaminated zones, which either died or were destroyed.

The indirect long-term effects of the accident went beyond the physical impacts upon the inhabitants of the three zones. Immediately following the accident, orders for furniture and clothes sold by local merchants were either cancelled or large discounts were demanded.[55] The plant itself was permanently closed a little more than a month after the accident.[56]

Many families and businesses were disrupted as a consequence of the forced evacuation and relocation of residents of the contaminated area. Houses in the most contaminated areas were demolished, while structures left standing had to be decontaminated. Initially, the Italian government allocated $48.4 million to carry out these measures, with most of that money earmarked for decontamination and health projects for affected residents.[57]

The magnitude of the problem is demonstrated by the fact that officials were not sure how to clean up the affected area for months after the accident. Demonstrations by former residents occurred, protesting the slow pace of the government's decontamination program.[58] The basic reclamation plan finally approved by the regional government provided that all vegetation and soil to a depth of one foot from the directly affected areas were to be removed and incinerated at 1,000 degrees centigrade.[59] Once an area had been sufficiently decontaminated to allow human activity again, a research and experimental laboratory to study techniques for neutralizing or reducing the effects of dioxin was constructed. Nearly three years after the accident, data supplied by the laboratory indicated that there was no sign that the toxicity of remaining dioxin-contaminated areas was diminishing.[60]

By the time the decontamination efforts had been largely completed, more than two tons of chemical waste containing dioxin had been removed from the total of 4,400 acres of land which had been contaminated by the Icmesa plant.[61] Even the disposal of this waste was not without mishap, as the 41 drums containing the waste disappeared during their transport out of Italy. The drums were eventually located in a storehouse

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54. *Hoffman-Larouche Chairman Sees End to Threat from Pollution at Seveso*, 1 Int'l Env't Rep. (BNA) 211 (July 10, 1978).

55. *Town in Italy's Toxic Area Misses Children It Sent Away*, N.Y. Times, Aug. 17, 1976, at 6, col. 4; *Poison Cloud*, *supra* note 39.

56. *Polluting Factory in Italy Will Close*, N.Y. Times, Aug. 21, 1976, at 6, col. 3.

57. *Italy Allocates Funds For Gassed Region*, N.Y. Times, Aug. 11, 1976, at 2, col. 4.

58. *Italians Stage Protest at Contaminated Town*, N.Y. Times, Oct. 12, 1976, at 7, col. 1; *Poison Cloud*, *supra* note 39.

59. *Seveso Disaster*, N.Y. Times, Aug. 19, 1976, at 34, col. 1; *Poison Cloud*, *supra* note 39.

60. 2 Int'l Env't Rep. (BNA) 611 (April 11, 1979).

61. *Hoffman-LaRouche Says Dioxin from Seveso Entirely Removed for Disposal Outside Italy*, 5 Int'l Env't Rep. (BNA) 485 (Nov. 10, 1982).

in northern France after considerable public furor.[62] Finally, more than six years after the accident, the Italian government oversaw the dismantling of the Icmesa reactor and the burial of the remaining rubble from the reactor in lead barrels in a 160,000-cubic-meter ditch situated in a corner of the once-highly contaminated sector.[63] A committee of independent scientists reported that, eight years after the accident, no chemical traces of the explosion were visible, except for occasional continuing cases of chloracne. The committee reported that Hoffmann-LaRoche was planning to landscape the affected area into a 40-hectare park.[64]

Hoffmann-Laroche indicated fairly early on that it intended to accept responsibility for the consequences of the explosion and to compensate those damaged by the accident, perhaps partly as a result of the findings of a special parliamentary investigating commission set up by the Italian government. The commission's report, issued one year after the accident, accused the Hoffmann-LaRoche subsidiary, Givaudan, of not only failing to inform the local and regional Italian authorities about the nature of the Icmesa operations, but also of failing to install automatic control and warning devices.[65]

The Italian government and the Lombardy region reached a settlement with Givaudan with regard to compensation for the Seveso accident. Givaudan agreed to pay the governments a total of $80 million for expenses incurred by various Italian ministries, land reclamation, health work, rebuilding in the area, lost crops, and decontamination.[66]

The commune of Seveso filed suit in Geneva, Switzerland against Givaudan in early 1979 for damages to the community and its inhabitants. The suit accused Givaudan of failing to take adequate safety precautions, failing to correct those inadequacies after becoming aware of them, and attempting a cover up after the explosion.[67] Seveso and Givaudan reached a settlement of the suit in late 1983 when Givaudan agreed to pay about $7.2 million to Seveso for damages.[68]

Five Icmesa executives, including the plant's managing director, technical director, plant designer, company chairman, and plant engineer, were brought to trial as a result of the Seveso explosion. The five were charged with negligence leading to a disaster, causing contamination of a

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62. *Dioxin Wastes Still Missing in Europe, Pressure Mounts for Controls on Shipments*, 6 Int'l Env't Rep. (BNA) 194 (May 11, 1983).

63. *Remnants of Icmesa Reactor Demolished, Closing Book on Seveso Explosion, Cleanup*, 7 Int'l Env't Rep. (BNA) 38 (Feb. 8, 1984).

64. *Id.* at 220.

65. *Commission Reports on Causes of Seveso, Makes General Suggestions for New Rules*, 1 Int'l Env't Rep. (BNA) 246 (Aug. 10, 1978).

66. *Figures for Seveso Compensation at Odds with Italian Announcement*, 3 Int'l Env't Rep. (BNA) 242 (June 11, 1980).

67. *Seveso Files Suit in Geneva Court Seeking Damages for Dioxin Disaster*, 2 Int'l Env't Rep. (BNA) 574 (Mar. 10, 1979).

68. *Italian Court Sentences Icmesa Officials for Roles in Explosion at Plant in Seveso*, 6 Int'l Env't Rep. (BNA) 454 (Oct. 12, 1983).

vast inhabited area that had to be evacuated, and failure to have adequate safety systems.[69] The Italian court found the five guilty and assessed sentences ranging from two and one-half to five years in prison.[70] Four of the convictions were overturned on appeal, while the fifth sentence was suspended.[71] Charges against the mayor of Meda and local health officials were initially filed and then later dropped. The charges were based upon the officials' failure to apply existing legislation which could have avoided the disaster.

Two and one-half years after the Seveso accident, Italy, which had virtually no environmental legislation in force during 1976, enacted legislation which reformed its national health care system. Provisions within the new law which had a bearing on environmental hazards caused by harmful substances included standards for the production, registration, sale, and use of chemical substances capable of upsetting the biological and ecological balance; the establishment and maintenance of a national inventory of chemical substances; and the creation of "risk maps" based on a requirement that all factories provide data on the toxicological characteristics of the products they use and their possible effects on humans and the environment.[72]

B. *Bhopal, India*

On the night of December 2-3, 1984, toxic methyl isocyanate (MIC) gas escaped from an underground storage tank at a Union Carbide chemical manufacturing plant in Bhopal, India and leaked into the atmosphere.[73] The gas covered an area of 25 square miles and resulted in an

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69. *Still Baffle*, *supra* note 40; *Dioxin Waste Still Missing in Europe*, *supra* note 62 at 196.

70. *Supra* note 68.

71. *See* Revzin, *Seveso: Ten Years After the Dioxin Leak*, Wall St. J., July 8, 1986, at 36, col. 1.

72. 2 Int'l Env't Rep. (BNA) 506 (Feb. 10, 1979).

73. *See, e.g.*, *The Implications of the Industrial Disaster in Bhopal, India*, Hearing before the House Subcommittee on Asian and Pacific Affairs of the Committee on Foreign Affairs, 98th Cong., 2d Sess., Dec. 12, 1984, at 3, 6 (statement of Robert A. Peck, Deputy Assistant Secretary for Near Eastern and South Asian Affairs, Department of State), and at 28 (statement of Ronald Wishart, Vice President for government relations, Union Carbide Corp.); *Hazardous Air Pollutants*, Hearing before the House Subcommittee on Health and the Environment of the Committee on Energy and Commerce, 98th Cong., 2d Sess., Dec. 14, 1984, at 8 (statement of Warren M. Anderson, CEO of Union Carbide Corp.); *Release of Poison Gases and Other Hazardous Air Pollutants from Chemical Plants*, Joint Hearing before the House Subcommittee on Health and the Environment and the Subcommittee on Commerce, Transportation and Tourism of the Committee on Energy and Commerce, 99th Cong., 1st Sess., March 26, 1985, at 198, 205 (statements by Warren M. Anderson and Jackson B. Browning, President and Vice President for Health, Safety and Environmental Affairs of Union Carbide Corp. respectively regarding possible causes of accident); *Bhopal — What Really Happened?*, Bus. Wk. (New Delhi), Feb. 25 - March 10, 1982, at 102; *Bhopal: City of Death*, India Today, Dec. 31, 1984, at 6; Hazarika, *Gas Leak in India Kills at Least 410 in City of Bhopal*, N.Y. Times, Dec. 4, 1984, at A1, col. 6; Diamond, *The Bhopal Disaster: How It Happened*, N.Y. Times, Jan. 28, 1985, at A1, col. 1.

unparalleled catastrophe, causing the death of over 1,600 people and injuring over 200,000 people as a direct result of the leak; several hundred more died in the next few months due to the fatal effects of the lethal gas.[74] Livestock were killed, crops damaged, and businesses interrupted.[75]

In the aftermath of the world's worst industrial accident, medical authorities were uncertain about the long-term effects of exposure to the deadly gas.[76] Two years after the disaster, it was reported that lingering effects on many Bhopal residents included "shortness of breath, eye irritation, and depression."[77] The Indian government reported that the death toll has risen to 2,347 people, that 30,000 to 40,000 people had suffered serious injuries in the incident,[78] and that it had received 500,000 leak-related claims.[79]

The accident occurred at the Bhopal plant of Union Carbide India, Ltd. (UCIL), a subsidiary of the Union Carbide Corp., a New York corporation with headquarters in Danbury, Connecticut, which owns 50.9% of its Indian subsidiary. The Indian government blamed Union Carbide for errors in the design, management, and oversight of the Bhopal plant, and specifically asserted that "unreasonable and highly dangerous and defective plant conditions" caused the catastrophe.[80] It cited inadequate safety measure, faulty alarm systems, storage of huge quantities of toxic chemicals, lack of cooling facilities, and poor maintenance at the factory.[81] The company, on the other hand, contended that the responsibility must lie with its subsidiary along with the state of Madhya Pradesh where the plant was located and the central government of India; it also alleged sabotage by a disgruntled worker at the plant.[82]

In the Bhopal district court where the case was pending, Union Car-

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74. *See, e.g.*, Lewin, *Carbide Is Sued in U.S. by India in Gas Disaster*, N.Y. Times, April 9, 1985, at D2, col. 2; Kramer, *For Bhopal Survivors, Recovery is Agonizing, Illnesses are Insidious*, Wall St. J., April 1, 1985, at 14, col. 2.

75. *See In re* Union Carbide Corp. Gas Plant Disaster at Bhopal, India in Dec., 1984, 634 F. Supp. 842, 844 (S.D.N.Y. 1986).

76. *See, e.g.*, Sullivan, *Long-Term Effects of Gas Unknown*, N.Y. Times, Dec. 6, 1984, at A10, col. 1; Bishop, *Long-Term Effects Aren't Known of Gas That Killed or Hurt Thousands in India*, Wall St. J., Dec. 6, 1984, at 7, col. 1; Diamond, *Lasting Health Damage Laid to Chemical Leakage in India*, N.Y. Times, Dec. 1, 1985, at 1, col. 2.

77. Miller, *Two Years After Bhopal's Gas Disaster, Lingering Effects Still Plague Its People*, Wall St. J., Dec. 5, 1986, at 30, col. 2.

78. Meier & Miller, *India Plans to Seek At Least $3 Billion From Union Carbide for Bhopal Claims*, Wall St. J., Nov. 24, 1986, at 3, col. 1; Hazarika, *India To Seek At Least $3 Billion From Union Carbide For Bhopal*, N.Y. Times, Nov. 23, 1986, at 10, col. 6.

79. Miller, *supra* note 77, at col. 3.

80. *See id.*; *India Sues Union Carbide in Bhopal; Case Differs Little from One Filed in U.S.*, 9 Int'l Env't Rep. (BNA) 343 (Oct. 8, 1986).

81. *India Sues Union Carbide*, *supra* note 80.

82. *See* Miller, *supra* note 77; Diamond, *Carbide Gives Details on Its Sabotage Claim*, N.Y. Times, Nov. 18, 1986, at 29, col. 1; Weisman & Hazarika, *Theory of Bhopal Sabotage Is Offered*, N.Y. Times, June 23, 1987, at 6, col. 1. In its response in the Bhopal court to the Indian government suit against it, Union Carbide said that its subsidiary and the Indian government had the key roles in operating and overseeing the plant. *Id.*

bide contended that, although it owned 50.9% of the stock in its subsidiary, the government of India had barred it from running the plant. Instead, it said that "it sold general design drawings to its Indian subsidiary, which then hired companies to do detailed design and construction. The parent trained some of the plant managers, but was unable to dictate the plant's daily operations."[83] It added that the 1973 agreement for the sale of the design, approved by the Indian government, stipulated that the parent "shall not, in any way be liable for any loss, damage, personal injury, or death" resulting from the use of the design specifications by the UCIL.[84] The company also contended that "the Indian government had approved and inspected the plant, knew about the dangers of MIC, and refused to allow American employees from Carbide to remain in India to provide technical assistance requested by its subsidiary to the Indians running the plant. . . . [T]he state government in Bhopal had allowed people to move close to the plant, hence knowing the dangers they would face in an accident."[85] Earlier, in a federal district court in New York, similar charges and countercharges regarding the responsibility for the design of the plant, overall control, and training of the personnel were exchanged by the government of India and Union Carbide.[86]

Questions have been raised about the safety of the plant design in Bhopal, which went into production in 1980,[87] and the adequacy of safety equipment and operating systems.[88] None of the safety devices worked.[89] Because of instrumentation errors, monitoring gauges did not work, and hence there was no early warning of the impending disaster. The mechanical valves which were supposed to act as a backstop measure were dysfunctional. Also, the vent gas scrubber (VGS) intended to neutralize any leaking gas by automatically "washing" the toxic gas with caustic soap, thereby rendering it harmless, was shut off when the leak occurred. The flair tower designed to burn leaking gas had also been shut down. However, according to one report, "because of faulty design, both the VGS and flair tower together also could not have prevented the MIC from escaping into the atmosphere."[90] As evidence of the faults in the plant design, it was reported that there was no backup system to prevent this

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83. *See* Diamond, *supra* note 82.

84. *Id.*

85. *Id.* at 29, col. 2.

86. *See In re* Union Carbide Corp., *supra* note 75, 634 F. Supp. at 855-59. *See also* Adler, *Carbide Plays "Hardball"*, AM. LAW., Nov. 1985, at 27, 58; *Discrepancies Are Seen in Bhopal Court Papers*, N.Y. Times, Jan. 3, 1986, at D3, col. 2.

87. *See Pesticide Plant Started as a Showpiece But Ran Into Troubles*, N.Y. Times, Feb. 3, 1985, at 8, col. 4.

88. On these issues, we have relied extensively on Professor Nanda's remarks at the April, 1985, meeting of the American Society of International Law. *See* 1985 PROC. AM. SOC'Y INT'L L. 304-310 (1987).

89. *See Bhopal — What Really Happened?*, *supra* note 73, at 104-105; *Bhopal: City of Death*, *supra* note 73, at 8-10.

90. *Bhopal — What Really Happened?*, *supra* note 73, at 105.

kind of gas escape. Safety measures used elsewhere by Union Carbide were lacking; for example, the UCIL plant lacked the computerized pressure/temperature sensing system, and there were no effective alternatives. A study of the design analysis of the storage area for MIC led one reporter to two conclusions:

> First, that the short-sighted design modification made in the pipeline connections, less than a year ago, along with the dysfunctioning of some valves, were primarily responsible for water ingress in the MIC tank. And, second, the original design of the MIC storage area did not provide even a single, safe route for a toxic gas at a very high temperature and pressure to be neutralized before escaping into the atmosphere. In other words, the safety features were greatly underdesigned.[91]

Following the Bhopal disaster, several claims on behalf of the victims were filed in India as well as in the United States,[92] raising questions about the possible violations of Indian law which prohibits solicitation of clients and contingency fees.[93] Meanwhile, on February 20, the Indian government adopted the Bhopal Gas Leak Disaster Ordinance and, on March 29, 1985, enacted the Bhopal Gas Leak Disaster (Processing of Claims) Act,[94] under which the government of India assumed responsibility as the sole representative of all the victims of the gas leak to bring a single action against Union Carbide. Subsequently, in April 1985 the Indian government, on behalf of the victims, filed as *parens patriae* a lawsuit against Union Carbide in the federal district court for the Southern District of New York, seeking both compensatory and punitive damages in an unspecified amount.[95] Before filing the suit, which invoked six, separate theories of liability on the part of Union Carbide — absolute liability, strict liability, negligence, breach of warranty, misrepresentation, and the multinational enterprise liability theory —[96] the government of India had rejected a Union Carbide offer to settle the controversy for $200 million dollars.[97]

Two U.S. lawyers challenged the Indian government's action of filing a lawsuit on behalf of all the victims by in turn filing a suit in India.[98] The challenge to block the Indian suit in the United States was based on

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91. *Id.* at 104.

92. *See* Stevens, *U.S. Lawyers Are Arriving To Prepare Big Damage Suits*, N.Y. Times, Dec. 12, 1984, at A10, col. 1; Galanter, *Legal Torpor: Why So Little Has Happened In India After the Bhopal Tragedy*, 20 TEX. INT'L L.J. 273, 290 (1985).

93. *See* Galanter, *supra* note 92, at 278, 290.

94. Bhopal Gas Leak Disaster Ordinance, No. 1 of 1985, Feb. 20, 1985. The text of the March 29, 1985 Act, *reprinted in* 25 I.L.M. 884 (1986).

95. *See* Galanter, *supra* note 92, at 286; Riley, *Bhopal: The Legal Escalation Begins In Earnest*, Nat'l L. J., April 22, 1985, at 8, col. 1; Lewin, *Carbide Is Sued In U.S. By India In Gas Disaster*, N.Y. Times, April 9, 1985, at A1, col. 5.

96. *See* Riley, *supra* note 95.

97. *See* Galanter, *supra* note 92, at 285.

98. *See* Riley, *supra* note 95, at 8, col. 3.

the alleged violations by the Indian government's legislation of the right of Indian citizens under the Constitution of India to choose their own counsel and, on the contention that if the Indian government also shared the responsibility for the disaster by failing to enforce safety regulations, it could not represent the victims because of a conflict of interest.[99]

The Judicial Panel on Multidistrict Litigation consolidated all the lawsuits brought in the United States in federal district court in the Southern District of New York.[100] A year after the suit was brought, District Judge Keenan dismissed the case on the grounds of forum non conveniens under three conditions: one, that Union Carbide consent to submit to the jurisdiction of the court of India and continue to waive defenses based upon the statute of limitations; two, that Union Carbide agree to satisfy any judgment rendered against it by an Indian court, provided that the minimal requirements of due process are met; and three, that Union Carbide comply with U.S. rules on discovery under the federal rules of civil procedure.[101]

Earlier efforts at a negotiated settlement were unsuccessful when the Indian government rejected a Union Carbide offer of $350 million dollars, which with interest would have accrued to $500-600 million and which was accepted by lawyers representing private plaintiffs in litigation.[102] Union Carbide appealed the judge's ruling contending that the Indian government must also be bound by U.S.-style discovery rules.[103] Attorneys for the individual plaintiffs in the Bhopal case also appealed the ruling by Judge Keenan that sent the proceedings to India.[104] Subsequently, on September 5, 1986, the Indian government sued Union Carbide in the Bhopal district court in India for damages arising out of the gas leak.[105] The Indian government sought at least $3 billion from Union Carbide Corp. in claims arising from the disaster.[106] In January 1987, the Second Circuit Court of Appeals reversed the Federal District Court and held that both Union Carbide and the Indian government must have equal access to evidence and granted Union Carbide U.S.-style discovery powers as well.[107] At the end of November 1987, all ongoing efforts to

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99. *See* Lewin, *supra* note 95, at D2, col. 4.

100. *See* Cates, *Hundred Lawyers Start Legal Cleanup*, Nat'l L. J., April 29, 1985, at 13, col. 1.

101. *In re* Union Carbide Corp., *supra* note 75, at 867.

102. *See India Refuses*, 9 Int'l Env't Rep. (BNA) 107 (April 9, 1986). The Indian government claims that it represents all victims of the disaster, based on the doctrine of *in parens patriae*, and on retainers executed by 487,000. *Id.* at col. 2.

103. *See* N.Y. Times, July 11, 1986, at 27, col. 6.

104. *See Plaintiffs' Attorneys in Bhopal Case Appeal Transfer of Proceedings to India*, 9 Int'l Env't Rep. (BNA) 313 (Sept. 10, 1986).

105. *Supra* note 81.

106. *See* Hazarika, *supra* note 73; Meier & Miller, *supra* note 78.

107. *See In re* Union Carbide Corp. Gas Plant Disaster at Bhopal, India in Dec. 1984, 809 F.2d 195 (2d Cir. 1987); Meir, *Union Carbide Gets Equal Access to Bhopal Data*, Wall St. J., Jan. 15, 1987, at 16, col. 1; Defries, *The Role of Environment in the Development Process*, 11 INT'L BUS. LAW. 52 (1983).

reach a negotiated settlement between the government of India and Union Carbide[108] had stalled,[109] and the Indian government filed criminal charges of culpable homicide in Bhopal against Union Carbide.[110]

Subsequently, on December 17, 1987, Judge M. W. Deo of the Bhopal District Court ordered Union Carbide to pay $270 million in interim relief to the victims of the accident.[111] On review, the State high court ruled that an interim payment of $193 million be paid.[112] On further appeal, India's highest court, the Supreme Court of India, urged the Indian government and Union Carbide to settle their protracted legal dispute.[113] The Bhopal tragedy created momentum to seek appropriate international, regional, and national action to provide proper export safeguards for hazardous substances and technologies and effective international assistance in establishing standards and in providing guidance to developing countries.

C. *Chernobyl, U.S.S.R.*

On April 26, 1986, a chemical explosion resulting in a meltdown occurred in one of the four reactors of the Chernobyl nuclear power plant near Kiev in the Soviet Union, causing in the destruction of the core of the reactor.[114] The Soviet authorities were slow both in notifying Soviet citizens likely to be affected by the accident and in revealing the details of the accident in the graphite-moderated reactor.[115]

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108. *See, e.g.*, Hazarika, *Carbide and India Strive for Bhopal Fund Accord*, N.Y. Times, Nov. 19, 1987, at 32, col. 1; *id.*, Nov. 18, 1987, at 31, col. 1.

109. *See* Wall St. J., Nov. 30, 1987, at 4, col. 1.

110. *See* N.Y. Times, Dec. 2, 1987, at 44, col. 1. On the litigation aspects of the case, *see* Nanda, *For Whom the Bell Tolls in the Aftermath of the Bhopal Tragedy: Some Reflections on Forum Non Conveniens and Alternative Methods of Resolving the Bhopal Dispute*, 15 DEN. J. INT'L L. & POL'Y 235 (1987).

111. *Indian Judge Orders Union Carbide to Pay*, 11 Int'l Env't Rep. (BNA) 3 (Jan. 13, 1988).

112. *Union Carbide Says Bhopal Judge Biased*, 11 Int'l Env't Rep. (BNA) 270 (May 11, 1988).

113. *See* N.Y. Times, Nov. 2, 1988, at C2, col. 1. On finding a solution, see Nanda, *supra* note 110, at 251-54; Magraw, *The Bhopal Disaster: Structuring a Solution*, 57 U. COLO. L. REV. 835, 837-46; McCaffrey, *Accidents Do Happen: Hazardous Technology and International Tort Litigation*, 1 TRANSNAT'L LAW. 41, 83-84 (1988). Pursuant to the order of the Supreme Court of India, Union Carbide paid $470 million to settle the case. *See* N.Y. Times, Feb. 25, 1989, at 19, col. 3.

114. *See* International Nuclear Safety Advisory Group, Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident 1 (Safety Series No. 75 - INSAG - 1, IAEA 1986) [hereinafter cited as IAEA Summary Report].

115. *See* Bohlen, *During Days of Delay, Children Played in Chernobyl's Dust*, Wash. Post Weekly Ed., June 22, 1987, at 19, col. 1; *Some Facts on Chernobyl Revealed*, 9 Int'l Env't Rep. (BNA) 139-40 (May 14, 1986); Sullivan, *Calamity Highlights Old Reactor-Design Debate*, N.Y. Times, May 1, 1986, at A11, cols. 1-3; Diamond, *Reactor Fallout is Said to Match Past World Total*, *id.*, Sept. 23, 1986, at A1, col. 1; [hereinafter cited as *Reactor Fallout*]; Diamond, *Long-Term Fallout: Comparison to Bombs Altered*, *id.*, Nov. 4, 1986, at 22, cols. 1-6. [hereinafter cited as *Long-Term Fallout*]; Ibrahim, *Soviet View on Lessons From Chernobyl Points Up Obstacles the West Now Face*, Wall St. J., Oct. 2, 1986, at 30,

According to the Soviet experts who reported at a special review meeting convened by the International Atomic Energy Agency in Vienna in August 1986, the accident was caused by a series of "willful violations" of operating procedures and human errors.[116] The triggering event was a special electrical systems test designed "to demonstrate improvement in the capacity of the turbine generators to support essential systems during a major station blackout."[117]

A report prepared by nuclear safety experts said that the runaway reaction, "an event considered to have an extremely low probability," was caused by special design characteristics of the reactor, coupled with purposeful violations of operating rules including the decision not to shut down the reactor.[118] Eventually when the shift foreman ordered the shut down of the reactor, it was too late. Within the next four seconds, the reactor "power was calculated to have reached 100 times full power . . . [which] resulted in fuel fragmentation, rapid generation of steam and ultimate destruction of the reactor core and associated structures."[119] Thirty-one people, all of whom were power plant personnel or firemen, died while over 200 suffered from symptoms of acute radiation syndrome, and 135,000 people were evacuated from several population centers within a radius of 30 kilometers around the power station.[120]

Reporting to the U.S. Senate Committee on Labor and Human Resources on the cleanup effort by the Soviet Union following the Chernobyl accident, Yevgeny P. Velikhov, a vice president of the Soviet Academy of Sciences and Chairman of the Energy Committee of the Supreme Soviet, said that tens of thousands of workers had "decontaminated 60,000 buildings in 500 villages," and had "built a special concrete wall in the soil to separate the groundwater from possible penetration into the river. This concrete wall surrounded all of the nuclear power station and had a depth of 15 meters."[121] He added that they had carted off radioactive topsoil from an area of several square miles and had built thousands of new houses and hundreds of social and supporting facilities for those evacuated from the area.[122]

While Dr. Velikhov predicted a "quite small" increase in cancer

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cols. 1-2; Boffey, *Panel Hears a Russian on Chernobyl*, N.Y. Times, Jan. 21, 1987, at 3, cols. 1-3.

116. *See* IAEA Summary Report, *supra* note 114, at 9, 17-30.

117. *Id.* at 15.

118. *See id.* at 13. *See also Reactor Fallout*, *supra* note 115, at 24, cols. 3-6; Boffey, *supra* note 115, at col. 3; *Russian Roulette at Chernobyl*, THE ECONOMIST, Aug. 30, 1986, at 75, col. 1.

119. IAEA Summary Report, *supra* note 114, at 25.

120. *See id.* at 6.

121. *See Reviewing the Causes and Consequences of the Chernobyl Nuclear Powerplant Incident, Hearing before the Senate Comm. on Labor and Human Resources*, 100th Cong., 1st Sess., at 3, 12 (Jan. 20, 1987).

122. *Id.* at 14.

deaths in the future because of radioactive releases,[123] other experts have predicted that thousands of cancer deaths in the future could be attributed to radioactive fallout from the Chernobyl accident.[124]

As a consequence of the accident, the Soviet Union either dismissed from their jobs or otherwise penalized at least twelve top officials.[125] The head of the nuclear power industry at the time of the accident was expelled from the Communist Party, while the director of the plant and two assistants were sentenced to prison terms of ten years each for criminal negligence as a result of the accident.[126]

The radiation fallout from the accident caused considerable concern and damage in many European countries. Initially, increased radiation levels were detected in the Scandinavian countries, but, because of shifting winds, several other European countries were also affected.[127] A Polish report to the International Atomic Energy Agency noted that radiation was detected as early as late April 27, and the authorities who began sampling the air, food, and the environment on April 29 found some milk from northeastern Poland contaminated.[128] The government took preventive actions, including the imposition of a ban on the pasturing of cows or feeding them fresh fodder, forbidding children in some regions to drink milk and giving them doses of iodine.[129]

In France, on May 1-3, radiation levels rose to as high as 400 times those normally recorded.[130] The authorities observed increases in the radioactivity of fruits and vegetables in eastern France; however, with the exception of the confiscation of a shipment of Alsatian spinach, there was no national intervention in the sales of French agricultural products.[131] In Greece, radiation levels were found to be 20 to 40 times higher than normal.[132] In the United Kingdom, the public was warned to avoid drinking rainwater in some areas of the country following the detection of the radioactive cloud on the Kent Coast on May 2.[133] On May 8, radiation levels

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123. *Id.* at 30.

124. *See* Boffey, *supra* note 115, at cols. 2-3; *Reactor Fallout*, *supra* note 115; *Long-Term Fallout*, *supra* note 115; *The Chernobyl Toll*, Wash. Post Weekly Edition, March 9, 1987, at 38, col. 4.

125. *Head of Soviet Atom Power Plants and 5 Others Penalized by Party*, N.Y. Times, Aug. 15, 1986, at 4, col. 5.

126. *Id. See also* Bohlen, *Dead Forests and a Ghost Town Are Chernobyl's Neighbors*, Wash. Post Weekly Ed., July 6, 1987, at 17, col. 1.

127. *E.g.*, N.Y. Times, May 6, 1986, at A6, col. 3.

128. *See Some Facts on Chernobyl Revealed*, 9 Int'l Env't Rep. (BNA) 140 (May 14, 1986).

129. *Id.*

130. *Government Withholds information, Then Says Radiation Levels Not Serious*, 9 Int'l Env't Rep. (BNA) 188 (June 11, 1986).

131. *Id.*

132. *Supra* note 128.

133. *EEC Lifts Ban on East European Food Imports, Substitutes U.S. Limits on Radiation Levels*, 9 Int'l Env't Rep. (BNA) 189 (June 11, 1986); *Radioactive Fallout From Chernobyl Will Kill 40 UK Residents, Board Says*, 9 Int'l. Env't Rep. (BNA) 353 (Oct. 8,

in Scotland were reported as "the highest they [had] ever been."[134] Radiation levels remained high in parts of England, Wales, and Scotland, and tough restrictions on the movement and slaughter of livestock were reintroduced for several hillfarms in Scotland in August 1987.[135] Similarly, significant increases in radiation levels were detected in Finland,[136] Italy,[137] Ireland,[138] and West Germany,[139] while some iodine 131 was detected in rainwater samples in the United States, and the State of Oregon advised people not to drink rainwater.[140]

The Swiss government banned fishing in Lake Lugano because of an unacceptable level of radiation in fish there[141] and decided to indemnify Swiss fishermen for any loss of income they suffered as a result of the government ban.[142] The West German government took 5,000 tons of powdered milk out of circulation due to the fact that the milk contained sixteen times the maximum level of radiation permitted for humans.[143] Subsequent attempts to sell the milk to Egypt ended when the West German government impounded the milk.[144]

Because of the increased levels of radiation found in food imports from the Soviet Union and the East European countries — Hungary, Czechoslovakia, Romania, Bulgaria, Poland, and Yugoslavia — the European Community imposed a temporary ban on such imports, which was lifted on June 1, 1986.[145] On that day, the Community imposed U.S. equivalent, strict limits on radiation levels for imported food products from all countries,[146] and on September 30, 1986, extended those limits for another five months.[147]

Several consumer groups and environmental organizations accused the European governments of not providing the public with the needed

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134. *EEC Lifts Ban*, *supra* note 133 at 189.

135. *See Radiation Levels From Chernobyl Prompt Limits on Livestock Slaughter, Movement*, 10 Int'l Env't Rep. (BNA) 442 (Sept. 9, 1987).

136. *See Effects of Chernobyl in Finland*, 9 Int'l Env't Rep. (BNA) 420 (Nov. 12, 1986).

137. *See* Salter, *Living With Fallout*, ATLANTIC, Jan. 1987, at 30.

138. *See Excess Radioactivity Found in Birds that Fly Through Chernobyl Contamination*, 9 Int'l Env't Rep. (BNA) 456 (Dec. 10, 1986).

139. *See Effects of Chernobyl Accident in April Still Felt Four Months Later in Germany*, 9 Int'l Env't Rep. (BNA) 272-73 (Aug. 13, 1986).

140. *No U.S. Effects Seen*, 9 Int'l Env't Rep. (BNA) 140 (May 14, 1986).

141. *See Ban Imposed on Fishing in Lake Lugano After High Levels of Radioactivity Found*, 9 Int'l Env't Rep. (BNA) 366 (Oct. 8, 1986).

142. *Id.* For a report on the effects on the Lapps whose reindeer have been contaminated, see Clines, *Chernobyl Shakes Reindeer Culture of Lapps*, N.Y. Times, Sept. 14, 1986, at A1, col. 2; A20, col. 4.

143. *See Federal Government Takes Over Problem of Disposing of Radioactive Milk Powder*, 10 Int'l Env't Rep. (BNA) 58 (Feb. 11, 1987); Tagliabue, *Keeping Tainted Foods Off Third World Shelves*, N.Y. Times, Feb. 8, 1987, at 2, col. 3.

144. Tagliabue, *supra* note 143.

145. *See EEC Lifts Ban*, *supra* note 133.

146. *Id.*

147. *See supra* note 141.

information and not taking prompt action. For example, a Brussels-based consumer group which represents consumers in all EEC countries criticized many European countries, especially France and Belgium, for not showing adequate concern. According to the report issued by the group, "[i]t is significant that those countries with the highest dependence on nuclear power tend to do the least."[148]

The report added that French authorities had "created a situation of silence and ignorance,"[149] the Benelux countries (Belgium, the Netherlands, and Luxembourg) showed "the least concern" and that Italy and Belgium had allowed economic consideration to influence their decisions.[150] Similarly, a coalition of environmental organizations called upon the EEC Commission to propose an amendment to the Seveso Directive — the Council Directive on Major Accident Hazards of Certain Industrial Activities[151] — to cover nuclear reactors as well, for "[t]here is no reason to exclude nuclear power plants any longer from the scope of the post-Seveso Directive."[152] They also called for the immediate closure of thirty-one "potential Chernobyls" within the European Community.[153]

In response to the damage caused by the radiation, the 518 member European Parliament adopted a resolution asking the EEC Council of Ministers to calculate losses to community farms whose contaminated products had to be destroyed and to claim damages from the Soviet Union, which the Parliament rebuked for failing to give timely and adequate information.[154] The parliament also appealed for common standards of design and operation of nuclear power plants, for the creation of an international safety inspectorate, and for the establishment of maximum doses of radiation in food products such as milk and vegetables.[155]

Among the responses of international organizations, the World Health Organization (WHO) was concerned with setting guidelines for countries affected by radiation,[156] while the United Nations Environment Program (UNEP) was primarily interested in the establishment of an international monitoring network.[157] Prevention and mitigation of the con-

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148. *Limits on Radioactivity in Foodstuffs to be Proposed*, 9 Int'l Env't Rep. (BNA) 272 (Aug. 13, 1986); *see also How the Atom Splits Europe*, THE ECONOMIST, Sept. 13, 1986, at 41, col. 1; Lewis, *Europe After Chernobyl: Cooler Attitudes Toward Nuclear Power*, N.Y. Times, April 27, 1987, at 6, col. 1.

149. *See Limits on Radioactivity in Foodstuffs to be Proposed*, 9 Int'l Env't Rep. (BNA) 272 (Aug. 13, 1986).

150. *Id.*

151. *See EEB Calls for Immediate Closure*, 9 Int'l Env't Rep. (BNA) 180 (June 11, 1986).

152. *See id.*

153. *Id.*

154. *See id.* at 179. *See also* OECD, *The Accident at Chernobyl — Economic Damage and Its Compensation in Europe*, 39 NUCLEAR L. BULL. 58 (June 1987).

155. *See Chernobyl Blast Triggers Debate*, 9 Int'l Env't Rep. (BNA) 179 (June 11, 1986).

156. *Some Facts on Chernobyl Revealed*, 9 Int'l Env't Rep. (BNA) 139 (May 14, 1986).

157. *Id.*

sequences of a nuclear power plant accident were of primary concern to the Vienna-based International Atomic Energy Agency (IAEA). Beginning in May 1986, when a special session of the Board of Governors of IAEA met in Vienna and deliberated on these issues,[158] IAEA's activities included the adoption by consensus at a special General Conference Session in September 1986 of two international conventions to strengthen international cooperation in nuclear safety and environmental protection.[159] In November of 1986, the IAEA's expert group of 173 persons from 48 countries undertook a week-long review of its safety programs.[160] The group called for strengthening existing IAEA standards of nuclear safety, including its nuclear incident reporting system.[161] It noted a need for additional IAEA guidance on fire protection at nuclear facilities and on procedures for mandatory tests on nuclear power reactors.[162]

The Standing Committee on Civil Liability of Nuclear Damage of the IAEA, meeting in March 1987, proposed that the existing international nuclear liability regimes established by the Paris Convention of 1960 and the Vienna Convention of 1963 be enlarged through the adoption of Joint Protocols to both conventions.[163]

A notable proposal of the European Community Commission for a Council Decision was offered on August 20, 1986, on "Community System Rapid Exchange of Information in Cases of Unusually High Levels of Radioactivity or of a Nuclear Accident."[164] Subsequently, in April 1987, the Commission presented to the Council a proposed Council Decision on the subject,[165] under which the government concerned would immediately inform the Commission and other member states "of the details of the accident and other data such as meteorological conditions, radioactivity levels in foodstuffs, measures taken to protect the public, and predicted behavior of the release over time."[166]

In the wake of the Chernobyl accident, while serious questions have been raised on the future of nuclear energy,[167] special efforts are being undertaken for sharing nuclear safety information and for the establishment of an adequate framework for coordinated international response to

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158. For a summary of the decisions taken by the Board at that meeting, see 25 I.L.M. 1009 (1986).

159. For a summary report, see *IAEA Conventions on Nuclear Safety Provide For Cooperation in Wake of Nuclear Accident*, 23 UN CHRONICLE, No. 5, Nov. 1986, at 74.

160. *See Atomic Energy Agency*, 9 Int'l Env't Rep. (BNA) 410 (Nov. 12, 1986).

161. *Id.*

162. *Id.*

163. 39 NUCLEAR L. BULL. 31 (June 1987).

164. COM (86) 434 Final, 20 Aug. 1986, *reprinted in European Community Commission Proposal*, 9 Int'l Env't Rep. (BNA) 377 (Oct. 8, 1986).

165. *See* 39 NUCLEAR L. BULL. 33 (June 1987).

166. *Id.*

167. *See, e.g.*, the report that even the European Community's energy ministers were unable to agree over the role of nuclear power in Europe in *Ministers Disagree*, 9 Int'l Env't Rep. (BNA) 180 (June 11, 1986).

a nuclear accident.[168]

D. *Basel, Switzerland*

Ten years after the Seveso accident, a major toxic chemical spill occurred in Europe during efforts to put out a fire at a chemical storage warehouse of Sandoz, a major Swiss chemical multinational in Basel. The spill, which occured November 1, 1986, resulted in a huge discharge of toxic chemicals into the Rhine.[169] While Swiss authorities initially reported that thirty tons of chemicals, including herbicides, pesticides and poisonous mercury, leaked into the Rhine,[170] some French reports put the figure of the spilled chemicals as high as 1,000 tons.[171] Eventually, Sandoz announced that much of the 1,246 tons of material inside the warehouse, including 824 tons of insecticide, 71 tons of herbicide, 39 tons of fungicide, 4 tons of solvents, and 12 tons of organic compounds containing mercury, was washed into the river by the water used by the firemen in putting out the fire.[172]

The worst accident of this kind since Seveso caused ecological disaster, adversely affecting France, Germany, and the Netherlands, in addition to Switzerland.[173] Subsequent reports said that Basel escaped a major environmental disaster "by a whisker," for the city could have been impacted by toxic fumes if the fire had burned longer.[174] Former West German Chancellor, Willy Brandt, referred to Basel as "Bhopal on the Rhine,"[175] and some political parties started calling it "Baselpal,"[176] while the French and West German press renamed the city "Chernobasel," or "Chernobale."[177] On the evening of November 1, 2,000 demonstrators

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168. For a recent U.S. report on international response to nuclear power safety concerns, see U.S. GAO/NSIAD - 85 - 128 (1986).

169. For reports, see, *e.g.*, Roth, *Swiss Accident That Polluted the Rhine May Have Heaviest Impact in Germany*, Wall St. J., Nov. 11, 1986, at 41, col. 2; Lewis, *Chemical Spill in Rhine Affects Four Countries*, N.Y. Times, Nov. 11, 1986, at 1, col. 2; Netter, *Anger Along the Rhine Grows After Chemical Spill*, *id.*, Nov. 12, 1986, at 7, col. 3. [hereinafter cited as *Anger Along the Rhine*]; Studer, *Swiss Never Thought Sandoz Disaster Could Happen in Their Orderly World*, Wall St. J., Nov. 13, 1986, at 33, col. 2; Netter, *Fourth Swiss Chemical Accident Sends a Cloud Over City of Basel*, N.Y. Times, Nov. 21, 1986, at 4, col. 1 [hereinafter cited as *Fourth Swiss Chemical Accident*]; Netter, *Swiss Look to Tighter Regulation After Spill*, *id.*, Nov. 23, 1986, at A5, col. 1 [hereinafter cited as *Swiss Regulations*]; *French, Germans Complain About Notice*, 9 Int'l Env't Rep. (BNA) at 389-90 (Nov. 12, 1986); 9 Int'l Env't Rep. (BNA) at 429-41 (Dec. 10, 1986).; 10 Int'l Env't Rep. (BNA) 3-7 (Jan. 14, 1987).

170. *See* Roth, *supra* note 169; Tagliabue, *The Rhine Struggles to Survive*, N.Y. Times, Feb. 15, 1987, at F4, col. 3.

171. *See* Lewis, *supra* note 169.

172. *See Radical Measures*, 9 Int'l Env't Rep. (BNA) 429, 430 (Dec. 10, 1986).

173. *See* Lewis, *supra* note 169, at 1, col. 2; 4, cols. 3-4; *Anger Along the Rhine*, *supra* note 169.

174. *See Independent Reports*, 10 Int'l Env't Rep. (BNA) 102 (Mar. 11, 1987).

175. *See supra* note 172.

176. *Id.*

177. *See Anger Along the Rhine*, *supra* note 169, at 7, col. 3.

marched through the streets of Basel carrying banners which read, "Seveso-Bhopal-Schweizerhalle." [178] Schweizerhalle is the Basel suburb where the Sandoz plant is located. Subsequently, it was revealed that several more incidents of chemical spills in the Rhine immediately preceding and in the few weeks following the Basel spill had occurred which also involved other Swiss chemical giants such as CIBA-Giegy, though reportedly none was as serious as the Sandoz spill.[179]

The Sandoz spill and those other incidents of chemical spills in the Rhine caused a great deal of concern in Europe. Questions raised included those of adequate notification, safety standards, violation of pollution control laws, as well as liability and compensation.[180] Calls were made for European Community action and for international cooperation to prevent such pollution.[181] The Netherlands representative told a special meeting of environment ministers from the states bordering the Rhine, convened in Zurich on November 12, 1986, that, following the accident, it had already spent a quarter of a million dollars on pollution control.[182]

On December 19, 1986, the French Environment Minister presented the Swiss government with a bill for $38 million for damages to French interests arising from the spill.[183] The figure of $38 million was estimated by an independent commission of French experts based upon short-term damages to the fishing and boating industries; medium-term damages, including the cost to restore the ecosystem; and potential damages, including the cost of building dams and other facilities linked to the Rhine, such as a water pumping system, assuming that no significant pollution of the groundwater aquifer had occurred.[184] The Swiss government and the Sandoz and CIBA-Geigy officials showed their willingness to settle claims for damages, although it was not clear who was to assume responsibility for how much of the claimed damages.[185] Subsequently, Sandoz paid damages to French fishermen[186] and to the French government.[187] Among other developments at Sandoz, safety rules related to the storage of toxic and flammable substances in the Sandoz group of companies were strengthened; Sandoz also set up the "Sandoz Rhine Fund" to help repair

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178. *See French, Germans Complain about Notice*, 9 Int'l Env't Rep. (BNA) 389, 390 (Nov. 12, 1986).

179. *See Fourth Swiss Chemical Accident*, *supra* note 169; Tagliabue, *supra* note 170; *'Radical Measures' supra* note 172, at 430-431.

180. *See generally, 'Radical Measures'*, *supra* note 172, at 431-433, 436.

181. *See generally, id.* at 440; *Government Bills Switzerland*, 10 Int'l Env't Rep. (BNA) 3 (Jan. 14, 1987).

182. *See supra* note 172, at 432.

183. *See Government Bills Switzerland*, *supra* note 181.

184. *See id.*

185. *See supra* note 172; *Sandoz Working Group Produces Report*, 10 Int'l Env't Rep. (BNA) 4 (Jan. 14, 1987).

186. *Sandoz Fisherman Settle on Rhine*, 10 Int'l Env't Rep. (BNA) 283 (June 10, 1987).

187. *Sandoz and French Gov't Settle*, 10 Int'l Env't Rep. (BNA) 492 (Oct. 14, 1987).

ecological damage from the November 1986 disaster and announced its donation of $7.3 million to the World Wildlife Fund for a three-year project to restore the flora and fauna of the Rhine River.[188]

Among the multilateral responses to the accident, noteworthy attempts include the establishment of a working group among French, Swiss, and German representatives to update the proper functioning of the information exchange systems and emergency contacts.[189] Also, an agreement was reached on December 19, 1986, regarding the necessary measures to prevent industrial accidents and to limit their consequences, at a ministerial conference on Rhine Pollution.[190] Mostafa K. Tolba, executive director of UNEP, made a proposal to negotiate treaties similar to those adopted on international notification and mutual assistance in the event of a nuclear accident, for prevention of transboundary toxic pollution.[191]

Tolba said at a press conference on December 15, 1986, that UNEP's existing International Register of Potentially Toxic Chemicals (IRPTC) could act as a framework for administering the two treaties.[192] He said that, as there are no existing agreements requiring international notification in the case of an accident involving toxic chemicals, a new convention on the subject is desirable.[193] Commenting on the Sandoz incident, Tolba said that the chemical spill at Basel "shows the ecological and economic folly of assuming that, if we ignore safety standards in the chemical industry, somehow the problems will go away."[194] He added that "[t]he accident reveals the full extent of the apathy, confusion, and general unpreparedness of the world's most advanced nations and the deplorable inadequacy of international legislation."[195] A notification requirement would obligate governments to provide instant information on the chemicals involved and their predicted behavior, the location of the plant, and the safety measures undertaken. The second convention would call for prompt assistance among states parties after an accident to minimize damage and harm.

Earlier, on November 20, 1986, Tolba had suggested that "a legal package should be drafted to prevent another Bhopal or another Basel."[196] As part of that package, he outlined the need for "instituting a program for governments, in cooperation with industry, to work with local leaders to identify acutely toxic chemicals, help prepare control measures

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188. *See Sandoz Accident Seen as New Impetus for Regulatory Actions Already in Works*, 10 Int'l Env't Rep. (BNA) 81,82 (Feb. 11, 1987).

189. *See id.* at 82.

190. *See Sandoz Working Group, supra* note 185, at 5.

191. *See id.* at 6-7.

192. *See id.* at 7.

193. *See id.*

194. *Id.*

195. *Id.*

196. *Radical Measures*, 9 Int'l Env't Rep. (BNA) 434 (Dec. 10, 1986).

to limit accidental releases and deal with such accidents."[197]

V. ISSUES RELATING TO THE EXPORT OF HAZARDOUS TECHNOLOGIES

The issues which emerge from the factual analyses of these four disasters tend to cut across the facile developed/developing country distinction. States often play more than one role in these situations by acting both as a home country and as a recipient country. However, while recipient countries in general face many potential problems as a result of their import of hazardous technologies, developing states that import these technologies or substances often face especially difficult problems due to an increased potential for risk, as many lack effective health, safety, and environmental standards and systems.

This differential in levels of risk between a more-developed recipient country, such as Italy, and a less-developed recipient country, such as India, is illustrated by the respective human losses that were suffered in the Seveso and Bhopal disasters. There has been, to date, no loss of life directly attributable to the Seveso accident. The loss of lives from Bhopal has exceeded 2,000 people, with many of the early deaths resulting from blocked air passages which led to injury to respiratory tissue.[198] This is not to suggest that the value of human life in developing countries is less than in developed countries, but rather that, for historical reasons, the potential risks in developing countries have tended to be higher.

A. *International Legal Norms*

International environmental law is still in a nascent stage of development and is not yet adequately equipped to provide the necessary assurances to the recipient countries in the transfer of hazardous technology that their interests will be protected under applicable norms of international law. Conversely, the applicable international legal norms do not define the responsibility of the exporting or home country to any appreciable extent. Although the current prescriptions by international bodies are usually in the form of non-binding guidelines and principles, the importance of such non-binding principles in eventually shaping environmental law should not be underestimated. They allow experimentation and growth, they create community expectations and influence state behavior, and, as happened with the Universal Declaration of Human Rights and Principle 21 of the Stockholm Declaration on the Human Environment,[199] some of these declarations and principles acquire the status of customary international law. For example, in the area of technology transfer, one could argue that the principles of notification, information exchange and consultation, among emerging principles of international environmental

197. *See id.*

198. *See supra* notes 77-78; *Toxic Substances*, 9 Int'l Env't Rep. (BNA) 133 (Apr. 9, 1986).

199. *See* U.N. Doc. A/CONF. 48/14 (1972).

law, should be considered to have acquired the status of customary international law.

The primary international legal principle in this area, drawn from the *Trail Smelter Arbitration*,[200] generally applies to states rather than to private actors. The decision in that case formulated the following rule: that it is unlawful for a state to cause transfrontier pollution which entails serious damage in another state. However, for both Seveso and Bhopal, unlike Chernobyl and the Sandoz fire in Basel, the activity in question did not generate pollution in the home state which then crossed a boundary to affect the people, property, or environment of an adjoining state. Rather, the whole industrial process took place within a single state and the resultant damage also occurred within that state. Furthermore, the activities which took place at both the Union Carbide and Givaudan plants, at least arguably, did not inherently result in pollution. The fact that accidents did occur may have been a consequence of problems with operating procedures and not the activity itself. Therefore, this principle is not directly applicable to either of those two disasters.

As noted above, some commentators have suggested that customary international law does place a duty upon states to cooperate when dealing with questions of transfrontier pollution.[201] Related to this duty of cooperation are the duties to provide information and to consult and negotiate.[202] However, again, these principles have in the past been applied to activities which occur in areas in geographic proximity to international borders and were not generally applied to industrial activity which occurs only within one state when the effects of that activity are likewise limited. The current efforts to formulate "informed consent" guidelines of the EEC and the United States may be extending these principles to situations such as Bhopal and Seveso.

This absence of norms is inextricably intertwined with the absence of appropriate international institutions and fora within which to maintain a claim once damage has been inflicted. This has meant that victims have had to rely upon national law and national court systems: for Seveso, Italian law and courts; for Bhopal, Indian law and courts; for the Sandoz incident, assumedly the various national laws of the victims and the applicable Swiss laws would be invoked; but in the case of Chernobyl, it is not yet clear how and what setting and under the application of what law

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200. Trail Smelter Arbitration (U.S. v. Can.), 3 R. Int'l Arb. Awards 1911 (1938); *see also* Corfu Channel Case (U.K. v. Albania), [1949] I.C.J. Rep. 4.

201. *See, e.g.*, Bothe, *International Problems of Industrial Siting In Border Areas and National Environmental Policies*, in TRANSFRONTIER POLLUTION AND THE ROLE OF THE STATES 79-97 (OECD 1981); Silva, *Pending Problems on International Law of the Environment*, in THE FUTURE OF THE INTERNATIONAL LAW OF THE ENVIRONMENT 217 (R. Dupuy, ed. 1985).

202. *See* Bothe, *supra* note 201; International Law Association, Committee on Legal Aspects of the Conservation of the Environment, Report to the Manila Conference 1978; Handl, *National Uses of Transboundary Air Resources: The International Entitlement Issue Reconsidered* 26 NAT. RES. J. 405, at 412-13 (1986).

would the claims against the Soviet Union be resolved.[203] The Soviet Union has refused to pay any compensation for crop losses in western European countries resulting from radioactive fallout from Chernobyl, although the Soviets claim that cleanup and relocation costs will total at least $2.98 billion.[204]

Additionally, these national courts and legal traditions may or may not be equipped to provide a speedy and just resolution for claims brought by those damaged by the pollution in question. In the case of Seveso, Hoffmann-LaRoche accepted responsibility for the accident early on, with the negotiations and court actions focusing primarily upon issues of the amount of compensation and the individual responsibility of the officials involved. A similar pattern is discernible following the Sandoz incident. For Bhopal, the issue of responsibility remains unresolved, perhaps in part because the level of damage is so much higher, and, in the case of Chernobyl, there is total uncertainty.[205]

B. *International Standards*

1. OECD

a. Post-Seveso

In the absence of directly applicable, international legal norms, the presence or absence of international standards assumes a greater importance. Prior to the Seveso accident, efforts had begun to address what was perceived by members of the Organization for Economic Cooperation and Development (OECD) as a need for coordination of the activities of the members in the toxic substances area. In 1971, the Sector Group on the Unintended Occurrence of Chemicals in the Environment (Chemicals Group) was formed. While the coordination function of the Chemicals Group became more important following the Seveso accident, initially the group formulated four major sets of recommendations for the member governments. The first of these was the limitation on the use of PCBs;[206] the second was the reduction of environmental discharges of mercury;[207] the third was the keeping of statistics on existing chemicals and the assessment of the potential effects of new chemicals prior to manufacture;[208] and the fourth was procedures for anticipating the effects of new chemicals, of new applications of existing chemicals, and of selected ex-

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203. *See, e.g.*, Malone, *The Chernobyl Accident: A Case Study in International Law Regulating State Responsibility for Transboundary Nuclear Pollution*, 12 COLUM. J. ENVTL. L. 203 (1987).

204. *See* Lee, *Chernobyl and the Nuclear Reaction*, Wash. Post Weekly Ed., Nov. 10, 1986, at 6, col. 1.

205. *See id.*; Malone, *supra* note 203.

206. O.E.C.D. Doc. C. (73), Feb. 20, 1973.

207. O.E.C.D. Doc. C. (73) 172, Oct. 2, 1973.

208. O.E.C.D. Doc. C (74) 215, Nov. 21, 1974.

isting chemicals.[209]

The Chemicals Group also devoted part of its budget to coordination of the various laboratory testing approaches employed by the OECD members. Little attention was devoted to information exchange even after the Seveso accident. The group also focused a portion of its efforts on the economic effects of toxic substances legislation. In particular, the group looked at the effects of inconsistent approaches among member countries to chemical assessment and control, although this emphasis did not appear in earnest until nearly two years after the Seveso disaster.[210]

The OECD Council subsequently adopted two further recommendations prior to the events of late 1984 at Bhopal. In February of that year, the Council recommended to member states principles on transfrontier movements of hazardous waste.[211] The recommendation called for the exchange of "adequate and timely information," which should include specifying "the origin, nature, composition, and quantities of waste intended to be exported, the conditions of carriage, the nature of environmental risks involved, the type of disposal and the identity of all entities concerned with the transfrontier movement or the disposal of the waste."[212] Then in April of 1984, the Council adopted a recommendation concerning information exchange related to the export of banned or severely restricted chemicals.[213]

This recommendation provided guidelines to the exporting country regarding the nature and scope of information it should provide the importing country so as "to enable the latter to make timely and informed decisions concerning the chemical." The recommendation specifically called for the OECD Chemicals Group and the Management Committee of the Special Programs on Chemicals, to submit a report to the Council by April 1987 on implementation of the recommendation.[214] It is reported that most countries are beginning to take action regarding information exchange on chemicals.[215]

Both of these latter recommendations sought primarily to restrict or control specific chemicals, products, or waste materials. Neither focused on regulation of the movement of the actual technology from state to state, with the result that, while the individual chemicals such as methyl isocyanate or trichlorophenol gas may have come within the ambit of the recommendations, the installations in Meda and Bhopal themselves did not. Furthermore, the Council recommendations were directed to member

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209. O.E.C.D. Doc. C. (77) 97, July 13, 1977.

210. *See* Schweitzer, *Toxic Chemicals: Steps Toward Their Evaluation and Control*, in ENVIRONMENTAL PROTECTION: THE INTERNATIONAL DIMENSION, 22-44 (D. Kay & H. Jackson, eds., 1983).

211. O.E.C.D. Doc. C. (83) 180 (Final), Feb. 13, 1984.

212. *Id.*, Principle 5.2.

213. O.E.C.D. Doc. C. (84) 37 (Final), May 3, 1984. *See also* 23 I.L.M. 664 (1984).

214. *See Export Proposal*, 9 Int'l Env't Rep. (BNA) 391, 392 (Nov. 12, 1986).

215. *See id.*

countries and would not necessarily have been applicable in a transfer to a non-OECD country.

b. Post-Bhopal

After the Bhopal accident, a stronger emphasis on the control of industrial processes and installations emerged from the OECD. In December of 1985, the OECD's Committee on International Investment and Multinational Enterprises agreed to incorporate environmental concerns into the Guidelines on Multinational Enterprises by means of a "clarification" of a reference to environmental protection already included. The guidelines indicated that multinationals were to "give due consideration to the member countries' aims and priorities with regard to the protection of the environment and consumer interests."[216]

The Environmental Committee of the OECD set forth its environment program for 1987 and beyond in April of 1986. The Committee emphasized the control of chemicals, hazardous wastes, and air pollutants, and economic development and the environment.[217] A project to suggest ways to improve the environmental assessment capabilities of private investors who undertake environmentally sensitive projects in developing countries was resisted by the United States. Also discussed was a proposal to review regulations and practices in member countries with regard to the control of hazardous installations and to investigate possible OECD guidelines for such installations.[218]

c. Post-Chernobyl and Basel

After the 1986 initiatives, the Environment Committee of the OECD concluded at its next meeting that, in light of the incidents at Chernobyl and Basel, a major priority for its work for 1987 would be the prevention of and response to industrial accidents.[219] The conclusion was reached at a meeting of the committee in Paris on December 9-11, 1986.[220] Specifically, the committee elevated its already planned project on hazardous installations to "a high priority for 1987."[221]

The Environment Committee highlighted four themes for the project:
(1)the need to provide "adequate and timely information" to all concerned parties in the case of an accident in which toxic substances are released;
(2)the need for better coordination, both nationally and across the borders, pertaining to the detection, monitoring, and response to toxic

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216. *See id.* Jan. 8, 1986, at 11.

217. *'Rationalized, Streamlined' Program Agreed by OECD Environment Committee,* 9 Int'l Env't Rep. (BNA) 153 (May 14, 1986).

218. *Id.*

219. *Major Incentive,* 10 Int'l Env't Rep. (BNA) 6 (Jan. 14, 1987).

220. *Id.*

221. *Id.*

releases;
(3)the need to provide for compensation to those who suffer damages from accidental release and for cleanup or environmental restoration costs; and,
(4)the need to take preventive steps and, in the event of an accident, the development of emergency preparedness and response plans.[222]

Erik Lykke, head of the OECD Environment Directorate, announced that by 1989 the OECD will develop an "integrated approach for the control of toxic substances in the environment," with the objective of formulating effective "overall" control strategies for toxic substances of all kinds.[223]

In March 1987, senior environmental protection officials from the member nations of OECD agreed "to take a 'leading role' in strengthening international cooperation for the prevention of and response to industrial accidents and to act to broaden national programs and international cooperation in the areas of testing and control of 'existing' chemicals."[224] The agreement was a result of a French initiative.[225]

In the wake of the Chernobyl accident, the Nuclear Energy Agency (NEA), whose program is shaped by the Steering Committee for Nuclear Energy of the OECD, selected the following priority items for its 1987 agenda: strengthening the NEA Incident Reporting System; expanding work on studies on serious accidents; achieving more effective harmonization and implementation of protection measures against radiation exposure in accident situations; and "developing more comprehensive and efficient international prescriptions on issues of nuclear, third-party liability and victims' compensation."[226]

2. EEC

a. Post-Seveso

Little in the way of multinational guidelines or standards was extant in the European Economic Community prior to the Seveso accident. However, following that disaster, the EEC began to develop a joint approach to hazards resulting from major accidents, based upon the member states' assessment that such an approach allowed them to pool their expertise, to minimize industrial safety controls as a source of competitive

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222. *Id.*

223. *Id.*

224. *OECD Nations to Take 'Leading Role' on Accident Prevention, Chemicals Testing*, 10 Int'l Env't Rep. (BNA) 145 (April 8, 1987).

225. *Id.* at 146.

226. *Reactor Safety, Post-Accidnet Protection Said to Dominate 1987 Work Program of NEA*, 10 Int'l Env't Rep. (BNA) 410 (Nov. 11, 1986). For a report on the safety of nuclear reactors in EOCD countries, see Nuclear Energy Agency, OECD, *Chernobyl and the Safety of Nuclear Reactors in OECD Countries* (Report by NEA Group of Experts 1987).

advantage or disadvantage, to merge accident and hazard control with their toxic chemicals control policy, to reduce the negative impact upon all industry that is caused by such accidents, and to address the special circumstances that are produced by plants located near international boundaries.[227]

As a culmination of these EEC efforts, the Council Directive on Major Accident Hazards of Certain Industrial Activities (so-called Seveso Directive) was formulated in mid-1982 by the Council of the European Communities.[228] The goals of this directive were (1) to prevent major accidents caused by industrial activities and (2) to limit the effects of such accidents if they did occur.[229] The Seveso Directive provided for a system of alarm and notification procedures when incidents involving dangerous chemicals occurred and, as it closely mirrored the events which occurred at the Icmesa plant, the directive therefore addressed process installations and included storage and transportation of chemicals within its definition of industrial activity.[230] The regulatory framework created under the Directive takes into account the nature and quantity of dangerous substances handled at a given plant and the type of activity conducted there.[231] One of the limitations of this directive, as with many such Council Directives, is that the implementation of the mandatory provisions was by and large left to the discretion of each member state. As a result, several of the members of the EEC have been quite slow in carrying out the mandated actions.[232] As of June 1987, only six of the twelve community members had fully implemented the Seveso directive.[233]

b. Post-Bhopal

About one year after the Bhopal accident, the EEC proposed that the Seveso Directive be strengthened by means of a lowering of the thresholds for the substances listed in Annexes III and IV of the directive.[234] These thresholds established the quantity of each substance, above which a company must notify the host country of the presence of the substance. Then, in early 1986, the EEC also opened up informal talks with industry representatives regarding a voluntary code of conduct on the transfer of

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227. *See* von Moltke, *Bhopal and Seveso — Avoiding a Recurrence*, THE ENVIRONMENTAL FORUM 21-23 (June 1985).

228. Directive 82/501/EEC, 5 O.J. No. L 230, 1 (1982), as amended by Directive 87/216/EEC, March 19, 1987.

229. *Id.* art. 1. *See also* art. 3.

230. *Id.* art. 1.

231. *See id.* art. 3.

232. For a recent report on the lack of implementation by member states, see *Most Members Have Not Reported Activities Under Seveso Directive, Commission Reveals*, 10 Int'l Env't Rep. (BNA) 17 (Jan. 14, 1987).

233. *Six Members Have Fully Implemented Sevesco Directive, EC Officials State*, 10 Int'l Env't Rep. (BNA) 327 (July 8, 1987).

234. Proposal for a Council Directive Amending Directive 81/501/EEC on the Major Accident Hazards of Certain Industrial Activities, Com (85) 572 (Final), Nov. 4, 1985.

potentially dangerous technology to developing countries.[235]

c. Post-Chernobyl and Basel

In the wake of the Chernobyl accident, the EEC Commission was concerned with setting uniform standards on levels of radioactivity in foodstuffs as well as on radiation exposure for nuclear industry workers and the general public, and the creation of an "ultra-rapid" information-exchange system for use in the event of nuclear accidents.[236] In August 1986, the Commission proposed a "Council Decision on a Community System of Rapid Exchange of Information in Cases of Unusually High Levels of Radioactivity or of a Nuclear Accident."[237] Under the proposal, a member state would be obligated to notify the Commission whenever it:

> measure[d] unusually high levels of radioactivity from the point of view of health protection or protection of the environment or whenever a nuclear accident or another event occur[red] on the territory of a Member State and there [was] the potential for, or actual occurrence of, an abnormal [sic] high release of radioactivity [sic] materials.[238]

Subsequently, it was announced in May 1987 that the Commission had drawn up an elaborate information exchange scheme which would enable the Community member nations and the Commission to react quickly and effectively to minimize the risks of a nuclear accident.[239] The Commission also developed plans to establish an inspectorate to monitor safety standards at nuclear power stations throughout the EEC.[240]

Following the Sandoz incident, the EEC Environmental Affairs Commissioner, Stanley Clinton Davis, told the European Parliament on November 13, 1986, that if Switzerland, which is not a member of the European Committee, had adopted a Seveso-type legislation, the ecological damage and the resulting pollution of the Rhine in the aftermath of the Sandoz fire "would have been substantially reduced."[241] He said that, in light of the Rhine incident, the EEC Commission will convene a meeting of experts to review the Seveso directive and suggest possible improvements.[242] Davis also noted that, as of December 1986, only four member

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235. *EEC, Industry Discusses Code of Conduct for Transfer of Technology to Third World*, 9 Int'l Env't Rep. (BNA) 33-34 (1986).

236. *Limits on Radioactivity in Foodstuffs to be Proposed Clinton Davis Announces*, 9 Int'l Env't Rep. (BNA) 272 (August 13, 1986).

237. *See* COM (86) 434 (Final), Aug. 20, 1986.

238. *Id.* art. 1.

239. *EC Proposed Information Exchange Strategy Aimed at Quick Response to Nuclear Accidents*, 10 Int'l Env't Rep. (BNA) 271-72 (June 10, 1987).

240. *Nuclear Power Prospects for Long Term Down 40 to 50%; Agency Reports*, 9 Int'l Env't Rep. (BNA) 350-351 (Oct. 8, 1986).

241. *Commission Steps Up Law Enforcement Following Rhine Pollution Occurance*, 9 Int'l Env't Rep. (BNA) 436 (Dec. 10, 1986).

242. *Id.*

states — Denmark, France, the United Kingdom, and West Germany — had implemented the Seveso directive and the new Community members, Portugal and Spain, were given a time extension.[243] According to Davis, the other community states which had not incorporated the 1982 Seveso directive into their national laws faced an initial warning which would be followed by legal action against them in the European Court of Justice at Luxembourg.[244] Subsequently, he reported that the Commission had instituted proceedings against Ireland and Luxembourg for failure to implement the Seveso Directive, and against Belgium, The Netherlands, Italy, and Greece for incomplete information.[245]

Compliance of the European community members with another of their obligations under the Seveso Directive, the provision of information on their national inventory of industrial activities,[246] has also been inadequate. It was reported following the Sandoz incident that the required information regarding the names and locations of plants, the types of industrial activities carried out, and the names of dangerous substances involved, had been provided by only five member countries — Ireland, Italy, Denmark, The Netherlands, and the United Kingdom.[247]

The Sandoz incident also prompted the EEC Environment ministers to ask the EEC Commission to explore the possibility of negotiating bilateral or multilateral treaties with non-EEC members to extend coverage of the Seveso Directive beyond the European Community borders.[248] They outlined three key elements which should underlie multilateral negotiations aimed at achieving "better environmental protection of the Rhine and other major waterways affecting the community: the improvement of the alarm and information system in case of accidental discharges of toxic chemicals; closer harmonization of national legislation on handling of such chemicals"; and "prompt cleanup, restoration, and equitable compensation and liability arrangements" for pollution damage by those responsible for originating it.[249]

Earlier, on July 2, 1986, the EEC Commission submitted to the Council a proposed "Regulation Concerning Export From and the Import Into the Community of Certain Dangerous Chemicals."[250] With the objective of establishing common notification and information procedures for imports and exports of banned or severely restricted chemicals,[251] the proposed Council regulation would require an exporter of such chemicals,

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243. *See id.* at 435.

244. *See id.* at 436.

245. *Most Members Have Not Reported, supra* note 232.

246. The obligation of the states is contained in article 5 of the Seveso Directive, *supra* note 228.

247. *Most Members Have Not Reported, supra* note 232.

248. *Extension of Seveso Oil Spill Legislation to Non-EEC Countries Discussed by Ministers*, 9 Int'l Env't Rep. (BNA) 443 (Dec. 10, 1986).

249. *See id.*

250. COM (86) 362 Final, July 2, 1986.

251. *Id.*, art. 1.

a list of which is contained in an annex,[252] to notify the designated authority of the exporting EEC member.[253] For the initial export of any of such materials, the exporting country would then inform the Commission, which would in turn notify the country of destination.[254] The Commission would then inform the exporting country "of any relevant reaction from the country of destination."[255] Beginning in 1989, the importing country would have to give consent to any shipment of such chemicals.[256] Earlier council directives on packaging and labeling would also apply to the shipment of such chemicals.[257] As was perhaps to be expected, chemical industry officials reacted negatively to this proposal, warning that the proposed regulation could adversely affect the European industry's competitive position.[258]

3. United Nations Guidelines and Standards

Prior to Seveso, the primary U.N. vehicle for activity in the area of the environmental consequences of economic development and the transfer of hazardous technology was the United Nations Environment Program (UNEP), established as a result of the Stockholm Conference in 1972.[259] By the mid-1970s, UNEP had become involved in the area of the export of dangerous pesticides.[260] UNEP's role here was primarily an informational one with no power to regulate. As a result, UNEP gave advisory opinions and generally reacted to problems that arose rather than attempting to anticipate them. Subsequently, it has been involved in a program on provisional notification of banned and severely restricted chemicals.[261]

One aspect of UNEP's work, the International Registry of Potentially Toxic Chemicals (IRPTC), which was designed to compile a list of all such chemicals, is now complete, and now, the next phase is to start a program of monitoring banned chemicals around the world and their effects on human health.[262] The IRPTC is presently engaged in the monitoring of UNEP's program on provisional notification of banned and severely restricted chemicals, and its work in risk assessment operations in the use of chemicals.[263]

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252. *Id.* Annex I.
253. *Id.* art. 3 (2).
254. *Id.* art. 3 (3).
255. *Id.*
256. *Id.* art. 4.
257. *Id.* art. 6.
258. *CEFIC Official Says Export Proposal could Hurt Industry's Competitiveness*, 9 Int'l Env't Rep. (BNA) 390-91 (1986).
259. G.A. Res. 2997, 27 U.N. GAOR Supp. (No. 30) 43, U.N. Doc. A/8730 (1972).
260. U.N. Doc. UNEP/GC/31 (1975).
261. *UNEP Group Moves From List Compilation To Monitoring Banned Chemicals Worldwide*, 9 Int'l Env't Rep. (BNA) 357-58 (Oct. 8, 1986).
262. *Id.* at 357.
263. *Id.* at 358.

Following Seveso, the U.N. General Assembly adopted a resolution on "Protection against products harmful to health and the environment" in December of 1982.[264] The resolution stated that banned products should be sold abroad only on the receiving country's request or if the consumption of such products is officially permitted in the importing country. "Full information" on the severely restricted products was also called for by the resolution.

The World Health Organization, which had been involved with international pesticide regulation since the late 1960s,[265] issued a report through its Committee on Environmental Pollution Control in Relation to Development in mid-1985.[266] The report concluded that environmental considerations should be included in all phases of the planning and decision-making process which lead to formulation of development plans. The report further indicated that the assessment of the health effects of major developmental programs, particularly risk assessment, by developing countries was at present far from satisfactory.

The International Labor Organization (ILO) participated in setting up a task force in late 1985 with a focus on preventing major industrial accidents, such as the Bhopal disaster. The task force was to assist in major hazard audits and to advise governments on setting priorities, upgrading factory inspectorates, and planning training programs.[267] The ILO was also to establish checklists for monitoring standards on major hazard installations, to prepare a comprehensive manual on major hazard control, and to begin work on a code of practice on prevention of major accidents involving hazardous materials or processes.[268]

In early 1986, UNEP gave its backing to the establishment of an international environment bureau to direct industries' involvement in environmental issues.[269] The proposed bureau would be run through the International Chamber of Commerce, although it would be autonomously funded and staffed. The primary functions of the bureau would be to serve as an information coordinating entity and to produce case studies on companies' experiences in environmental management. The continued emphasis on information generation and coordination rather than regulation that characterizes other U.N. efforts in this area was thus maintained.

In addition, the U.N. Center on Transnational Corporations

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264. Resolution 37/137, adopted Dec. 17, 1982.

265. *See, e.g.*, World Health Organization/Food and Agricultural Organization, Guidelines for Legislation Concerning the Registration for Sale and Marketing of Pesticides, WHO Doc. OH/69.3, FAO Doc. PL:CP/21 (1969).

266. *Development Plans in Third World Countries Should Assess Environment, WHO Report Says*, 8 Int'l Env't Rep. (BNA) 237 (July 10, 1985).

267. *ILO Asked to Set Up Task Force*, 8 Int'l Env't Rep. (BNA) 367 (Nov. 13, 1985).

268. *Id.*

269. *New International Bureau to Address Industry's Role*, 9 Int'l Env't Rep. (BNA) 49 (Feb. 12, 1986).

(UNCTC) issued a report which evaluated transnational corporations and issues related to the environment.[270] This report found it likely that governments in developing countries, in the wake of the Bhopal disaster, would impose new requirements for disclosure of information that would allow them to make more effective risk assessments of new plants and equipment. The UNCTC reported that safety considerations had not been given priority attention during the approval process for foreign direct investment or technology acquisition by developing countries. Partly as a result of the India/Union Carbide litigation, the report also suggested that international aspects of insurance issues relating to environmental management were straining the ability of existing civil procedures for the settlement of such cases.[271]

4. Multilateral Development Banks

Prior to Bhopal, the multilateral development banks, and particularly the World Bank, exhibited little direct concern over the potential environmental effects of the projects which were built as a result of bank funding. The World Bank did develop a handbook which set forth the procedures to be followed in evaluating a particular project proposal and the expected environmental consequences. That 1971 handbook attempted to provide guidance on the identification, detection, measurement, and control of adverse environmental effects for any given project.[272] In 1985, the World Bank updated that handbook to bring it more in line with an emphasis on sustained economic development that implicitly depends upon environmental concern.[273] The updated version of the handbook placed environmental analysis of a project as a separate factor to be looked at by the World Bank in evaluating a project.[274]

Early in 1985, the World Bank issued its own guidelines on the use of pesticides in developing countries. These guidelines emphasized that the choice of pesticides for use by developing countries should be based on strict environmental and health criteria.[275]

Later that year, draft guidelines for controlling major industrial accident hazards in developing countries were also issued by the World Bank.[276] The hazards guidelines, which were for use on projects involving pesticides, fertilizers, petrochemicals, and methanol, were drawn from the

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270. *Third World May Require More Information to Improve Risk Assessment*, 9 Int'l Env't Rep. (BNA) 34 (Feb. 12, 1986).

271. *Id.* at 35.

272. *See* Lee, *The Environment, Public Health, and Human Ecology*, (World Bank 1985). For an extensive background discussion of this topic, see Rich, *The Multilateral Development Banks, Environmental Policy, and The United States*, 12 ECOLOGY L.Q. 681 (1985).

273. *See* Lee, *supra* note 272.

274. *Id.*

275. *World Bank's Guidelines*, 8 Int'l Env't Rep. (BNA) 124 (Apr. 10, 1985).

276. *Guides on Accident Hazards*, 8 Int'l Env't Rep. (BNA) 112 (Apr. 10, 1985).

EEC's Seveso Directive and therefore included industrial processes and the storage and transport of hazardous materials.[277] Under the guidelines, hazardous operations were classified on the basis of the quantity of the substance stored or processed at the site or transported. Project developers were required to show that they had recognized any major risks, had taken measures to prevent accidents and minimize the effects of those that do occur, and prepare emergency plans for dealing with such accidents that were compatible with off-site measures drawn up by local authorities.[278]

Legislation passed by the U.S. Congress in late 1985 increased pressure on the multilateral banks in this area by calling upon the directors of the banks to ensure that there was a thorough evaluation of the potential environmental problems associated with all proposed loans for projects involving large impoundments of rivers in tropical countries, penetration roads into undeveloped areas, and agricultural and rural development programs.[279] This legislation provided the groundwork for efforts by the U.S. and Scandinavian directors of the World Bank to hold up a loan for massive regional development scheme in Brazil until the environmental consequences of the project were more thoroughly evaluated.[280]

In the 1986 appropriations measure, the United States Congress reaffirmed a direct linkage of environmental issues and development funding.[281] This resulted in strengthening the pertinent provisions of the 1985 bill, such as requiring instructions to the executive directors of the multilateral development banks to promote the commitment of their institutions to add ecologically trained and experienced people to their staff and to promote consultations in the countries receiving bank loans with nongovernmental organizations that may be adversely affected by the projects.[282] In addition, among new provisions in 1986, one directs the U.S. Agency for International Development to compile categorized lists of proposed projects which are likely to have adverse effects on the environment, natural resources, or indigenous peoples, and the U.S. executive directors are to be instructed to seek changes necessary to eliminate or mitigate these effects.[283] Another mandates that policies similar to those now governing pesticide use be formulated for application to other industrial

277. *Id.*

278. *Id.* at 113.

279. *US Representatives*, 9 Int'l Env't Rep. (BNA) 50 (Feb. 12, 1986); *MDB Development Policies*, 9 Int'l Env't Rep. (BNA) 150 (May 14, 1986). *See also* Rich, *Environmental Management and Multilateral Development Banks*, 10 CULT. SURVIVAL Q. 4 (1986).

280. Environmental Defense Fund Newsletter, December 1986, at 2.

281. For a succinct analysis, see Walsh, *World Bank Pressed on Environmental Reforms*, 234 SCIENCE 813 (Nov. 14, 1986).

282. *Id.* at 814. *See also House Panel Reports Foreign Aid Bill*, 9 Int'l Env't Rep. (BNA) 277, 278 (Aug. 13, 1986); *A Greener Hue for Development Aid*, THE ECONOMIST, March 28, 1987, at 69, col. 1.

283. *House Panel Reports*, *supra* note 282.

chemicals as well.[284]

Some positive developments have occurred since the new president of the World Bank, Barber B. Conable, acknowledged the thrust of these legislative efforts at the annual meeting of the Bank in the fall of 1986, noting that attention to environment was essential for sustained development.[285]

C. *National Standards and Regulations*

1. General

The picture which emerges from an analysis of national perspectives on transfer of hazardous technologies is somewhat blurred by the fact that a single country can be, and often is, both a recipient country and an exporting country. For example, the Bhopal plant had a sister plant in the United States which was based upon the same design plans. The Basel accident illustrated the fact that Switzerland, which was the home country for the parent company of Givaudan, ten years later became the site of its own industrial disaster. Therefore, contradictory perspectives on the issues in this area can often be found within a single country.

2. Industrialized Countries

The members of the EEC have been slow on the uptake with regard to the implementation of the Seveso Directive. It took almost six years from the time of the accident for that directive to even take effect, and, by mid-1984, Italy, Greece, and Belgium still had all failed to take the necessary steps to bring themselves into compliance.[286] Italy, in particular, had been dragging its feet, as the European Commission threatened to take Italy to the European Court of Justice over Italy's failure by 1981 to implement five directives dealing with PCBs, waste oil, and water-related matters.[287] This reluctance to take the necessary measures can be attributed to the manner in which the directive was formulated, as it left the implementation to the discretion of the member states. With regulatory responsibility usually compartmentalized among worker safety and environmental agencies and concerns over the likelihood that disparate regulation by individual member states would create unequal competitive conditions, there was little impetus for countries, such as Italy, to develop the required legislation if that legislation offered no direct economic benefits to the country. In fact, the perception often was that the implement-

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284. Walsh, *supra* note 281 at 814.

285. *Id.* at 815. On the current situation, see Nanda, *Human Rights and Environmental Considerations in the Leading Policies of International Development Agencies — An Introduction*, 17 DEN. J. INT'L L. & POL'Y 26-51 (1988).

286. *Compliance by Belgium, Greece, Italy*, 7 Int'l Env't Rep. (BNA) 220 (July 11, 1984).

287. *Court Actions Brought against Italy*, 4 Int'l Env't Rep. (BNA) 786 (Nov. 4, 1981).

ing legislation would create negative economic effects by increasing manufacturing costs to the companies that would be impacted by the new law and regulations and, therefore, was to be avoided for as long as possible.

However, within a few months of the Bhopal disaster, a new attitude towards hazardous installations was perceptible within the Common Market Countries. Legislation in France was drafted which would permit no construction, residential or commercial, within a required safety zone around such hazardous plants.[288] This legislation would apply to installations already subject to the Seveso Directive. Belgium and Italy followed suit shortly thereafter by introducing the necessary legislation to bring themselves into compliance with the directive.[289] The United Kingdom also drafted new guidelines which addressed issues of emergency planning for industrial sites. This planning was to be completed in consultation with local authorities and public emergency services.[290]

Following the Chernobyl accident, several members of the European community, including Denmark, Greece, Ireland, Portugal, Luxembourg, and West Germany, expressed concern about the safety and security at the controversial French nuclear power plant at Cattenom, near the Luxembourg and West German borders.[291] After a clearance from the EEC Commission, however, the French government started up its first reactor at the plant on October 14, 1986.[292] Subsequent attempts to halt Cattenom by the use of judicial proceedings were unsuccessful.[293]

National legislation in the aftermath of the Chernobyl accident included the 1987 French Decree on the High Council for Nuclear Safety and Information,[294] under which the Council is charged with informing the public and the media on questions of nuclear safety and on incidents and accidents occurring in nuclear installations. The Federal Republic of Germany enacted the Preventive Radiation Protection Act in December 1986,[295] which provides for a clear distribution of administrative powers between the federal government and the states in organizing preventive measures against radioactive contamination caused by nuclear accidents and similar events. Sweden issued two ordinances, in force as of April 1,

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288. *Bill Would Establish Safety Zone*, 8 Int'l Env't Rep. (BNA) 35 (Feb. 13, 1985).

289. *Law to Implement "Seveso Directives"*, 8 Int'l Env't Rep. (BNA) 90 (Feb. 13, 1985); *Minister of Health Issues Order*, Int'l Env't Rep. (BNA) 120 (Apr. 10, 1985).

290. *Executive Issues Emergency Planning Guide*, 8 Int'l Env't Rep. (BNA) 366 (Nov. 13, 1985).

291. *See, e.g., Officials of Germany, Luxembourg Focus on Security*, 9 Int'l Env't Rep. (BNA) 274, 275 (Aug. 13, 1986); *Foreign Ministers Protest Building of Nuclear Plants Near Borders*, 9 Int'l Env't Rep. (BNA) 350 (Oct. 8, 1986).

292. *France Starts up First Cattenom Reactor After Getting Clearance by EEC Commission*, 9 Int'l Env't Rep. (BNA) 409, 410 (Nov. 12, 1986).

293. *Court Declines again to Halt Cattenom*, 10 Int'l Env't Rep. (BNA) 60 (Feb. 11, 1987).

294. *See* 39 NUCLEAR L. BULL. 13 (June 1987).

295. *See id.* at 16.

1987,[296] which provide for compensation to persons who suffered economic losses as a result of the Chernobyl accident. Earlier, in January 1987, the Swedish Parliament amended the 1984 Act on Nuclear Activities, under which there is a prohibition against the granting of a license to construct a nuclear power plant.[297] The amendments entered into force on February 1, 1987.[298]

After the Basel accident, several countries, including West Germany, France, Switzerland, and Canada, adopted stringent safety measures to prevent toxic chemical spills. At a meeting of Environment Ministers from the EEC countries on November 25, 1986, West German Environment Minister, Walter Wallmann, urged the EEC to adopt stringent standards for chemical plants and to conduct a review of industrial liability laws in Europe.[299] Earlier, on November 18, he ordered the regional authorities in West Germany to make a list specifying the location of all pesticide warehouses in the country and called for a strengthening of safety standards.[300] Subsequently, on December 3, he announced that the list of dangerous substances covered by West Germany's environmental regulations would be widened and that requirements for companies reporting pollution incidents to the authorities would be further strengthened.[301]

The French Environment Ministry started taking steps to establish "safety" or "isolation" zones around hazardous installations.[302] On December 17, 1986, it announced several new measures for the effective prevention of accidental pollution in factories.[303] At a ministerial conference on Rhine pollution on December 19, 1986, Swiss President Alfons Egli told a special session of the Swiss Parliament that his government will take "radical measures" to ensure that another disaster like the Sandoz fire does not occur again.[304] On December 18, 1986, cradle-to-grave legislation was introduced in the Canadian House of Commons, the primary focus of which was on preventive aspects.[305]

3. United States

The United States approach, while primarily that of an exporting

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296. *See id.* at 21.

297. *See id.*

298. *See id.* at 20.

299. *Extension of SEVESO, Oil Spill Legislation to Non-EEC Countries Discussed by Ministers*, 9 Int'l Env't Rep. (BNA) 443 (Dec. 10, 1986).

300. *Even Tighter Pollution Regulations Announced in Wake of SANDOZ Incident*, 9 Int'l Env't Rep. (BNA) 438 (Dec. 10, 1986).

301. *Id.*

302. *French Require 'Isolation Zone' Around Factories to Reduce Amount of Risk*, 10 Int'l Env't Rep. (BNA) 16 (Jan. 14, 1987).

303. *Government Bills Switzerland $38 Million*, 10 Int'l Env't Rep. (BNA) 3 (Jan. 14, 1987).

304. *'Radical Measures'*, 9 Int'l Env't Rep. (BNA) 429 (Dec. 10, 1986).

305. *See* 10 Int'l Env. & Rep. (BNA) 9 (Jan. 14, 1987).

country, has also been shaped by the events at the sister plant to Bhopal in Institute, West Virginia. Evaluations and studies, like the one undertaken by the Environmental Protection Agency, looked at possible gaps in the environmental statutes to determine whether statutory changes were needed in order to prevent chemical plant accidents similar to Bhopal from happening.[306] Legislation also was introduced which would have brought increased pressure upon the EPA to strengthen its efforts in chemical safety enforcement.

The United States, as an exporter of technology and products, has in place legislation which provides the basis for the regulation of the export of hazardous technologies or products. In the past, the Export Administration Act (EAA) has been the vehicle for attempts to control sensitive exports.[307] Certainly, the EAA has been used by the U.S. government to prohibit the export of technologies it considered to be sensitive with regard to more traditional foreign policy concerns. In its reenactment in 1985, control of hazardous exports was deemed to be a policy suitable for inclusion with the other traditional concerns.[308] Some have also argued that the National Environmental Policy Act[309] could also be the basis for U.S. regulation of exports. The most directly applicable legislation has been the Federal Insecticide, Fungicide, and Rodenticide Act,[310] which contains both domestic registration and export notification provisions with regard to the export of pesticides.

The policy assumptions which underlie these latter provisions, from the exporting country perspective, are three-fold. First, the notification is a part of the general principle of comity between states, in that it is good practice to alert the recipient country to risks that have been identified by the exporting country with regard to the technology or process in question. Furthermore, notification is assumed to be sufficient to allow the identification of all the risks present and that this identification will result in a valid analysis of those risks, as well as the benefits, by the recipient country.

The Bhopal tragedy, however, brings into sharp focus the questions regarding the propriety of allowing tort litigation in U.S. courts,[311] if a U.S. based multinational enterprise controlled a foreign business and op-

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306. *Task Force Studies Adequacy of U.S. Laws to Prevent Chemical Accidents Like Bhopal*, 8 Int'l Env't Rep. (BNA) 33 (Feb. 13, 1985).

307. 50 U.S.C. App. §§2401-2420.

308. *See* Pub. L. No. 99-64, 99 Stat. 120, 121, § 3(13) (July 12, 1985).

309. 42 U.S.C. §§ 4321-61.

310. 7 U.S.C. § 136. For proposed legislation under which regulations on the export of hazardous substances would have been further strengthened, see H.R. 638, introduced by Congressman Michael Barnes, Jan. 22, 1985, 99th Congress, CONG. REC., at 28, 186; H.R. 1703, introduced by Congressmen Bonker and Solarz, March 25, 1985, 99th Congress, CONG. REC., at 28, 245.

311. RESTATEMENT (REVISED) OF THE FOREIGN RELATIONS LAW OF THE UNITED STATES § 601 (Tent. Draft No. 4, 1983), lends support to granting access to U.S. courts for Bhopal plaintiffs.

erated it under conditions deficient by standards generally applicable in the United States. This approach would operate on a different set of policy assumptions from those delineated for the existing legislation by projecting the standards prevalent in the United States outside of the U.S. borders. Such a projection of standards assumes that there can and should be a single standard of operation, regardless of the context, and that the United States, at least for its own multinationals, is the appropriate source for that standard.

Finally, notwithstanding a problem with defining "control"[312] to determine access to U.S. courts, enough case law exists in the United States to make a determination for jurisdictional purposes in the antitrust and securities fields, i.e., whether a parent-subsidiary relationship warrants the exercise of jurisdiction in the United States. A similar determination could be made were such legislation adopted pertaining to jurisdiction for tort legislation.

4. Developing Countries

Following the Chernobyl accident, the People's Republic of China promulgated in October 1986 regulations on safety supervision and control of civilian nuclear installations.[313] The regulations set up a regime of licensing and control of such installations and establish a National Nuclear Safety Administration whose task is to centralize supervision of the safety of such installations nationally.

Generally, developing countries tend to be recipient countries for the purpose of the transfer of hazardous technology and products. In the pre-Bhopal context, this meant that the responsibility for the protection of the peoples and the environments in developing countries has also rested with the governments of those countries. At the time of the Stockholm conference in 1972, there was widespread concern among developing countries that the perceived imposition by developed countries of environmental regulations and safeguards was a new way of making a claim on the limited productive resources available to developing countries.[314] This new claim was seen as an obstacle to the future rate of development in these countries. There was also a fear that the more stringent environmental regulations being implemented in the developed countries would limit the export potential for raw materials and products produced by the developing countries. Finally, there was also a general concern among developing countries that they would be expected to bear the increased costs associated with the more stringent environmental regulations with-

312. For a discussion of theories of direct liability for Union Carbide, U.S.A., see Westbrook, *Theories of Parent Company Liability and the Prospects for International Settlement*, 20 TEX. INT'L L.J. 32 (1985).

313. *See* 39 NUCLEAR L. BULL. 9 (June 1987).

314. *See, e.g.*, [Founex report] UNCTAD, *Development and Environment, Report and Working Papers of a Panel of Experts* (Founex) (Mouton 1972); Defries, *supra* note 107.

out having the financial capability to take full advantage of the new opportunities that would arise from the development of environmental control processes.

This initial resistance to incorporating environmental concerns into development plans, when combined with the general enthusiasm with which developing countries courted foreign capital and industrial projects, contributed to the Bhopal accident and, to a slightly lesser extent, the Seveso accident. Countries such as India and Italy were eager to increase their level of industrialization. Special favors in the form of tax breaks or concessions on utility costs were often granted to encourage companies to establish plants in the granting country.

Those mechanisms which did exist that would allow the recipient country to exercise some control over the environmental consequences of the proposed installation or project were often ignored or poorly implemented. In India, zoning codes and development plans did exist for many Indian cities. However, enforcement and implementation were often less than adequate. Furthermore, countries that were encouraging new investment often did not have stringent health and environmental regulations. As noted earlier, Italy did not formulate any legislation specifically addressing environmental issues until after the Seveso accident, and, even then, it did so in an indirect manner.

Recipient countries were often likely to lack trained personnel who had the skills to run a major industrial installation safely. Once a plant was built, the surrounding communities were often not instructed as to the proper procedures in the case of an accident, as occurred at Seveso and Bhopal.

The new guidelines and legislation which have been formulated as a result of these tragedies generally do not shift the burden of responsibility away from the recipient countries. Under the notification requirements, the country receiving the technology or product is still to carry out the analysis of the information received in order to make a determination of possible environmental effects. Where a recipient country lacks the skilled personnel or the funding to adequately analyze such data, the end result may be no different than if no notification had occurred at all.

D. *Nongovernmental Organizations*

Efforts by nongovernmental organizations to shape and generate public support for guidelines or standards in the area of the transfer of hazardous technology have primarily taken place since the Bhopal accident. In early 1985, the Conservation Foundation announced an agreement on voluntary guidelines for labeling pesticides exported to developing countries.[315] In Europe, a coalition seeking controls on exports of

315. *Guides on Labeling Exported Pesticides*, 8 Int'l Env't Rep. (BNA) 124 (Oct. 9, 1985).

dangerous products to developing countries was formed by consumer and environmental groups.[316] The World Resources Institute has also added its voice to the calls for an increased awareness of the relationship between development, population, and environmental problems.[317] Following the Chernobyl and Basel accidents, several nongovernmental groups in Europe sought concerted international action to cope with the threats to the environment caused by such accidents.[318]

E. *Multinational Corporations*

The attitudes toward corporate responsibility for the transfer of hazardous technologies have shifted considerably as a result of the Seveso, Bhopal, and Basel disasters. While, in the case of Union Carbide, there has been no complete acceptance of legal responsibility to date, the settlement negotiations have certainly implied that acceptance by the company.[319] In the cases of Seveso and Basel, that acceptance of liability took place early on.

The major shift has been in the increasingly sharp focus upon the design and operating procedures for major industrial installations. Several reports analyzing the Bhopal accident indicated that the disaster was caused by insufficient attention to safety in the process design, dangerous operating procedures, lack of proper maintenance, faulty equipment, and major costs in manning levels, crew sizes, and skilled supervision.[320] This sharpening of focus has highlighted the general absence of corporate policies on environment and resource management. Such policies would address issues of workplace hazards, industrial accidents, marketing of hazardous products and relations with the recipient country's environment and natural resource officials.[321]

To illustrate, the Sandoz group established an internal working group which redefined safety rules regarding the storage of toxic and flammable substances.[322] The group's specific recommendations related to specifications and equipment of storage buildings, storage density, volume and technique, packaging and storage records; and retention of water used for fire-fighting in case of fire.[323] The European Council of Chemical Manu-

316. *Coalition Seeks 'Meaningful Controls'*, 8 Int'l Env't Rep. (BNA) 339 (Oct. 9, 1985).

317. *New Political Agenda on Environment*, 9 Int'l Env't Rep. (BNA) 12 (Jan. 8, 1986).

318. *Counter Conference Planned*, 9 Int'l Env't Rep. (BNA) 288 (Aug. 13, 1986).

319. *See, e.g., Unions Say Heeding Employee's Warnings Could Have Prevented Accident at Bhopal*, 8 Int'l Env't Rep. (BNA) 308 (1985).

320. *See, e.g.*, the statement by the vice-president of Dow Chemical Canada Inc., that better management practices were the key to preventing tragedies such as Bhopal. Quoted in *Better Management Policies*, 8 Int'l Env't Rep. (BNA) 232 (July 10, 1985).

321. *SANDOZ Working Group Produces Report*, 10 Int'l Env't Rep. (BNA) 4 (Jan. 14, 1987).

322. *Id.*

323. *European Chemical Manufacturers Agree on Guidelines*, 10 Int'l Env't Rep. (BNA) 329 (Nov. 11, 1987).

facturers Federation prepared guidelines in May 1987 which are based on the premise that the chemicals industry "has a duty to satisfy itself that its products are manufactured, handled, transported, used, and disposed of safely and without unacceptable risk to the environment and that it should not only comply with the law, but also take independent and responsible actions."

Increased emphasis on changes in corporate policies, however, has not been without resistance, as the Business and Industry Advisory Committee objected to guidelines proposed by the OECD's Environment Committee which called upon multinational corporations to consider environmental protection and environmentally related health problems and to cooperate with local authorities by providing information and assistance.[324] Similarly, resistance by the chemical industry to the proposed more stringent regulations by the EEC in 1986 regarding the export of banned or severely restricted chemicals was quite vocal.[325]

VI. APPRAISAL AND RECOMMENDATIONS

A. *General*

The preceding survey highlights the need for further action on all levels — multilateral, bilateral, and national. It is only in the aftermath of these tragic occurrences that safety issues pertaining to the export of hazardous substances and technology and nuclear power plants have received special attention both nationally and internationally. How to translate the enhanced worldwide concern with and awareness of these issues[326] into concrete measures is the next challenge. Specifically, the need is to develop further the existing principles of international environmental law and to clarify the roles and obligations of international organizations, exporting countries, recipient countries, and multinational enterprises.

B. *International Legal Norms and International Standards*

It is high time that selected developing norms of international environmental law, such as the principles of timely notification, information

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324. *Guidelines for Multinationals, Environment Rejected*, 8 Int'l Env't Rep. (BNA) 186 (June 12, 1985).

325. *See CEFIC Official says Export Proposal Could Hurt Industry's Competitiveness*, 9 Int'l Env't Rep. (BNA) 391-92 (Nov. 12, 1986); *see also Making Company Disasters Less Disastrous*, THE ECONOMIST, Jan. 31, 1987, at 55, col. 1.

326. According to a recent EEC poll, released on December 4, 1986, 59 percent of the respondents named chemical plants as the pollution source worrying them most. Commenting on the poll, the EEC Environmental Affairs Commissioner said at a news conference that "[p]ublic awareness of and concern about environmental issues continues to grow. This poll confirms public uneasiness about environmental issues and the failure of public authorities to deal effectively with the threats to our environment." *Chemical Pollution Top Public Concern*, 9 Int'l Env't Rep. (BNA) 441 (Dec. 12, 1986).

exchange, and consultation, on which a broad consensus already exists, be enshrined in a general convention on environmental protection. The Convention on Early Notification of a Nuclear Accident,[327] which entered into force on October 27, 1986, represents a step in this direction, with its requirement that states promptly publicize any information concerning nuclear accidents in order to minimize the transboundary impacts of such an accident.[328] Similarly, the need is to develop and clarify the obligation of a state causing transboundary harm to grant affected persons equal access and equal treatment to administrative and judicial proceedings.[329] Also, mediation, conciliation, and arbitration as dispute settlement mechanisms need to be refined and encouraged.[330]

A promising development in this area is the work of the World Commission on Environment and Development, which in August 1986 received a report from an expert's group on legal principles on environmental protection and sustainable development which should be in place by the year 2000.[331] Beginning with article 1 which recognizes the "fundamental right to all human beings to an environment adequate for their health and well-being,"[332] the group recommended a set of 22 articles to constitute a framework for global cooperation on both preventive and remedial aspects.[333]

The recent activities of the UNEP,[334] the EEC,[335] the OECD,[336] and other regional groups[337] as well as states[338] and multinational enterprises[339] are indeed responsive to the growing need, especially of the recipient countries. Even further emphasis on anticipatory and preventive aspects is needed.

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327. *Reprinted in* 25 I.L.M. 1370 (1986).

328. *Id.* art. 2.

329. For an OECD recommendation on the subject, see *Recommendation of the Council for Implementation of Regime of Equal Right of Access and Non-Discrimination in Relation to Transfrontier Pollution*, OECD Doc. C.(77) 28 (Final 1977).

330. For reports on recent programs in this area, see generally Anderson, *Negotiation and Informal Agency Action*, 1985 DUKE L.J. 261; Patton, *Settling Environmental Disputes: The Experience with and Future of Environmental Mediation*, 14 ENVTL. L. 547 (1984); and Wald, *Negotiation of Environmental Disputes: A New Role for the Courts*, 10 COLUM. J. ENVTL. L. 1 (1985).

331. *See* Experts Group on Environmental Law of the World Commission on Environment and Development, *Environmental Protection and Sustainable Development: Legal Principles and Recommendations* (R.D. Munro and J.G. Lammers, eds. 1987).

332. *OCED Gets Report From Experts Group on International Law*, 9 Int'l Env't Rep. (BNA) 417 (Nov. 11, 1986).

333. *See id.* at 417-18; *see also* Shabecoff, *Pollution Study: The Economic Link*, N.Y. Times, April, 27, 1987, at 1, col.1.

334. *See supra* § V(B)(3).

335. *See supra* § V(B)(2).

336. *Id.* § V(B)(1).

337. Regional groups such as the Organization of American States have only recently begun to take initiatives in this area.

338. *See supra* at § V(C).

339. *See supra* § V(E).

While the notion of state responsibility concerning issues such as transboundary pollution is receiving considerable attention,[340] it is also appropriate to consider the issue of state responsibility with regard to transfers of dangerous technology and hazardous wastes. An examination of the examples discussed earlier in this article will reveal the difficulty in applying the concept to this area: most of the transfers were between private parties rather than states, with the role of the state being merely regulatory.[341]

Traditionally, state responsibility has been used as a means for imposing reparations upon a state that has caused damage to parties abroad.[342] However, in the case of the type of accidents considered here, monetary damages are poor compensation for possibly permanent damage to the environment. Thus, imposition of state responsibility may also be said to have a second purpose, which would be to encourage nations to enact and enforce environmental standards that would prevent such accidents from occurring.[343] Therefore, even though a state may not be a party to a transaction that brings a dangerous technology within its borders, it can be said to have an obligation to regulate that technology so that it does not cause harm.[344]

This also raises the question whether a nation which exports such technology may also bear responsibility, even though it is not a party to the transaction. A state that allows careless export of a hazardous technology would probably have to share responsibility with a state that allows careless imports of technology. However, it is not always the mere export of the technology that is the cause of such accidents: there may be such issues as careless supervision and failure to enforce local laws or company regulations.[345] It would also seem that the preventative purpose of the doctrine of state responsibility would not be well served by in ef-

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340. *See generally* Magraw, *Transboundary Harm: The International Law Commission's Study of 'International Liability*, 80 AM. J. INT'L L. 305 (1986); Nanda, *The Establishment of International Standards for Transnational Environmental Injury*, 60 IOWA L. REV. 1089 (1979); Williams, *Public International Law Governing Transboundary Pollution*, 13 U. QUEENSLAND L. J. 112 (1984); *International Liability for Nuclear Pollution*, 11 SUFF. TRANSNAT'L L. J. 75 (1987); Goldie, *Transfrontier Pollution — From Concepts of Liability to Administrative Conciliation*, 12 SYR. J. INT'L L. & COM. 185 (1985); *International Pollution: The Struggle Between States and Scholars Over Customary Environmental Norms: The Hazy View After Chernobyl and Basel*, 12 S. ILL. U. L. J. 247 (1987); *see also supra* notes 20-21 (on a proposed convention controlling transboundary shipments of hazardous waste).

341. *But see*, Handl, *State Responsibility for Accidental Transnational Environmental Damage by Private Persons*, 74 AM. J. INT'L L. 525 (1980).

342. *See* Williams, *supra* note 340, at 115; *Report of the International Law Commission on the Work of Its 39th Session*, 42 U.N. GAOR, supp. (No. 10) at 89, U.N. Doc. A/42/10 (1987)[hereinafter cited as *ILC Rep.*].

343. *See* Magraw, *supra* note 340, at 326; *ILC Rep*, *supra* note 343, at 108-110.

344. *See, e.g.*, Report of the U. N. Conference on the Human Environment, *supra* note 24.

345. *See supra* note 82 and accompanying text.

fect relieving the importing nation of the financial responsibility for any future accident by holding the exporting state liable for compensation. However, by relieving the exporting state of all responsibility, there may indeed be serious difficulties for innocent victims seeking compensation for injuries and other losses.

Keeping the above difficulties in mind, it is appropriate to now inquire into alternate theories of liability. While several theories have been suggested by commentators, two will be discussed here.[346] A fault basis of liability would allow liability to be imposed when a state breaches an obligation, causing an injury to a party in another state.[347] Strict liability would impose liability for acts or omissions that cause injuries in another territory even if applicable standards of care were maintained.[348] The rationale of strict liability is to make such injuries part of the cost of the enterprise.[349] In effect, it would be because a state is gaining a benefit from the existence of the enterprise (taxes, employment, experts, etc.) that it should also have to bear the risk of loss vis-a-vis an innocent third party. In a purely domestic situation, it would also be justified on a theory of loss-spreading — a corporation could pass on the added costs (of insurance, judgments) throughout the society by increasing the price of its products. Since society benefits from the products, society as a whole should bear the cost of the risk, rather than the innocent injured individual.[350] Even though the company may be "innocent," i.e., not at fault, since it can better spread the loss, it would be liable. This loss-spreading rationale may not be directly applicable to states in the case of an accident that causes harm in another country, since, theoretically, the loss would not be spread in the country where the loss occurred. However, the theory of enterprise liability would still be applicable, since the society that benefits from the enterprise by profiting from the export would be liable for risks caused by it.

It should be noted that the imposition of state responsibility would not exonerate the private companies that may be responsible for the accident.[351] Injured parties may also choose to seek a judgment against these companies; however, in many cases there may be difficulties, such as access to the courts of a foreign nation, etc.[352] Even if a state is held responsible and pays compensation, it would still be able to demand compensation from the company.[353]

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346. Additional theories would include subjective fault criteria (*see* Williams, *supra* note 340, at 116) and absolute liability (*id.* at 117-18; Goldie, *supra* note 340, at 195-98; Magraw, *supra* note 340, at 327).

347. *See* Magraw, *supra* note 340, at 316-19.

348. *See id.*; *ILC Rep.*, *supra* note 342, at 111-13; Goldie, *supra* note 341, at 190.

349. *See* Goldie, *supra* note 340, at 190.

350. *See id.* at 193.

351. *See ILC Rep.*, *supra* note 342, at 110-11.

352. *See id.* at 111.

353. *See id.*

There is as yet no consensus on whether any of these theories of liability has already been accepted as customary. The recent discussions of the International Law Commission concerning International Liability for Injurious Consequences Arising Out of Acts Not Prohibited by International Law reflect a diversity of views on the subject.[354] Some representatives felt that strict liability was not presently accepted in international law,[355] while others did.[356] The Special Rapporteur defended the inclusion of the concept as it was necessary to provide compensation, and he also asserted that strict liability would not necessarily be inconsistent with the preventive purpose of the topic.[357] He also suggested that, to accomplish these purposes, the concept of strict liability might be modified from the concept used in domestic legal systems and in some international conventions.[358]

If some obligation is to be the underlying basis of state responsibility concerning accidents involving dangerous technology and hazardous wastes, the nature of the obligation must be explored further. Principle 21 of the 1972 Declaration of the U.N. Conference on the Human Environment could be the basis of an obligation to regulate adequately activities within a nation's borders so as not to harm the environment of other nations.[359] In the case of export of hazardous waste, this principle could be clearly construed to impose an obligation on the exporting nation, since the activity that produced the waste took place there. In most cases, if such a nation has no adequate way for disposing of the waste, as a producer of the waste, it should be responsible for the consequences.[360]

However, the export of hazardous technology may not easily fit within this framework. Instead, certain other obligations may be said to fall upon exporting nations. The exporting nation may be responsible for ensuring that appropriate information is disclosed to the importing nation regarding the potential hazards posed by the technology.[361] Further, it may also be required to ensure that adequate designs and safeguards are furnished to the importing nations regarding hazardous installations.[362] The breach of these obligations might give rise to state responsibility of the exporting nation if the damage were caused by such an omission.

Presently, the International Law Commission is engaged in the study

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354. *See id.* at 89-115.

355. *See id.* at 111-112.

356. *See id.* at 112, citing *Trail Smelter* arbitration, (U.S. v. Can.) 3 R. Int'l Arb. Awards 1905 (1938 and 1941); and Gut Dam Claims, *reprinted in* 8 I.L.M. 118 (1980).

357. *See id.* at 113.

358. *See id.*

359. *See* note 24 *supra.*

360. The U.S. has recently considered such an obligation; *see U.S. Would Tie Waste Exports to Bilateral Agreements*, 11 Int'l Env't Rep. (BNA) 472 (Sept. 14,1988).

361. Such as decision was passed recently by the OECD Governing Council, *Hazardous Installation Measures Adopted*, 11 Int'l Env't Rep. (BNA) 465 (Sept. 14, 1988).

362. *See id.*

of a workable regime concerning the topic of state responsibility.[363] While the debate thus far indicates that there are widely divergent views on some issues, the necessity of reaching a consensus in the area seems widely understood. Concepts such as "knowledge" and "foreseeability" may also be important in allaying the fears some nations have of expanded liability.[364] Once concepts become clearer in their application to simpler cases, a better evaluation of state responsibility regarding the export of hazardous technology can then be made. For the time being, awareness of the issues involved, as well as genuine concern for the protection of the environment, are the essential first steps. The next task is to have in place appropriate domestic and regional legislation, as well as responsible and restrained actions on the part of multinational enterprises.

C. The Role of the Main Actors

Problems are likely to be accentuated, especially for developing states,[365] in the absence of a systematic information-sharing system. Generally, as recipient countries of hazardous products or technology, they have to rely on foreign test data, due to the fact that many of them lack the capability and wherewithal to conduct adequate risk analysis and, therefore, are unable to make intelligent choices about appropriate technology and products. Also, many developing states lack adequate environmental laws and regulations[366] and even those in place are inconsistently applied and implemented.[367]

As discussed earlier, it may be necessary for exporting countries to apply their own laws, such as export control mechanisms,[368] to assist in a worldwide effort to prevent harm from hazardous substances and technology. It may be that the application of more stringent standards of exporting countries should apply to such exports even when the recipient state with its lax standards would welcome a hazardous substance or technology. Also, both developed countries and international organizations can play a useful role in providing recipient countries with the technical assistance which they sorely need. It is equally important that multinational enterprises act in a responsible fashion.

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363. *See ILC Rep.*, *supra* note 342. For a report on the earlier work of the International Law Commission regarding environmental law and state responsibility, see generally McCaffrey, *An Update on the Contributions of the International Law Commission to International Environmental Law Relating to the Environment*, 11 ECOLOGY L. Q. 189 (1983).

364. *See ILC Rep.*, *supra* note 342, at 93-94.

365. *See supra* § III(C)(4).

366. *See, e.g.*, Nanda, *The Development of U.S. Environmental Law: Some Lessons for Other Nations* (Paper presented at Conference on Common Law in Asia, University of Hong Kong, Dec. 15-17, 1986, a copy of which is on file with the DEN. J. INT'L L. & POL'Y).

367. *See id.*

368. *See supra* § III(C)(3).

VII. CONCLUSION

It is perhaps useful to recall that the modern environmental movement is of rather recent origin and can be traced to the 1960s when Rachel Carson' *Silent Spring*[369] and Garret Hardin's *The Tragedy of the Commons*[370] enhanced public awareness on environmental issues. Seveso, Bhopal, Chernobyl, and Basel have shocked the world community into paying special attention to issues concerning the export of hazardous substances and technologies. Thus, at a recent world conference on chemical accidents, there

> emerged a sense of the all-too-real potential for industrial accidents; the need for emergency preparedness and response efforts that are realistic and multidisciplinary; the necessity of involving government, industry, and the public in the planning process; the gaps in information on health and safety effects of chemicals; the importance of preventive measures; and the need for international cooperation and coordination in response planning and in notification given other countries.[371]

Similarly, the dumping of hazardous wastes abroad is a matter of international concern. As noted earlier,[372] pertinent forms of international environmental law are still in a developing stage. Although these norms are not at present considered obligatory as "hard" law upon states, international organizations and multinational enterprises, they provide useful guidelines for the activities of these actors. Also, even if these norms are deemed as "soft" law, they nonetheless reflect a growing trend.

Such developing norms relate to state responsibility,[373] and also include the obligation to exchange information and to notify and consult in a timely fashion;[374] the imposition of strict liability for the harm caused by the export of hazardous waste or technology;[375] and the imposition of liability to compensate the victims.[376] To prevent further Bhopals there is urgency for the formulation of enforceable international legal standards which are applicable to the export of hazardous technologies. Similar standards are needed to apply to the export of hazardous waste. As the cases studied here show, the problem is serious. Until recently, however, the gravity of the challenge was not universally recognized. Now that it is acknowledged that these cases may simply be the tip of the iceberg, much more needs to be done in taking both preventive and remedial measures.

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369. R. CARSON, SILENT SPRING (1962).

370. Hardin, *The Tragedy of the Commons*, 162 SCIENCE 1243 (1968).

371. *World Conference on Chemical Accidents Reflects Concern over Recent Disasters, Highlights Need for Planning, Cooperation*, 10 Int'l Env't Rep. (BNA) 407 (Aug. 12, 1987).

372. *See supra* §§ III, V(A), VI(B.).

373. *See supra* notes 33-38, 340-364, and accompanying text.

374. *See supra* note 202.

375. *See supra* notes 348-350 and accompanying text.

376. *See* Rosencranz, *Bhopal, Transnational Corporations, and Hazardous Technologies*, 17 AMBIO 336, 336-337 (1988).

The problem needs to be addressed urgently and promptly. Appropriately, the enhanced awareness that only concerted global efforts can succeed is now being translated into specific measures by UNEP, regional organizations such as OECD and EEC, and national legislation. The world community has no choice but to find effective measures at the global, regional, bilateral and national levels to meet this challenge.