MODELS AND METAPHORS FOR ENCOURAGING RESPONSIBLE PRIVATE MANAGEMENT OF TRANSBOUNDARY TOXIC SUBSTANCES RISK: TOWARD A THEORY OF INTERNATIONAL INCENTIVE-BASED ENVIRONMENTAL EXPERIMENTATION

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1. INTRODUCTION

During the twentieth century, public legal concern about the environment has evolved, in broad and overlapping strokes, from assorted local governmental responses to national norms, to regional treaties between a few sovereign nation-states, to multilateral and even global conventions, charters, declarations, conferences, and agendas.[1] During this same time frame, private legal concern about the environment, at least at the domestic level in a few developed nation-states, has begun to slowly shift from a largely defensive, tort law liability-avoidance orientation to a more proactive, negotiated, contractual approach of voluntarily-assumed responsibility.[2] As we prepare to move into the twenty-

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[1] For a useful and succinct historical background on the emergence of the field of international environmental law, see ALEXANDRE KISS & DINAH SHELTON, INTERNATIONAL ENVIRONMENTAL LAW (1991) [hereinafter INTERNATIONAL ENVIRONMENTAL LAW] ("International environmental law, the newest branch of international law, comprises those international juridical norms whose purpose is to protect the environment. . . . [It] originated in a growing awareness that our planet is endangered by the continued multiplication of human population, by increasingly invasive technology, and by the disordered activities of humanity."). *See generally id.* at xiii-xxix (providing a chronological table of international environmental agreements entered into during the twentieth century).

[2] The evolution of environmental law and policy in the United States is instructive. Seminal American environmental statutes like the Clean Air Act, as amended, 42 U.S.C. §§ 7401-7671q (1996), and the Clean Water Act, as amended, 33 U.S.C. §§ 1251-1387 (1996) were premised on common law nuisance principles. *See* Robert F. Blomquist, *The Beauty of Complexity*, 39 HASTINGS L.J. 555, 558-60 (1988) (reviewing WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW: AIR AND WATER (1986)). Private interests, from corporate polluters to citizen activists, tended to focus on the broad question

first century and the third millennium of our era,[3] it is apparent that, in contrast to the rich and varied literature addressing the direct public management of international environmental risk,[4]

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of whether or not a polluter was liable, based on broad notions of fault and causation, for discrete environmental harms, and the appropriate remedy for ameliorating the harm. *See id.*; *see also* Comprehensive Environmental Response, Compensation and Liability ACT (CERCLA), as amended, 42 U.S.C. §§ 9601-9675 (1996) (incorporating a strict liability tort-based statutory scheme).

Starting in earnest during the 1970s, some innovative American manufacturers like the Minnesota Mining and Manufacturing Company (3M Company) led the way in beginning the process of shifting their focus from pollution-control/liability-avoidance approaches to pollution prevention/contractual-like commitments to avoid harmful pollution from occurring in the first place. *See generally* Robert F. Blomquist, *Government's Role Regarding Industrial Pollution Prevention in the United States*, 29 GA. LAW REV. 349 (1995) (discussing pollution prevention law and policy developments in the United States during the last two decades).

[3] Viewing any cultural phenomenon from a millennial perspective, whether it be law or fashion, technology or art, economics or religion, induces a sense of deep humility. As poignantly expressed by Oxford University Professor Felipe Fernandez-Armesto:

> I have a vision of some galactic museum of the distant future in which Diet Coke cans will share with coats of chain mail a single small vitrine marked 'Planet Earth, 1000-2000, Christian Era.' The last decade of our millennium may be under-represented, because so much of our significant trash will have biodegraded into oblivion; but material from every period in every part of the world, over the last thousand years, will be seen by visitors as evidence of the same quaint, remote culture: totem poles and Tompion clocks, Netsuke ivories and Nayarit clays, bankers' plastic and Benin bronzes. The distinctions apparent to us, as we look back on the history of our thousand years from just inside it, will be obliterated by the perspective of long-time and vast distance. Chronology will fuse like crystals in a crucible, and our assumptions about the relative importance of events will be clouded or clarified by a terrible length of hindsight.

FELIPE FERNÁNDEZ-ARMESTO, MILLENNIUM: A HISTORY OF THE LAST THOUSAND YEARS 11 (1995). While it is tempting to speculate on the nature of the international (intergalactic?) environmental (space?) order over the next thousand years, from 2000 A.D. to 3000 A.D., I will defer that urge at this time and leave that task to science fiction writers.

[4] A working bibliography of some key American law review articles which discuss, in relatively general terms, direct command and control public management of international environmental risk include the following: Ambassador Richard E. Benedick, *The Montreal Ozone Treaty: Implications for Global Warming*, 5 AM. U. J. INT'L L. & POL'Y 227 (1990); David P. Bryden, *Environmental Rights in Theory and Practice*, 62 MINN. L. REV. 163 (1978); John A. Busterud, *International Environmental Relations*, 7 NAT. RESOURCES LAW. 325 (1974); W.J. Coppoc, *The Environment: No Respecter of National Boundaries*, 43 ALB. L. REV. 520 (1979); Richard A. Falk, *The Global Envi-*

little serious normative attention is being given to the structure and characteristics of a system of indirect public encouragement that would effectively promote private initiatives to mitigate the international problem of environmental risk that crosses national boundaries.

The purpose of this Article is to consider some models and metaphors that will encourage private efforts to manage one type of international environmental risk better: transboundary toxic substances risk. Initially, I will describe the nature of the problem of international toxic substances pollution as a "*transsectoral environmental problematique*" which requires incentive-based policy interventions in order to promote private solutions to a very public problem.[5] Secondly, I will consider a number of indirect, incentive-based policy models (tradeable emissions to pollution charges; subsidies to challenge regulations; and information reporting to technical assistance). Moreover, as a component of this analysis, the Article will review various institutional metaphors (global intergovernmental organizations to global non-governmental organizations and regional organizations to federal political systems) that might be employed to better encourage

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ronment and International Law: Challenge and Response, 23 KAN. L. REV. 385 (1975); Lothar Gündling, *Our Responsibility to Future Generations*, 84 AM. J. INT'L L. 207 (1990); Robert W. Hahn & Kenneth R. Richards, *The Internationalization of Environmental Regulation*, 30 HARV. INT'L L.J. 421 (1989); Ann Hunkeler, *International Environmental Issues: A Selected Annotated Bibliography*, 17 STAN. J. INT'L L. 347 (1981); Douglas M. Johnston, *Systematic Environmental Damage: The Challenge to International Law and Organization*, 12 SYRACUSE J. INT'L L. & COM. 255 (1985); Oleg S. Kolbasov, *Modern Ecological Policy and the Utilization of a Global Environmental Protection Strategy*, 5 PACE ENVTL. L. REV. 445 (1988); Blanka Kudej, *International Environmental Law: Selective Bibliography*, 20 N.Y.U. J. INT'L L. & POL. 825 (1988); Bradley Larschan & Bonnie C. Brennan, *The Common Heritage of Mankind Principle in International Law*, 21 COLUM. J. TRANSNAT'L L. 305 (1983); Myres S. McDougal & Jan Schneider, *The Protection of the Environment and World Public Order: Some Recent Developments*, 45 MISS. L.J. 1085 (1974); Ved P. Nanda & William K. Ris, Jr., *The Public Trust Doctrine: A Viable Approach to International Environmental Protection*, 5 ECOLOGY L.Q. 291 (1976); Carol Annette Petsonk, *The Role of the United Nations Environment Programme (UNEP) in the Development of International Environmental Law*, 5 AM. U. J. INT'L L. & POL'Y 351 (1990); Philippe J. Sands, *The Environment, Community and International Law*, 30 HARV. INT'L L.J. 393 (1989); Louis B. Sohn, *The Stockholm Declaration on the Human Environment*, 14 HARV. INT'L L.J. 423 (1973); David S. Zalob, *Approaches to Enforcement of Environmental Law: An International Perspective*, 3 HASTINGS INT'L & COMP. L. REV. 299 (1980).

[5] *See infra* notes 8-101 and accompanying text.

responsible private environmental stewardship of transboundary toxic substances pollution risk.[6] Finally, I conclude with a suggested set of principles for a theory of international incentive-based environmental experimentation that has the potential for reducing transboundary toxic substances risk.[7]

2. TOXIC SUBSTANCES AND THE TRANSSECTORAL ENVIRONMENTAL PROBLEMATIQUE

2.1. Factual Contours

2.1.1. The Nature of Toxic Substances

A toxic substance may be defined as any material, chemical, or chemical mixture, whether useful or intended to be discarded, which may present an unreasonable risk of injury to health or the environment. Potential injuries posed by such substances range from death, at one extreme, to disease and birth defects at the other. "Toxicity," then, is a biological measure of harmfulness.[8] The key related parameters include: the dose of the substance in question;[9] the exposure route of the substances; the response

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[6] *See infra* notes 102-217 and accompanying text.

[7] *See infra* notes 218-39 and accompanying text.

[8] The meaning of "toxic substances" is ambiguous. For example, one recent publication, OLGA L. MOYA & ANDREW L. FONO, FEDERAL ENVIRONMENTAL LAW: THE USER'S GUIDE 375 (1997) [hereinafter USER'S GUIDE] includes seven substantive toxic-related definitions, including toxic pollutants, toxic substances, and toxic waste, among others. "Toxicity," is thus related to "hazardousness." As apparent in the following definition of "hazardous substance," derived from the Resource Conservation and Recovery Act ("RCRA"), as amended, 42 U.S.C. §§ 6901-6992k (1996) (*see generally* 40 C.F.R. § 261 (1996)), a toxic substance is one potential type of hazardous substance. A hazardous substance is "[a]ny material that poses a threat to human health and/or the environment. Typical hazardous substances are toxic, corrosive, ignitable, explosive, or chemically reactive." *Id.* at 364.

For other definitions of "toxic" or "toxicity," see, for example, TOXIC CHEMICALS, HEALTH AND THE ENVIRONMENT 1 (Lester B. Lave & Arthur C. Upton eds. 1987) [hereinafter TOXICS AND THE ENVIRONMENT] (discussing the danger due to the toxicity of different chemicals); Stanley M. Pier, et al., *Recognition and Evaluation of Hazards, in* TOXIC TORTS: LITIGATION OF HAZARDOUS SUBSTANCE CASES 2 (1984) [hereinafter *Recognition of Hazards*] (defining toxicity as a chemical's capacity to produce injury or harm).

[9] Sources define the term "dose" in various ways. *See, e.g.*, JOHN HARTE ET AL., TOXICS A TO Z: A GUIDE TO EVERYDAY POLLUTION HAZARDS 15 (1991) [hereinafter TOXICS A TO Z] ("A dose is usually expressed in one of three ways: 1) the amount of the substance actually in the body, 2) the amount

characteristics of a particular organism to a particular dosage;[10] and the overall risk presented by the substance.[11]

Toxic substances may be classified in at least five ways: (1) the relative toxicity of the substance;[12] (2) the origins of the substance;[13] (3) the form of the substance;[14] (4) the chemical struc-

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of the material entering the body (usually in food, drinking water, or the air you breathe) or 3) the concentration in the environment."); *Recognition of Hazards, supra* note 8, at 2 (explaining that a dose considers both the concentration or quantity of a chemical and the duration of exposure to it); TOXICS AND THE ENVIRONMENT, *supra* note 8, at 115 (defining a dose as the "amount of chemical deposited on or translocated to a site on or within the body where toxic effects take place").

[10] Sources vary in their definition of the term "response." *See, e.g.*, TOXICS A TO Z, *supra* note 9, at 16, 446 ("[T]he statement of the health damage (or response) resulting from a specified dose can be couched in many different forms because there are so many different dimensions to human health and its degradation"); *Recognition of Hazards, supra* note 8, at 9 ("[T]he *dose-effect* or *dose-response* relationship is an essential element in determining those exposures that would be considered safe and those which represent potentially hazardous conditions."); *see also* TOXICS AND THE ENVIRONMENT, *supra* note 8, 170-71, which states:

> The paradigms of toxicology are straightforward: (1) Each individual chemical or physical agent has a toxicity syndrome associated with exposure to that agent. (2) The response to the agent follows a general dose-response relationship (response increasing with dose). And (3) the response in laboratory animals predicts the response in humans. The assumptions underlying the interpretation of the dose-response relationship are that a receptor or receptors have been occupied and that the occupation of these receptors results in a toxic response. . . . The greater the percentage of the receptors occupied, the greater the response, until a maximum level of response is achieved.

[11] A sample definition of "risk" is that "[r]isk [is] a complex evaluation of both the amount of potential damage and the probability of the damage actually occurring." TOXICS A TO Z, *supra* note 9, at 446; *see also* TOXICS AND THE ENVIRONMENT, *supra* note 8, at 24 (discussing the concept of risk).

[12] In this regard, most scientists contend that a 50 percent lethal dose (LD 50), or the dosage that will cause death of 50 percent of the sample of tested animals, is "the most useful way to estimate toxicity." *Poisons and Poisoning*, 25 ENCY. BRIT. 895, 895 (1990).

Use of lethal dosage, however, is not feasible with regard to direct measurement of toxic impacts on human beings. In this regard, one commonly used toxicity rating system demarcates toxicity classes on the basis of commonly-encountered criteria such as "taste," "a mouthful," or "an ounce." "Substances so poisonous that a taste (less than seven drops) probably would kill a man are rated 6, 'supertoxic'. At the other end of the scale are found substances in class 1, 'practically nontoxic', with probably lethal doses of a quart or more." *Id.* at 896.

[13] Regarding origins of toxic substances, "*(a)* toxins of plant and animal origin are of special interest to veterinary toxicologists, medicinal herbalists,

ture of the substance;[15] and (5) the potential health risks associated with the substance.[16]

2.1.2. Shifting Concern from Conventional Pollutants to Toxic Pollutants

Modern national environmental policies had their genesis in basic pollution control laws passed by various developed countries during the 1960s and 1970s. Engendered by both political and intellectual ferment, particularly in the United States,[17] modern

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chemists, metabolic biochemists, and nutritionists; *(b)* industrial chemicals and minerals are of concern to occupational physicians and industrial hygienists; and *(c)* drugs are the focus of pharmacologists and clinical toxicologists." *Id.*

[14] A form-based toxicological approach differentiates between the following substances: "*(a)* radiation: radioactive nuclides (*e.g.*, radioactive iodine); *(b)* gases: carbon monoxide, hydrogen sulfide, war gases; *(c)* liquids: solvents; *(d)* solids: asbestos, metals." *Id.*

[15] Different chemical structures, or variations in chemical nature, of poisons include the following: "*(a)* acids: oxalic; *(b)* alkalies: lye, ammonia; *(c)* alcohols: ethyl, methyl; *(d)* amines: aniline; *(e)* heavy metals: mercury, lead, cadmium; *(f)* hydrocarbons: kerosene, benzene; *(g)* chlorinated hydrocarbons: dichlorodiphenyl-trichloroethane (DDT), dieldrin, carbon tetrachloride, polychlorinated biphenyls; *(h)* organic phosphates: parathion, malathion, and others." *Id.*

[16] *See* "Dear Colleague" letter of U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry (1992). The ATSDR announced the development of "a list of seven priority health conditions (PHCs)" to provide guidance in pursuing the Agency's mission. The seven PHCs identified by the Agency included the following (in alphabetical order):

Birth defects and reproductive disorders
Cancers (selected anatomic sites)
Immune function disorders
Kidney dysfunction
Liver dysfunction
Lung and respiratory diseases
Neurotoxic disorders

Id. However, carcinogenicity, the potential of a substance to cause any number of human carcinomas, has typically been the chief concern of most people. For a fascinating study dealing with cancer, toxic substances and regulatory policy, see CARL E. CRANOR, REGULATING TOXIC SUBSTANCES: A PHILOSOPHY OF SCIENCE AND THE LAW (1993) (providing chilling statistics about the cancer risk in America and the cancer risk from toxic chemicals in particular).

[17] *See generally* Robert F. Blomquist, *"Clean New World": Toward an Intellectual History of American Environmental Law, 1961-1990*, 25 VAL. U. L. REV. 1 (1990); Robert F. Blomquist, *"To Stir Up Public Interest: Chairman Edmund S. Muskie and the United States Senate Special Subcommittee's Water Pollution Investigations and Legislative Activities, 1963-66: A Case Study in Early*

environmental law and policy initially focused on typical or *conventional pollutants* on a sector (or media) by sector basis. This focus typically led to specific national environmental laws dealing with air pollution in one statute, water pollution in another statute, and solid and other conventional waste addressed in another statute.[18] Each statute was accompanied by a set of implementing regulations. The term conventional pollutants generally refers to substances that are being released in large volumes, highly visible, and relatively easy to link to particular health and environmental effects.[19] Typical conventional air pollutants include sulfur dioxide and nitrogen oxides; common conventional water pollutants include dissolved solids, oil, and grease.[20]

Commencing in the late 1970s and early 1980s, however, leading environmental policymakers changed their focus from conventional pollutants to a second class: *toxic pollutants*. These

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Congressional Environmental Policy Development, 22 COLUM. J. ENVTL. L. 1 (1997).

[18] *See, e.g.*, WILLIAM H. RODGERS, JR., ENVIRONMENTAL LAW (2d ed. 1994) (detailing the approaches taken in the United States); *see also* SIMON BALL & STUART BELL, ENVIRONMENTAL LAW: THE LAW AND POLICY RELATING TO THE PROTECTION OF THE ENVIRONMENT (2d ed. 1994) (noting the approach taken in the United Kingdom); Wang Xi & Robert F. Blomquist, *The Developing Environmental Law and Policy of the People's Republic of China: An Introduction and Appraisal*, 5 GEO. INT'L. ENVTL. L. REV. 25 (1992) (discussing the approach taken in the People's Republic of China).

[19] *See* Robert Gottleib & Maureen Smith, *The Pollution Control System: Themes and Framework, in* REDUCING TOXICS: A NEW APPROACH TO POLICY AND INDUSTRIAL DECISIONMAKING 19 (Robert Gottleib, ed. 1995) [hereinafter REDUCING TOXICS]. As a shorthand, one can distinguish this class of pollutants by the fact that they create "more 'obvious' (in the sense of acute or short-term) problems, although they might also be associated with more complex, subtle, and long-term effects. The conventional pollutants, and in many cases their primary source categories, are comparatively few in number." *Id.*

[20] Conventional pollutants are usually "[s]tatutorily listed pollutants understood well by scientists. These may be in the form of organic waste, sediment, acid, bacteria, viruses, nutrients, oil and grease, or heat." USER'S GUIDE, *supra* note 8, at 359. Technically speaking, however, it is customary in American environmental law to view "conventional pollutants" as a specialized way of referring to common water pollutants. Common American air pollutants have customarily been referred to, in a technical sense, as "criteria pollutants" under the 1970 amendments to the Clean Air Act. "EPA has identified and set standards to protect human health and welfare for six [common air] pollutants: ozone, carbon monoxide, total suspended particulates, sulfur dioxide, lead and nitrogen oxide." *Id.*

pollutants are

> typified by carcinogens that are invisible and otherwise more difficult to detect, and which may affect health and cause environmental damage at trace concentrations or very low exposure levels, although the degree of uncertainty tends to be very high. While they may be associated with short-term hazards, they are at least of equal concern due to their persistence in the environment, and/or their ability to cause serious disease after long latency periods.[21]

Three important systemic characteristics of industrial use of toxic chemicals exist. First, the risks posed by toxic substances occur at varying and disparate points of the life cycle of its use.[22] Second, "distribution of exposure to risk varies markedly across heterogeneous products and uses."[23] Third, in a general sense, a considerable number of substitute products and processes to any particular toxic substance exit.[24]

2.2. The Current International Legal Approach to Toxic Substances Risk

Current international environmental law often utilizes cross-

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[21] REDUCING TOXICS, *supra* note 19, at 19. There are thousands of potentially toxic chemicals. Some chemicals have been more thoroughly studied than others. *See* JOHN D. GRAHAM ET AL., IN SEARCH OF SAFETY: CHEMICALS AND CANCER RISK 5 (1988) (discussing a specialized study of American regulatory policy concerning formaldehyde and benzene, two toxic pollutants).

[22] *See* MOLLY K. MACAULEY ET AL., USING ECONOMIC INCENTIVES TO REGULATE TOXIC SUBSTANCES [hereinafter ECONOMIC INCENTIVES] 6 (1992) ("The potential for risks to health and the environment may occur at the mine mouth or during production of the feedstock, during production of intermediate products that use the chemical as an input, during use by industry or households, and upon disposal."); *see also* CELIA CAMPBELL-MOHN ET AL., ENVIRONMENTAL LAW: FROM RESOURCES TO RECOVERY (1993) (explaining the laws governing an activity from the time resources are extracted, through their manufacture, to the ultimate disposal of the wastes).

[23] ECONOMIC INCENTIVES, *supra* note 22, at 7. "It is not always the case that *all* products or uses of chemicals pose potential risks; nor is the nature of the risk always the same . . . ." *Id.*

[24] *See id.* "Regulating a substance (or one of the products in which it appears or uses to which it is put) is likely to include substitution of another product or process." *Id.*

cutting regulatory techniques and strategies such as "licensing, lists, and standard-setting."[25] As it has developed during this century, the law has tended to organize, regulate, and differentiate between five discrete sector-based approaches to environmental policy: air, soil, wildlife, oceans, and inland waters.[26] Within the last twenty-five years, however, roughly coinciding with the 1972 United Nations Conference on the Human Environment ("UNCHE"),[27] what may be termed the *transsectoral environmen-*

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[25] INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 155. Initially, "[l]icensing regimes act to prohibit certain activities unless a permit has been accorded by the proper authorities. Permits [as exemplified by the London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matters, 26 U.S.T. 2403, Dec. 29, 1972] can be general, concerning an entire type of activity, or specific, required in precise cases." *Id.*

Secondly, the "use of lists avoids too much technical detail being included in the basic norms [of international agreements] and also permits modification of the listed substances without going through the often cumbersome amendment process." *Id.* at 157.

The third generic technique of international environmental legal protection is standard-setting. This technique can be subdivided into four categories of standard-setting: (1) quality standards (which fix the maximum permissible level of ambient pollution); (2) emission standards (which seek "to specify the quantity of pollutants, or their concentration in discharges, which can be emitted by a given source"); (3) process standards (specifying in considerable detail the way various production processes must take place); and (4) product standards (which "fix the physical or chemical composition of items such as pharmaceuticals or detergents, or the handling, presentation and packaging of products, particularly those which are toxic, or the levels of pollutants which the product can emit during its use, such as automobile emission standards"). *Id.* at 158-59.

[26] *See generally id.* at 155-305 (discussing frameworks, basic concepts, historical evolution, specific sector-based norms, case studies, and illustrations of international environmental sectoral approaches); WESLEY MARX, THE OCEANS: OUR LAST RESOURCE (1981) (examining the history of thoughtless abuse to which we have subjected the world's oceans; describing how many of the effects of human past mistakes are only now coming to light; and exploring a broad spectrum of alternatives for safeguarding the oceans).

[27] *See* Patricia Birnie, *The UN and the Environment*, *in* UNITED NATIONS, DIVIDED WORLD 327, 337-66 (Adam Roberts & Benedict Kingsbury eds., 2d ed. 1993) (discussing the UNCHE and its impact on the subsequent growth of international environmental law).

> Six subjects were placed on UNCHE's agenda [in 1972]: planning and management of human settlements for environmental quality; environmental aspects of natural resource management; identification and control of pollutants and nuisances of broad international significance; educational, informational, social, and cultural aspects of environmental issues; development and environment; international organizational implications of action proposals. The aim was to adopt

tal problematique has emerged as an intellectual construct for resolving a few particularly vexing environmental concerns.

Regulations "aimed at integrated solutions are becoming more common," and there is an aspiration towards "globalization or holistic treatment of the environment."[28] Indeed, transboundary toxic substances are a paradigmatic case study of the *transsectoral environmental problematique.* Since toxic substances can have an "impact throughout the environment or pass from one sector to another,"[29] they often make single-sector approaches ineffective.

The current dominant international legal approach to toxic substances risk, while weak and fragmented, is characterized by multiple command and control regulatory approaches that tend to overlap in certain respects and cluster around two transsectoral policy problems: (1) toxic products and (2) toxic wastes.[30]

2.2.1. Toxic Products

The international production and use of chemical products has markedly increased during the past fifty years. Between 70,000 and 100,000 different varieties of chemical products are currently

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a Declaration on the Human Environment.

Id. at 339.

The Stockholm Declaration was the culmination of the 1972 UNCHE. "The Stockholm Declaration (a formalization used in the UN only when principles of special importance are being proclaimed) laid down twenty-six disparate principles, addressing developmental as well as environmental issues . . . ." *Id.* at 348; *see also* EVOLVING ENVIRONMENTAL PERCEPTIONS: FROM STOCKHOLM TO NAIROBI (Mostafa Kamal Tolba ed., 1988) (reproducing the text of the Stockholm Declaration of 1972 and the Nairobi Declaration of 1982, along with statements of various nations attending these international environmental conferences). Of particular interest with regard to toxic substances, Principle 6 of the Stockholm Declaration provides that: "The discharge of toxic substances or other substances . . . must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of all countries against pollution should be supported." *Id.* at 5.

[28] INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 307.

[29] *Id.*

[30] *See id.* In addition to these policy problems, international environmental law has evolved over the last decade to encompass other complex policy problems that defy isolated sectoral regulatory approaches. Examples include the problems of radioactivity, radioactive wastes, ozone depletion, and global warming. *See id.* at 328-45.

being sold in international commerce.[31] As noted by the drafters of *Agenda 21*, an aspirational "soft law" blueprint approved by the delegates to the June 1992 United Nations Conference on Environment and Development ("UNCED") in Rio de Janeiro, Brazil:[32]

> [a]mong the . . . chemical substances in commerce and the thousands of substances of natural origin with which human beings come into contact, many appear as pollutants and contaminants in food, commercial products and the various environmental media. Fortunately, exposure to most chemicals (some 1,500 cover over 95 per cent of total world production) is rather limited, as most are used in very small amounts.[33]

In a nutshell, the current international legal regime governing toxic products risk is characterized by three distinctive features: (1) few rules of broad and universal scope, (2) a discontinuous approach with several policy gaps, and (3) little treaty-made law, but rather existing rules established by disparate international

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[31] *See id.* at 308 (estimating between 70,000 to 80,000 chemical products in world commerce); *cf.* UNITED NATIONS, AGENDA 21: PROGRAMME OF ACTION FOR SUSTAINABLE DEVELOPMENT, [herinafter AGENDA 21] ¶ 19.11 *reprinted in* UNITED NATIONS, AGENDA 21: THE UNITED NATIONS PROGRAMME OF ACTION FROM RIO, U.N. Sales No. E.93.1.11 (1993) (estimating 100,000 chemical products in use).

[32] AGENDA 21 and THE RIO DECLARATION ON ENVIRONMENT AND DEVELOPMENT, UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT, U.N. Doc. A/CONF. 151/5/Rev. 1 (1992), *reprinted in* 31 I.L.M. 874, are major new examples of "soft law," based "on political agreement rather than on legally binding instruments." Maurice Strong, *Beyond Rio: Prospects and Portents*, 4 COLO. J. INT'L ENVTL. L. & POL. 21, 33 (1993). Unlike "hard law," which comes mainly from custom or treaties, "soft law" relies "on general statements of principle. Soft law instruments focus on building consensus on a particular issue, while leaving more binding commitments for subsequent agreements." *Id.* at 31, n.30; *see also* Geoffrey Palmer, *New Ways to Make International Environmental Law*, 86 AM. J. INT'L L. 259, 269 (1992). "Although not legally binding," "soft law" instruments "provide a basis for voluntary cooperation, which enables the action process to proceed expeditiously and paves the way for negotiation of binding agreements." Strong, *supra*, at 31-32.

[33] AGENDA 21, *supra* note 31, ¶ 19.11.

organizations.[34] At present, the only general regulatory international standards for toxic products consist of a set of recommendations adopted by the International Programme on Chemical Safety ("IPCS") in London in 1991 for "increased coordination among United Nations bodies and other international organizations involved in chemical risk assessment and management,"[35] and recommendations by the World Health Organization ("WHO") issued in 1986 and approved by the Governing Council of the United Nations Environmental Programme ("UNEP"). The WHO recommendation addresses the worldwide production of chemical substances and calls for more thorough and complete health assessments. The WHO also calls for more effective risk-based regulation of marketing and use of toxic products by means of international agreements and cooperation among states.[36]

Agenda 21, however, proposes a somewhat redundant and ambiguous internationally-coordinated six-part program[37] consisting of the following:

- "Expanding and accelerating international assessment of chemical risks;"[38]
- "Harmonization of classification and labelling of chemicals;"[39]

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[34] *See* INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 309.

[35] AGENDA 21, *supra* note 31, ¶ 19.75.

[36] *See* INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 309.

[37] *See* AGENDA 21, *supra* note 31, ¶ 19.4.

[38] *Id.* Specifically, the drafters of AGENDA 21 recommend that:

> Governments, through the cooperation of relevant international organizations and industry, where appropriate, should:
> (a) Strengthen and expand programmes on chemical risk assessment within the United Nations systems . . . ;
> (b) Promote mechanisms to increase collaboration among Governments, industry, academia and relevant non-governmental organisations involved in the various aspects of risk assessment of chemicals and related processes, in particular the promoting and coordinating of research activities to improve understanding of the mechanisms of action of toxic chemicals;
> (c) Encourage the development of procedures for the exchange by countries of their assessment reports on chemicals with other countries for use in national chemical assessment programmes [sic].

Id. ¶ 19.14.

[39] *Id.* ¶ 19.4. *Agenda 21* suggests that a joint public and private international harmonization project should commence.

- "Information exchange on toxic chemicals and chemical risks;"[40]
- "Establishment of risk reduction programmes [sic];"[41]

Governments, through the cooperation of relevant international organizations and industry, where appropriate, should launch a project with a view to establishing and elaborating a harmonized classification and compatible labelling system for chemicals in use in all United Nations official languages including adequate pictograms. Such a labelling system should not lead to the imposition of unjustified trade barriers. The new system should draw on current systems to the greatest extent possible; it should be developed in steps and should address the subject of compatibility with labels of various applications.

Id. ¶ 19.28.

[40] *Id.* ¶ 19.4. The drafters of *Agenda 21* recommend a more coordinated system of information exchange, suggesting that,

> [g]overnments and relevant international organizations with the cooperation of industry should:
> (a) Strengthen national institutions responsible for information exchange on toxic chemicals and promote the creation of national centres where these centres do not exist;
> (b) Strengthen international institutions and networks, such as IRPTC [the International Register of Potentially Toxic Chemicals], responsible for information exchange on toxic chemicals;
> (c) Establish technical cooperation with, and provide information to, other countries, especially those with shortages of technical expertise, including training in the interpretation of relevant technical data, such as Environmental Health Criteria Documents, Health and Safety Guides and International Chemical Safety Cards . . . ; monographs on the Evaluation of Carcinogenic Risks of Chemicals to Humans . . . ; and decision guidance documents . . . as well as those submitted by industry and other sources;
> (d) Implement the PIC [Prior Informed Consent] procedures [which were introduced in the 1989 UNEP Guidelines] as soon as possible and, in the light of experience gained, invite relevant international organizations such as UNEP, GATT, FAO, WHO and others, in their respective area of competence to consider working expeditiously towards the conclusion of legally binding instruments.

Id. ¶ 19.39.

[41] *Id.* ¶ 19.4. *Agenda 21* further recommends that:

> [g]overnments, through the cooperation of relevant international organizations and industry, where appropriate, should:
> (a) Consider adopting policies based on accepted producer liability principles, where appropriate, as well as precautionary, anticipatory and life-cycle approaches to chemical management, covering manufacturing, trade, transport, use and disposal;
> (b) Undertake concerted activities to reduce risks for toxic chemicals, taking into account the entire life cycle of the chemicals. These activities *could encompass both regulatory and non-regulatory measures*

- "Strengthening of national capabilities and capacities for management of chemicals;"[42]
- "Prevention of illegal international traffic in toxic and dangerous products."[43]

. . . ;
(c) Adopt policies and regulatory and *non-regulatory measures to identify, and minimize exposure to, toxic chemicals by replacing them with less toxic substitutes and ultimately phasing out the chemicals that pose unreasonable and otherwise unmanageable risk to human health and the environment and those that are toxic, persistent and bio-accumulative and whose use cannot be adequately controlled*;
(d) Increase efforts to identify national needs for standard setting and implementation in the context of the FAO/WHO Codex Alimentarius in order to minimize adverse effects of chemicals in food;
(e) Develop national policies and adopt the necessary regulatory framework for prevention of accidents, preparedness and response, *inter alia*, through land use planning, permit systems and reporting regulations on accidents . . . ;
(f) Promote establishment and strengthening, as appropriate, of national poison control centres [sic] to ensure prompt and adequate diagnosis of poisonings;
(g) Reduce overdependence on the use of agricultural chemicals through alternative farming practices, integrated pest management and other appropriate means;
(h) Require manufacturers, importers and others handling toxic chemicals to develop, with the cooperation of producers of such chemicals, where applicable, emergency response procedures and preparation of on-site and off-site emergency response plans;
(i) Identify, assess, reduce and minimize as far as feasible by environmentally sound disposal practices, risks from storage of outdated chemicals.

Id., ¶ 19.49 (emphasis added).

[42] *Id.* ¶ 19.4. *Agenda 21* also suggests that nations, in conjunction with the UN, should,

(a) Promote and support multidisciplinary approaches to chemical safety problems;
(b) Consider the need to establish and strengthen, where appropriate, a national coordinating mechanism to provide a liaison for all parties involved in chemical safety activities . . . ;
(c) Develop institutional mechanisms for the management of chemicals, including effective means of enforcement;
. . . .
(f) Develop, in cooperation with industry, emergency response procedures, identifying means and equipment in industries and plants necessary to reduce impacts of accidents.

Id., ¶ 19.59.

[43] *Id.*, ¶ 19.4. Specifically, the drafters of *Agenda 21* recommend, among other things, that:

Agenda 21's provisions for environmentally sound international management of toxic chemicals "involve variations upon classic problems of political philosophy and public policy."[44] Given the inherent scientifically uncertain and ethically ambiguous question of acceptable levels of risk for producing, transporting, and utilizing toxic products in international commerce, a variety of alternative philosophical frameworks are theoretically available for interpreting the aspirational objectives of Chapter 19 of *Agenda 21*. As perceptively noted in a recent essay about the ethical dimensions of *Agenda 21*'s toxic substances policy proposals, a variety of potential hermeneutic readings of Chapter 19 are possible.

> First, utilitarianism can focus on the consequences of policies and actions by maximizing aggregate utility of relevant populations. Second, parietal optimalization can be used to examine distributional changes that increase utility for some members of relevant populations without making anyone worse off. Third, notions of equality can be used to evaluate the premise that those who receive the benefits should bear the burdens. Notions of equality can also assist in analysis of the premise that burdens should be distributed in proportion to ability to bear them. Fourth, contractual obligations for allocating benefits and burdens can be studied. Fifth, Rawlsian theories of justice can be evaluated to help resolve problems of distribution of burdens. Such theories stem from the concept that each

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> [t]here is currently no global international agreement on traffic in toxic and dangerous products (toxic and dangerous products are those that are banned, severely restricted, withdrawn or not approved for use or sale by Government in order to protect public health and the environment). . . .
> Further strengthening of international and regional cooperation is needed to prevent illegal transboundary movement of toxic and dangerous products.

Id., ¶¶ 19.66-.67.

[44] John Lemons & Eleanor Saboski, *The Scientific and Ethical Implications of Agenda 21: Toxic Chemicals, in* ETHICS & AGENDA 21: MORAL IMPLICATIONS OF A GLOBAL CONSENSUS 69, 71 (Noel J. Brown & Pierre Quiblier eds., 1994) [hereinafter "ETHICS & AGENDA 21"].

> individual is to have equal rights to basic liberties compatible with similar liberties for others, and from the principle by which a policy is judged fair if it allocates equal benefits to affected parties. Sixth, principles of deep ecology can be evaluated for resolution of distributional burdens. Such principles hold that humans should not interfere with the structure, function, or beauty of ecosystems.[45]

On a regional level of global affairs, both the Organization for Economic Cooperation and Development ("OECD")[46] and the European Economic Community ("EEC")[47] have undertaken a variety of legal and administrative initiatives regarding various aspects of production, marketing, notification, and risk assessment of toxic products. For example, a series of OECD resolutions, passed during the 1970s and 1980s, established a coordinated method of assessing the ecotoxicities of various chemical compounds before they were placed on the market.[48] Similarly, numerous EEC directives over the last thirty years have estab-

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[45] *Id.* at 71-72.

> Problems of toxic chemicals are compounded because of the lack of consensus whether, or to what extent, present generations have obligations to those of the future. Philosophical viewpoints [inherently possible in Agenda 21's toxic chemical provisions] regarding obligations to the future include:
>
> (1) no moral obligations beyond the immediate future exist;
> (2) rights and interests of members of future generations are the same as those of contemporary generations;
> (3) moral obligations to the future exist, but the future is assigned less weight than the present.

Id. at 72.

[46] OECD is the organizational successor to the former Organization of European Economic Cooperation, formed in 1948 to oversee the Marshall Plan. *See* INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 77. The composition of the OECD has remained the same since 1960; it includes all Western European states, the United States, New Zealand, Australia, Canada, and Japan. *See id.* OECD conducts studies, makes resource inventories, and passes both binding and non-binding resolutions. *See id.* at 77-78.

[47] The 1957 Treaty of Rome established the European Economic Community. *See id.* at 79. The representatives of the nine EEC countries met in October of 1972 and "adopted a declaration proclaiming the necessity to improve the quality of life, paying particular attention to nonmaterial values and to protection of the environment." *Id.* at 79.

[48] *See id.* at 309-10.

lished comprehensive toxic product classification, packaging, and handling requirements.[49] During the same period, several OECD resolutions have developed notification and consultation procedures among member states regarding toxic products.[50] Since the promulgation of the "Seveso Directive in 1982,"[51] the EEC has required:

> member states to take measures necessary to ensure that all manufacturers engaged in listed activities have to prove . . . that they have identified the existing major accident hazards, adopted appropriate safety measures, and provided persons working on the site with sufficient information, training and equipment in order to ensure their safety.[52]

2.2.2. *Toxic Wastes*

International legal agreements entered into by nation-states since the early 1970s have tended to single-out toxic wastes for special legal treatment.[53] In general, modern international environmental legal agreements have followed pre-existing national legislation in defining wastes subject to international standards,[54]

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[49] *See id.* at 310-11.

[50] *See id.* at 311.

[51] The Seveso Directive, Council Directive 82/501/EEC, 1982 O.J. (L 230), is named after the Italian town in which Europe's worst industrial accident occurred. *See id.* at 312.

[52] *Id.* Interestingly, "[a]fter the Sandoz accident near Basel, the Swiss government decided to integrate the principles of the Seveso directive into its national legislation." *Id.*

[53] "For example, the 1978 Agreement on Great Lakes Water Quality, the 1976 Convention on the Protection of the Rhine Against Chemical Pollution, and the 1974 draft Convention of the Council of Europe all seek to eliminate toxic pollutants." *Id.* at 313. "The problem of toxic or dangerous wastes is extremely complicated, if only due to the difficulty of defining 'wastes.'" *Id.*

[54] *See id.* at 314. For example, "the OECD defined waste as 'any material considered as waste or legally defined as waste in the country where it is situated or through or to which it is conveyed.'" *Id.* (quoting OECD Recommendation C(83)180 (Feb. 1, 1984)). Interestingly:

> the annex to EEC Directive of March 20, 1978 enumerates 27 substances or materials which are given priority — whose presence in wastes in such quantities or in such concentrations as to constitute a risk to health or the environment confers on wastes the quality of "toxic" or "hazardous." This directive thus follows the same approach

as well as designating peculiarly troublesome waters as "toxic."[55] Two areas of international legal regulation of toxic wastes merit special concern: toxic waste management and transboundary movement of toxic wastes.[56]

With regard to waste management issues, UNEP has labelled the international transportation of toxic or dangerous wastes a priority subject.[57] UNEP empaneled a group of experts to deal with this issue, experts who eventually promulgated the Cairo Guidelines.[58] The Cairo Guidelines, in turn, led to the adoption of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal ("Basel Convention") in March of 1989.[59]

Regional waste policies are characterized by a waste-by-waste approach. For example, the OECD — while drafting a general policy encouraging nation-states within its jurisdiction to develop a "comprehensive waste management policy" regarding the "design, manufacture and use of products as well as the reclamation and disposal of wastes"[60] — focused regulation on specific types of toxic wastes and listed harmful chemicals.[61] Similarly, the EEC has concentrated its regulatory approach[62] on specific

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> as international conventions regulating the dumping of wastes into the sea, applicable rules for the protection of certain rivers such as the Rhine, and Community directives aimed at protecting the aquatic environment of the EEC.

Id. (citing Council Directive, Annex, 78/319, 1978 O.J. (L 84/43)).

[55] *See id.*

[56] *See id.*

[57] *See id.* UNEP adopted legal priorities including waste transportation at a 1981 conference in Montevideo. *See id.* at 315.

[58] *See id.* at 315. These directives received UNEP approval in 1987. *See id.*

[59] *See id.* at 315, 326-28 (discussing the legal machinations ultimately leading to the 1989 Basel Convention); *see also* UNITED NATIONS, ENVIRONMENT PROGRAMME, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Mar. 22, 1989, U.N. Doc. UNEP/IG.80/3 [herinafter Basel Convention] *reprinted in* 28 I.L.M. 657 (1989).

[60] INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 316.

[61] *See id.* at 317.

[62] *See id.* The EEC, however, also adopted a general directive in July 1975 which set forth a general approach for all wastes of member nation-states.

> These general principles, which have been developed since in UNEP decisions, oblige states to take measures to promote the prevention, recycling and processing of waste, encourage the reduction of quantities of certain wastes, and establish or designate competent

toxic wastes such as waste oils, polychlorinated terphenyls ("PCTs"), titanium dioxide industry wastes, and sewage sludge.[63] In addition, signatories of the Antarctic Treaty System are subject to a 1989 decision on waste disposal practices in the Antarctic region which focused on plans and procedures for dealing with specific potentially toxic wastes.[64]

With regard to the legal regulation of transboundary movement of toxic wastes, four points deserve elaboration. First, numerous treaties and other international agreements have been in force for many years.[65] These agreements consider both the quantity and danger of individual substances in seeking to regulate the transboundary shipment of toxic wastes.[66]

A second point concerning transboundary movement of toxic wastes is the existence of a customary norm established in the 1972 Stockholm Declaration and carried through to the 1992 Rio Declaration. This norm requires nation-states "to ensure that activities carried out within their jurisdiction . . . do not cause damage to the environment of other states" — as would a mishap during the transboundary movement of toxic wastes.[67] Indeed,

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authorities to plan, organize, authorize and supervise the operations of eliminating wastes.

Id. (citing Council Directive 75/442/EEC, arts. 7, 8, 1975 O.J. (L 194/39)).

[63] *See id.*

[64] *See id.* at 319 (citing *Antarctic Treaty System, Decisions of the XVth ATCP Meeting, reprinted in* 20 ENVTL. POL. & L. 51 (1990)). "Numerous products and substances are regulated: pesticides, PCBs, nonsterile soil and certain packaging cannot be sent to Antarctica. Existing abandoned fuel drums and fuel must be removed where practicable as well as radioactive materials, electrical batteries, and heavy metals or harmful persistent compounds." *Id.*

[65] Some examples of these agreements include: European Agreement Concerning the International Carriage of Dangerous Goods by Road, 1957; Regulation of the Carriage of Dangerous Substances on the Rhine, 1970; Convention for the Protection of the Natural Resources and Environment of the South Pacific Region, 1986; Annex III to the Agreement of Cooperation for the Protection and Amelioration of the Environment in the Frontier Region Between Mexico and the United States, 1986, and; the Ottawa Agreement of 1986 between Canada and the United States concerning transfrontier movement of dangerous wastes. *See id.* at 320-22.

[66] *See id.*

[67] *Id.* at 322 (citing Declaration of the UN Conference on the Human Environment, Principle 21, June 16, 1972). The Rio Declaration on Environment and Development, Principle 2, which was adopted by the 1992 UN Conference on the Environment and Development in Rio de Janeiro states that:

States have, in accordance with the Charter of the United Nations and

the 1989 Basel Convention[68] is the most prominent and important international agreement to reaffirm the rights of nation-states to refuse dangerous wastes produced in other nation-states.[69]

A third point about the legal regulation of the transboundary movement of toxic wastes is that there exists a customary rule of international environmental law holding that states are responsible

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> the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction.

Rio Declaration on Environment and Development, Principle 2, June 14, 1992 *reprinted in* UNITED NATIONS, AGENDA 21: THE UNITED NATIONS PROGRAMME OF ACTION FROM RIO, U.N. Sales No. E.93.1.11 (1993) .

[68] *See* Basel Convention, *supra* note 59.

[69] As delineated by one authority, some of the more important provisions of the Basel Convention are that:

> (1) A signatory state cannot send hazardous waste to another signatory state that bans imports of it.
> (2) A signatory state cannot ship hazardous waste to any country that has not signed the treaty.
> (3) Every country has the sovereign right to refuse to accept a shipment of hazardous wastes.
> (4) Before an exporting country can start a shipment on its way, it must have the importing country's consent in writing.
> (5) No signatory country may ship hazardous waste to another signatory state if the importing country does not have the facilities to dispose of the waste in an environmentally sound manner.
> (6) When an importing country proves unable to dispose of legally imported waste in an environmentally sound way, then the exporting state has a duty either to take it back or to find some other way of disposing of it in an environmentally sound manner.
> (7) The Convention declares that "illegal traffic in hazardous wastes is criminal."
> (8) Shipments of hazardous waste must be packaged, labelled, and transported in conformity with generally accepted and recognized international rules and standards.
> (9) Bilateral agreements may be made within and without the Convention, but the agreements must conform to the terms of the Basel Convention and be no less environmentally sound.
> (10) The Convention calls for international cooperation involving the training of technicians, the exchange of information and the transfer of technology.
> (11) The Convention sets up a secretariat to supervise and facilitate its implementation.
> (12) The Convention asks that less hazardous waste be generated and that it be disposed of as close to its source as possible.

INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 328.

for their own activities as well as the activities of those over whom they exercise control.[70] Accordingly, states can be held accountable for transboundary environmental damage which emanates from within their borders and subsequently causes environmental damage within the borders of other nation-states, even though such damages may be caused by a private party.[71]

Fourth, the drafters of *Agenda 21* in Rio in 1992 created an impressive body of "soft law." Chapter 20 of *Agenda 21* calls for greater international efforts regarding the following:

- "Promoting the prevention and minimization of hazardous waste;"[72]

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[70] *See id.* at 122-25; *see generally* 5 RECIEL No. 4 (1996) (discussing international environmental damage in symposium).

[71] *See id.*

[72] AGENDA 21, *supra* note 31, ¶¶ 20.9 to 20.19. *Agenda 21* provides that:

> The following activities should be undertaken:
> (a) Governments should establish or modify standards or purchasing specifications to avoid discrimination against recycled materials, provided that those materials are environmentally sound;
> (b) Governments, according to their possibilities and with the help of multilateral cooperation, should provide economic or regulatory incentives, where appropriate, to stimulate industrial innovation towards cleaner production methods, to encourage industry to invest in preventative and/or recycling technologies so as to ensure environmentally sound management of all hazardous wastes, including recyclable wastes, and to encourage waste minimization investments;
> (c) Governments should intensify research and development activities on cost-effective alternatives for processes and substances that currently result in the generation of hazardous wastes that pose particular problems for environmentally sound disposal or treatment, the possibility of ultimate phase-out of those substances that present an unreasonable or otherwise unmanageable risk and are toxic, persistent and bio-accumulative to be considered as soon as practicable. Emphasis should be given to alternatives that could be economically accessible to developing countries;
> (d) Governments, according to their capacities and available resources and with the cooperation of the United Nations and other relevant organizations and industries, as appropriate, should support the establishment of domestic facilities to handle hazardous wastes of domestic origin;
> (e) Governments of developed countries should promote the transfer of environmentally sound technologies and know-how on clean technologies and low-waste production to developing countries in conformity with Chapter 34, which will bring about changes to sustain innovation. Governments should cooperate with industry to develop guidelines and codes of conduct, where appropriate, leading to cleaner

- "Promoting and strengthening institutional capacities in hazardous waste management;"[73]

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production through sectoral trade industry associations;
(f) Governments should encourage industry to treat, recycle, reuse and dispose of wastes at the source of generation, or as close as possible thereto, whenever hazardous waste generation is unavoidable and when it is both economically and environmentally efficient for industry to do so;
(g) Governments should encourage technology assessments, for example through the use of technology assessment centres;
(h) Governments should promote cleaner production through the establishment of centres providing training and information on environmentally sound technologies;
(i) Industry should establish environmental management systems, including environmental auditing of its production or distribution sites, in order to identify where the installation of cleaner production methods is needed;
(j) A relevant and competent United Nations organization should take the lead, in cooperation with other organizations, to develop guidelines for estimating the costs and benefits of various approaches to the adoption of cleaner production and waste minimization and environmentally sound management of hazardous wastes, including rehabilitation of contaminated sites, taking into account, where appropriate, the report of the 1991 Nairobi meeting of government-designated experts on an international strategy and an action programme, including technical guidelines for the environmentally sound management of hazardous wastes; in particular in the context of the work of the Basel Convention, being developed under the UNEP secretariat;
(k) Governments should establish regulations that lay down the ultimate responsibility of industries for environmentally sound disposal of the hazardous wastes their activities generate.

Id. ¶ 20.13.

[73] *Id.* ¶¶ 20.20 to 20.31. *Agenda 21* provides that:

The following activities should be undertaken:
(a) Governments should establish and maintain inventories, including computerized inventories, of hazardous wastes and their treatment/disposal sites, as well as of contaminated sites that require rehabilitation, and assess exposure and risk to human health and the environment; they should also identify the measures required to clean up the disposal sites. Industry should make the necessary information available;
(b) Governments, industry and international organizations should collaborate in developing guidelines and easy-to-implement methods for the characterization and classification of hazardous wastes;
(c) Governments should carry out exposure and health assessments of populations residing near uncontrolled hazardous waste sites and initiate remedial measures;
(d) International organizations should develop improved health-based criteria, taking into account national decisionmaking processes, and assist in the preparation of practical technical guidelines for the

- "Promoting and strengthening international cooperation in the management of transboundary movements of hazardous wastes;"[74]

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prevention, minimization and safe handling and disposal of hazardous wastes;
(e) Governments of developing countries should encourage interdisciplinary and intersectoral groups, in cooperation with international organizations and agencies, to implement training and research activities related to evaluation, prevention and control of hazardous waste health risks. Such groups should serve as models to develop similar regional programmes;
(f) Governments, according to their capacities and available resources and with the cooperation of the United Nations and other relevant organizations as appropriate, should encourage as far as possible the establishment of combined treatment/disposal facilities for hazardous wastes in small- and medium-sized industries;
(g) Governments should promote identification and clean-up of sites of hazardous wastes in collaboration with industry and international organizations. Technologies, expertise and financing should be available for this purpose, as far as possible and when appropriate with the application of the "polluter pays" principle;
(h) Governments should ascertain that their military establishments conform to their nationally applicable environmental norms in the treatment and disposal of hazardous wastes.

Id. ¶ 20.22.

[74] *Id.* ¶¶ 20.32 to 20.38. *Agenda 21* provides that:

Governments, according to their capacities and available resources and with the cooperation of United Nations and other relevant organizations, as appropriate, should:
(a) Incorporate the notification procedure called for in the Basel Convention and relevant regional conventions, as well as in their annexes, into national legislation;
(b) Formulate, where appropriate, regional agreements such as the Bamako Convention regulating the transboundary movement of hazardous wastes;
(c) Help promote the compatibility and complementarity of such regional agreements with international conventions and protocols;
(d) Strengthen national and regional capacities and capabilities to monitor and control the transboundary movement of hazardous wastes;
(e) Promote the development of clear criteria and guidelines, within the framework of the Basel Convention and regional conventions, as appropriate, for environmentally and economically sound operation in resource recovery, recycling reclamation, direct use or alternative uses and for determination of acceptable recovery practices, including recovery levels where feasible and appropriate, with a view to preventing abuses and false presentation in the above operations;
(f) Consider setting up, at national and regional levels, as appropriate, systems for monitoring and surveillance of the transboundary movements of hazardous wastes;

- "Preventing illegal international traffic in hazardous wastes."[75]

Given the legal evolution of transboundary movement of toxic wastes from a customary "do no harm" principle, to various written agreements between nation-states, to the aspirational propositions of *Agenda 21*'s Chapter 20, it is useful to synthesize the overarching issues which link international toxic products policy[76] and international toxic wastes policy.[77]

Professor Eric Katz has identified four basic issues regarding potentially toxic industrial products and wastes. He observes the following key pragmatic problems with toxic substances, and obliquely refers to what is referred to earlier in this Article as the *transsectoral environmental problematique*:

> First, ascertaining the actual risks involved, by discovering the potential harmful affects [sic] of the waste and the relevant probabilities of negative outcomes. Second,

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(g) Develop guidelines for the assessment of environmentally sound treatment of hazardous wastes;
(h) Develop guidelines for the identification of hazardous wastes at the national level, taking into account existing internationally — and, where appropriate, regionally — agreed criteria and prepare a list of hazard profiles for the hazardous wastes listed in national legislation;
(i) Develop and use appropriate methods for testing, characterizing and classifying hazardous wastes and adopt or adapt safety standards and principles for managing hazardous wastes in an environmentally sound way.

Id. ¶ 20.34.

[75] *Id.* ¶¶ 20.39 to 20.46. *Agenda 21* provides that:

Governments, according to their capacities and available resources and with the cooperation of the United Nations and other relevant organizations, as appropriate, should:
(a) Adopt, where necessary, and implement legislation to prevent the illegal import and export of hazardous wastes;
(b) Develop appropriate national enforcement programmes to monitor compliance with such legislation, detect and deter violations through appropriate penalties and give special attention to those who are known to have conducted illegal traffic in hazardous wastes and to hazardous wastes that are particularly susceptible to illegal traffic.

Id. ¶ 20.42.

[76] *See supra* notes 31-51 and accompanying text.

[77] *See supra* notes 52-75 and accompanying text.

> adopting policies that will terminate (or greatly reduce) the immediate harms. Third, planning for the future, long-range reduction of the waste stream, so as to eliminate (or generally reduce) the source of the negative outcomes. A fourth basic issue arises because of the global nature of waste/pollution problems, and because of the multi-national character of *Agenda 21*: respecting issues of international equity or justice by developing differing criteria for nations at different levels of development.[78]

Moreover, Katz posits what he calls:

> three sets of potential ethical [and instrumentalist] conflicts, or problems, that are raised by a consideration of the values underlying the [toxic substances] policy recommendations of . . . *Agenda 21*:
> (1) Need to balance competing interests of governments, industry and private individuals;
> (2) *Need to balance economic incentives, education, and legislation* as the proper means for changes in attitude and lifestyle;
> (3) Need to balance human-centered policy goals with the direct preservation of the natural environment.[79]

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[78] Eric Katz, *Ethical Issues and Agenda 21: Waste and Pollution Policies* in ETHICS & AGENDA 21, *supra* note 44, at 91-92. Professor Katz sees philosophical linkages between four waste/pollution chapters of *Agenda 21*. As he observes:

> Chapter 19 focuses on toxic chemicals; Chapter 20 on hazardous waste; Chapter 21 on solid waste, including sewage; and Chapter 22 on radioactive waste. The different types of wastes require differing sets of technological responses — the treatment of sewage will be different than the treatment of radioactive waste; however, the ethical issues that arise in all four chapters are similar.

Id. at 91. This Article, however, will use Katz's schemata to focus only on toxic products and wastes.

[79] *Id.* at 94 (emphasis added).

2.3. *The Need for Incentive-Based Environmental Experimentation*

As discussed in Section 2.2., the current international paradigm for management of transboundary toxic substances risk, while motivated by good intentions, is fragmented, weak, and resembles an ad hoc assemblage of rules, standards, practices, exhortations, and precatory goals. An essential feature of the current international paradigm is an excessive reliance on command and control environmental regulations. These regulations, in turn, are largely promulgated, drafted, and enforced by national government officials in the public sectors of leading developed, Western-style nation-states, and contain isolated — and merely aspirational — attempts by international political authorities and public institutions to effectively promote and blend disparate national rules into an international approach. In this respect, it appears that the United States' traditional command and control environmental regulatory paradigm is the most prominent and widely-emulated public environmental regulatory system in the world today.[80]

As argued by Professor Richard B. Stewart, however, the predominant U.S. command and control model of environmental regulation that has developed over the past twenty-five years suffers from numerous policy failings.[81] First, Stewart points out

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[80] *Cf.* Richard B. Stewart, *United States Environmental Regulation: A Failing Paradigm*, 15 J.L. & COM. 585, 590-91 (1996) [hereinafter *A Failing Paradigm*] ("While other industrialized nations rely predominantly on command and control measures to achieve environmental regulation, the dysfunctions of the command system in those countries are far less than those in the United States. Western European nations and Japan are smaller and less internally diverse. In many instances, there is a tradition of cooperation between government and industry in these nations."). Stewart does not dispute the powerful influence of the U.S. environmental command and control paradigm. Indeed, he concedes that "[t]here is, however, a danger that centralized environmental regulation by the Commission of the European Communities *will replicate some of the problems* that now plague the United States." *Id.* at 591, n.23 (emphasis added) (citing Richard B. Stewart, *Antidotes for the "American Disease"*, 20 ECOLOGY L.Q. 85 (1993)).

[81] As Stewart poignantly writes:

> [t]he current paradigm of environmental regulation in the United States assumes that economic actors (including producers and consumers) in a capitalist market-based economy will not take measures to reduce pollution, wastes, and other forms of environmental degradation unless *coerced by government* to do so. Further, the

that U.S. command and control environmental regulation, supervised and enforced by the Environmental Protection Agency ("EPA"), is the functional equivalent of the various central planning systems of now-collapsed Eastern European nations. The Eastern European systems failed because of "the inability of central planners to gather and process the information needed to write directives appropriately responsive to the diverse and changing conditions of different economic actors."[82] Thus, U.S. "EPA regulation writers," and those public environmental regulatory officials around the world who are influenced by the U.S. example, "face grave difficulties in gathering information about the diverse circumstances of different facilities and devising requirements that are responsive to these different circumstances."[83]

A second related deficiency of the current U.S. environmental regulatory approach is its "creat[ion] [of] enormous economic waste by failing to equalize the marginal costs of control of the same pollutant across different sources."[84] According to Stewart:

> Uniform 'one size fits all' requirements are adopted for categories of industrial facilities, ignoring large variations in the costs of control among different facilities within the same category. In addition, the piecemeal and uncoordinated character of regulation writing results in large differences in the marginal costs of control among different categories of facilities. As a result, the costs of achieving a given overall level of pollution control under the centralized command system run up to twice as much, or more, as what they would be under market-based systems, such as pollution fees or tradeable pollution permits, that tend to equalize the marginal costs of control among

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> paradigm holds that the ethically appropriate and most effective way to exercise such coercion is through *command and control regulations* taht [sic] prescribe in detail *what market actors must or must not do in order to reduce discharges of pollution and waste.*

A Failing Paradigm, *supra* note 80, at 585 (emphasis added).

[82] *Id.* at 587.

[83] *Id.*

[84] *Id.* at 587-88.

different sources.[85]

Third, the prevailing American-style of environmental regulation, widely emulated by other nation-states and the international community, "wastes tens of billions of dollars annually. These wasted resources could be used for investment in higher levels of environmental quality or for meeting other societal needs."[86]

Professor Stewart argues that a fourth policy failing of this traditional environmental paradigm is the natural tendency for "[t]he clumsy dysfunctions of the command system . . . [to] become more acute as regulators [following this model] adopt ever more detailed requirements in a continual effort to reduce pollution and waste per unit of output, in order to maintain or improve environmental quality in the face of continued economic growth."[87] Unfortunately, "the incremental economic and administrative costs of further controls . . . dwarf the incremental environmental benefits."[88]

A fifth policy deficiency of direct, centralized public environmental regulation is "its inherent information-gathering and decision-making limitations . . . ."[89] As Stewart explains, "centralized [command and control] regulation produces a fragmented jumble of particularistic commands that cannot meet the needs for intelligent priority setting, and for integrated pollution and waste prevention and control on a multimedia, facility-by-facility or region-by-region basis."[90] A sixth problem is that "[c]entralized technology-based command and control regulation also has been strikingly ineffective in dealing with the behavior of small or diffuse pollution sources,"[91] such as small chemical plants and modest-sized toxic waste facilities.

A seventh shortcoming of the dominant American-style is the

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[85] *Id.* at 588 (citing Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333 (1985) (summarizing findings of economic studies)).

[86] *Id.*

[87] *Id.*

[88] *Id.*

[89] *Id.*

[90] *Id.*

[91] *Id.* at 588-89.

"[r]eliance on technology-based regulatory requirements result[ing] in overcontrol of some environmental problems, undercontrol of others, and failure to tailor measures in an integrated fashion responsive to the circumstances of particular ecosystems."[92] Eighth, in an analogous way, based on Stewart's analysis, "[t]he necessarily fragmented proliferation, under different statutory programs, of detailed requirements for control of discharges from specific waste streams into particular media prevents facility managers from adopting integrated approaches to reduce environmental risks at less cost."[93] Thus,

> [f]or example, a joint EPA-industry study of a major refinery found that aggregate environmental risks could be reduced, and compliance costs sharply reduced, through an integrated approach that would reduce the level of control of some waste streams while increasing the level of control of others. The EPA concluded, however, that the existing network of regulations applicable to the facility did not permit such flexibility.[94]

A ninth deficiency of the American-led environmental regulatory policy is that, "[w]hile command and control regulation can ensure adoption of existing technologies, it does not create appropriate incentives for the development of new technologies and production methods to further reduce pollution" of various kinds.[95] Tenth, command and control environmental regulations have a propensity to focus on specific practices at the expense of

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[92] *Id.* at 589.

[93] *Id.*

[94] *Id.*

[95] *Id.* According to Professor Stewart:

> In order to achieve the goal of maintaining or improving environmental quality, *while still maintaining economic growth*, enterprises must be given both the incentive and the flexibility to devise and adopt innovative, resource-efficient methods of production. . . . [C]ommand regulation may actually impede such innovation. The coercive logic of the command paradigm is thus at odds with the need to encourage enterprises to pursue competitive strategies and technological innovations based on resource efficiency, and to adopt integrated environmental risk management and control measures.

Id. (emphasis added).

the greater goal of pollution reduction. "[C]ommand regulation is an exercise in micromanagement that ignores the need for appropriate macro-level incentives and revisions in non-regulatory government measures and policies [such as government procurement policies mandating recycled goods for government purchase] that affect resource use, in order to shift the sectoral pattern of economic activity away from sectors that consume and degrade natural resources."[96]

An eleventh policy defect of the American environmental regulatory system, in Stewart's view, consists of "[f]ar-reaching environmental liabilit[y]"[97] features, like those imposed on a staggering number of "potentially responsible parties" by draconian hazardous waste cleanup laws like the Comprehensive Environmental Response, Compensation, and Liability Act ("CERCLA").[98] Combined with more traditional command and control laws, these cleanup laws impose extensive liability and "create enormous transaction costs because of the inherent complexities of determining appropriate [governmentally commanded and controlled cleanup] remedies and the large number of parties charged with liability."[99]

Finally, a twelfth policy defect of the prevailing American method of environmental regulation, according to Stewart, is that "[t]he dysfunctions of our command centered environmental regulatory system are exacerbated by the adversary culture . . . and the legal superimposition of formalized decision-making procedures, and searching judicial review over the central planning process."[100]

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[96] *Id.* at 589-90 (citing ECOLOGICAL ECONOMICS: THE SCIENCE AND MANAGEMENT OF SUSTAINABILITY (Robert Costanza ed., 1991)).

[97] *Id.* at 590.

[98] *See id.*

[99] *Id.* at 590 (referring to CERCLA, 42 U.S.C. §§ 9601-9675 (1994)). "The sweeping scope of liability also generates high risk-bearing costs and fails to provide appropriate caretaking incentives." *Id.*

[100] *Id.* Professor Stewart opines that "[b]y regulating vital decisions about environmental risk management through a remote, arcane, and piecemeal bureaucratic process, the command and control system necessarily runs a serious democracy deficit." *Id.*

Despite Professor Stewart's unrelenting attack on the prevailing command and control approach of American environmental law, *see supra* notes 80-100 and accompanying text, it should be acknowledged that during the last few years the EPA has initiated various programs to begin to modify the predominant command and control environmental law paradigm in the United States.

With regard to international transboundary risk from toxic substances, what is to be done to begin a strategic movement away from present disparate, nationally-dominant, public law, command and control regimes governing toxic substances, which are loosely linked with assorted international public law requirements and procedures? Could some bold, new, and imaginative private efforts to prevent and abate risks from transboundary movement of multi-media toxic substances help to ameliorate the *transsectoral environmental problematique* in this policy area? Could governmental institutions indirectly encourage responsible, public-regarding behavior by private parties in reducing transboundary toxic substances risk, thereby crafting a workable framework for international, incentive-based environmental experimentation? Alternatively, would it make any sense to advocate adoptinng a more direct and intrusive system of command and control environmental regulation of toxic substances be on a global scale?

As envisioned by Professor Stewart, "[a]doption of market-based incentives and flexible contract-based instruments for environmental protection" on an international basis would be an important and salutary strategy for improving international environmental law.[101] Stewart's reasoning and conclusion are persuasive. However, in designing such a system for indirect public encouragement of private management of transboundary toxic substances risk, what analogous concepts could we employ? Section 3, below, examines some models and metaphors along these lines.

3. ANALOGIES FOR ENCOURAGING PRIVATE ENVIRONMENTAL STEWARDSHIP OF TOXIC SUBSTANCES THROUGH PUBLICLY STRUCTURED INCENTIVES

The key to improving toxic substances management on the

See 1996 A.B.A. SEC. NAT. RESOURCES, ENERGY, AND ENVIRONMENTAL LAW, PROCEEDINGS OF FOURTH ANNUAL FALL MEETING [hereinafter FOURTH SONREEL PROCEEDINGS], Jonathan Z. Cannon, *Reinventing Environmental Protection—Talking Points*, Tab 2 (BEYOND COMPLIANCE: MAKING REGULATORY REFORM WORK FOR YOU). These reforms have thus far been unimportant. *See* Blomquist, *Government's Role Regarding Industrial Pollution Prevention in the United States*, *supra* note 2, at 438 (criticizing the "program of the month" political/public relations approach of the EPA in recent years in trying to show progress in going beyond the traditional command and control environmental paradigm).

[101] *A Failing Paradigm*, *supra* note 80, at 595.

international level emerges from two stark realities, one political and one economic: (1) "the weakness and fragmentation of international political authority and institutions"[102] at the end of the twentieth century, and (2) the "rapidly increasing global economic integration"[103] due to burgeoning international trade, more extensive travel, and major advances in communications and information technology.[104] Given these realities, a radical teleological[105] argument would tend to reject global international regional, subregional, and bilateral governmental organizations. Any international political authority or international public institution would be written off, pursuant to this view, as useless or irrelevant in attempting to fashion solutions to the emerging international environmental and economic issues of managing transboundary toxic substances risk.

I contend, however, that a moderate, or balanced, teleological approach of linking desired ends with pragmatic and efficient

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[102] *Id.*

[103] *Id.*

[104] *See, e.g.*, Jay G. Martin, *Strategic Realities in the 1990s for Multinational Oil Companies' Future Investment in Foreign Countries*, 1 FOURTH SONREEL PROCEEDINGS, *supra* note 100, Tab 1 (THE INTERNATIONALIZATION OF THE PETROLEUM BUSINESS: NEW COMPETITIVE FRONTIERS AND KEY FACTORS FOR SUCCESS). According to Martin, by way of illustration of increased globalization in this industry:

> • International oil companies and national oil companies will restructure themselves with increasing alliances and cross shareholdings to supply capital and share risks. Oil industry rationalization, asset swaps and downsizing will continue in the United States and other . . . producing areas.
>
> . . . .
>
> • Competitive advantage will rest with massive companies or small, strong companies with significant market share in targeted markets. Medium-sized companies with no significant market share or competitive advantage will be increasingly vulnerable to competition and market forces.
>
> • Environmental regulations and expectations will create substantial demands on capital. Environmental strategy will be a differentiator in corporate approaches, perhaps determining survival and success, particularly downstream.

Id.

[105] Teleology is a "philosophical doctrine that all of nature, or at least intentional agents, are goal-directed or functionally organized." THE CAMBRIDGE DICTIONARY OF PHILOSOPHY 791 (Robert Audi ed., 1995).

means[106] has the potential of yielding more interesting, fruitful, and useful insights regarding these vexing international public policy problems of transboundary toxic substances risk than the radical model mentioned above. My approach looks first at functional models of economic incentives, broadly interpreted to include such indirect public and quasi-public environmental policy tools as tradeable permits, challenge regulations, subsidies, liability, information disclosure, and technical assistance. These relatively non-prescriptive, private techniques, when properly deployed, can, similar to Adam Smith's "Invisible Hand,"[107] indirectly achieve public-regarding ends linked to international environmental stewardship of toxic substances. My balanced teleological approach also examines various institutional metaphors, compar-

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[106] I acknowledge a debt of gratitude to Judge Richard A. Posner for the inspiration for this approach. *See generally* RICHARD A. POSNER, OVERCOMING LAW (1995). Posner defines a "pragmatic approach" to the law as one,

> that is practical and instrumental rather than essentialist—interested in what works and what is useful rather than in what 'really' is. It is therefore *forward-looking*, valuing continuity with the past only so far as such continuity can help us cope with the problems of the present and of the future. . . .
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> . . . .
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> The pragmatist believes in progress without pretending to be able to define it, and believes that it can be effected by deliberate human action. These beliefs are connected with the instrumental character of pragmatism. It is a philosophy of action and of betterment . . . .

Id. at 4-5 (footnotes omitted).

[107] *See* ADAM SMITH, THE WEALTH OF NATIONS (1776) *reprinted in* 39 GREAT BOOKS OF THE WESTERN WORLD (Robert Maynard Hutchins ed., 1952):

> As every individual, therefore, endeavours as much as he can both to employ his capital in the support of domestic industry, and so to direct that industry that its produce may be of the greatest value; every individual necessarily labours to render the annual revenue of the society as great as he can. He generally, indeed, neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, *led by an invisible hand to promote an end which was no part of his intention.* Nor is it always the worse for the society that it was no part of it. By pursuing his own interest he frequently promotes that of the society more effectually than when he really intends to promote it.

Id. at 194 (emphasis added).

ing global intergovernmental organizations to global non-governmental organizations, international regional governmental organizations to international subregional ones, and bilateral organizations to federal political systems. In taking a metaphorical approach,[108] my purpose is to use whatever insights can be gained in pondering indirect and relatively non-intrusive methods that governmental and non-governmental organizations can utilize in order to encourage responsible private management approaches to public environmental problems.

3.1. Environmental Policy Tool Models

3.1.1. Tradeable Permits

The regulatory tool[109] of tradeable permits are "government-issued permits that allow the owner to emit a specific quantity of pollutants [or to use specific quantities of toxic substances] over a specified period, and which can be bought from and sold to others."[110] In the relatively isolated instances when this tool has been used, "[t]he government typically caps aggregate emissions [or substance-use quantities] from sources within a geographic region by issuing only the number of permits consistent with environmental goals" of stabilizing or reducing ambient pollution loads or risks of exposure to toxic substances.[111] "A relatively new approach to tradeable emissions is an 'open market,' in which unregulated sources [like publicly-spirited citizen groups] may opt into the program voluntarily."[112] In the United States, "[e]missions trading has been used most widely under the Clean Air Act and to a more limited degree to address water quality issues."[113]

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[108] *See* RICHARD A. LANHAM, A HANDLIST OF RHETORICAL TERMS 100-01 (2d ed. 1991) (defining a metaphor as "[c]hanging a word from its literal meaning to one not properly applicable but analogous to it; assertion of identity rather than . . . likeness").

[109] Throughout Section 3.1, I rely heavily on an excellent report, U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, ENVIRONMENTAL POLICY TOOLS: A USER'S GUIDE, OTA-ENV-634 (1995) [hereinafter ENVIRONMENTAL POLICY TOOLS] (envisioning existing governmental approaches to environmental policy as a "toolbox" full of different "tools" and explaining the differences between single-source and multisource tools).

[110] *Id.* at 10 tbl.1-1.

[111] *Id.*

[112] *Id.*

[113] *Id.*

Some economic theorists have suggested the plausibility of using a permit trading scheme to prevent or alter both the production and consumption of certain toxic substances. For example, these analysts have extolled the virtues of what they call a "permit-trading phasedown" of the use of cadmium in coatings, pigments, and stabilizers.[114] Discussing the proposal from the standpoint of a possible *domestic* policy option for American environmental regulators, they observe the following:

> As a practical matter, the cadmium market seems to be suited to such a permit-trading system. First, it may be administratively easier to target directly the quantity of cadmium rather than its price, particularly given the doubts as to whether a cadmium tax will reduce use. Second, the use of cadmium, other than for nickel-cadmium batteries, is already stable or declining. Quantity targets using permits might therefore be more easily agreed upon in a market with growing demand (that is, pressures to release the quantity cap may be less in a declining market). Finally, because of the small number of refiners and importers of refined cadmium, policing the purchases of cadmium metal may not be too difficult. Control may also be relatively easy for imports of intermediate products (such as pigments and stabilizers) that contain cadmium.
> . . .
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> The tradeable-permit scheme is best viewed in comparison to the likely ban or cutback on the uses of cadmium that might be expected under command-and-control regulation. In some applications, cadmium remains strongly preferred [on the marketplace] over possible substitutes. A general ban or proportional cutback in cadmium use would impose high costs on these uses, but a tradeable-permit scheme, like a tax mechanism, would allow market forces to allocate cadmium to these uses where it is of high value. In addition, the process of reallocation through taxes or trading avoids a burdensome

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[114] *See* ECONOMIC INCENTIVES, *supra* note 22, at 101. For a discussion of the worldwide production and use of cadmium, the market for cadmium, the properties of cadmium, and the uses of cadmium, see *id.* at 80-87.

> administrative process of determining exemptions from the ban, such as occurred under Sweden's program to restrict cadmium.[115]

The actual mechanics of a tradeable-permit program for reducing cadmium use,

> would begin by allocating annual permits to existing purchasers of refined cadmium and imported intermediate cadmium products. The initial permits would authorize the use of cadmium at levels somewhat below existing use. Each year, the amount of cadmium permitted would be reduced. These permits would be tradable [sic] among firms. The program would be terminated after some interval (perhaps 10 years), at which point cadmium use would be either eliminated or limited to a rate of use determined for each product type. The procedures could be essentially the same as those used in the successful phasedown of lead in gasoline.
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> During the phasedown, industries that could easily substitute away from cadmium use would do so, selling their permits to firms that found it more costly to reduce cadmium use. Overall use of cadmium would be cut back to the administratively determined level, with the reduction in use allocated among firms in a cost-efficient manner as a result of the trades.[116]

Another type of toxic substances tradeable permit scheme might also be used to provide incentives to private firms to reduce formaldehyde use and emissions.[117] With regard to a proposal for an American formaldehyde tradeable permit system,

> [a] permit trading scheme that allowed producers to bid for the right to manufacture formaldehyde could help ensure

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[115] *Id.* at 101.

[116] *Id.* at 101-02 (citation omitted).

[117] *See id.* at 65. For a discussion of formaldehyde's production, uses, health effects, and environmental effects, see *id.* at 53-56.

> that air- and water-quality standards were met, although the direct costs of permits are less predictable than tax rates. The quantity of permits made available, like tax rates, might also be regionally tailored to be more restrictive in air- or water-quality nonattainment regions. Permits could be issued and tradable [sic] within geographic regions surrounding the facilities producing formaldehyde, with the number of permits available set according to air- and water-quality standards relevant to the area. High costs of transporting formaldehyde would serve as a check on the movement of formaldehyde from low-permit-fee locations to high-permit-fee locales, provided the cost of a permit was less than the transportation costs . . . .[118]

A question remains as to what type of institution could practically issue and administer a toxic substances tradeable permit system.[119] Another basic problem with attempting to provide international economic incentives for reduction and control of toxic substances such as cadmium and formaldehyde is the variability of toxic exposures and ambient environmental qualities in different parts of the world. Given similarly-shared risks from toxic substances among various nation-states, (for example, common pollution problems along the U.S.-Mexico border, or the French-German border) some type of tradeable permit system might be useful and workable on a bilateral or regional basis.

At the global level, it may be theoretically worthwhile for policymakers to consider "tradeable greenhouse gas permits" (for the global problem of potentially excessive buildup of carbon dioxide and other greenhouse gases)[120] and tradeable chlorofluor-

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[118] *Id.* at 65 (citation omitted). It should be noted that tradeable emission incentives are not appropriate for all types of toxic substances. A prime example is the case of chlorinated solvents such as perchloroethylene ("PERC"), trichloroethylene ("TCE") and methylene chloride ("METH"), which are used in various industrial cleaning applications. *See infra* notes 130-31 and accompanying text. Tradeable emissions permits are economically inappropriate for chlorinated solvents because of the high number of industrial users, excessive monitoring and enforcement costs, and the potential for anomalous results that could lead to disincentives for proper disposal and illegal dumping. *See* ECONOMIC INCENTIVES, *supra* note 22, at 32-33 tbl.2-6.

[119] *See infra* note 126 and accompanying text.

[120] *A Failing Paradigm*, *supra* note 80, at 595.

ocarbon ("CFC") gas permits (to abate the breakdown of the protective stratospheric ozone shield from CFC gases emitted from locales around the world).

3.1.2. Pollution or Substance Charges

Pollution or substance charges (sometimes referred to as taxes) possess a variety of characteristics. First, they require "a regulated entity to pay a fixed dollar amount for each unit of pollution emitted or disposed" or each unit of a regulated substance used.[121] Second, these "charges do not set a limit on emissions or production,"[122] unlike tradeable emission programs which enforce an overall ceiling on various externalities. "Instead, the government must calculate what level of charge will change the behavior of regulated entities enough to achieve environmental objectives."[123] Thus, "[s]ources are free to choose whether to emit [or dispose of] pollution," or to use various chemical substances in the firms' varying production processes; however, in such cases they must pay the given charge or tax.[124] Alternatively, firms may voluntarily opt to "pay for the installation of controls to reduce emissions."[125] In either scenario, the theoretical objective is to reduce toxics and reduce environmental risk.[126]

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[121] ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 11 tbl.1-1.

[122] *Id.*

[123] *Id.*

[124] *Id.*

[125] *Id.*

[126] Pollution charges raise revenue that can be used to operate the [respective] program or to go to general revenues. Pollution charges [have been] used widely as a revenue-raising instrument, set at a level adequate to help fund regulatory programs but too low to significantly change behavior. . . .

Much of the economic literature focuses on the potential of pollution charges to send accurate signals to entities about the cost of using the environment's capacity to assimilate waste and to force entities to pay for the full societal costs of their pollution—'internalizing the externalities,' in economic jargon. However, setting a pollution charge at a level that accurately reflects full societal costs—neither higher [n]or lower—is probably impractical because of the enormous analytical and data requirements required.

In order to act as an incentive, pollution charges must vary according to the amount of pollution produced. Such variation can provide a direct incentive for sources to cut back on their emissions and waste. Flat rate structures provide little incentive to reduce pollution. For example, a uniform solid waste disposal fee per

The United States and several European countries have experimented with various types of pollution charges. These charges are used widely in the United States "for collection and disposal of commercial, industrial, and household waste,"[127] but are rarer in the United States for targeted water discharges[128] and air emissions.[129] "Pollution charges are used more frequently in Europe than in the United States;" these charges focus on air pollutants such as sulfur dioxide and nitrogen oxides, in addition to industrial and hazardous waste.[130]

An excise tax on the sale of toxic chlorinated solvents[131] is a type of pollution or substance charge that might be an appropriate policy intervention to abate the use of these substances and thereby encourage more responsible private management of

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household [or firm] that is unrelated to the amount generated does not provide an incentive to reduce waste.

Id. at 119.

[127] *Id.* at 121 (discussing volume-based verses flat fee charges paid for waste disposal in the United States).

[128] *Id.* (stating that publicly owned treatment works ("POTWs") in the United States charge fees for discharging into their systems and discussing a proposed bill in New York in 1992 that would have established a pollution charge program for water pollution).

[129] "Air emission charges most often are set at a level designed to recover administrative costs of state air quality programs, rather than to provide a significant incentive for sources to reduce their emissions." *Id.*

The Clean Air Act Amendments of 1990 provide American environmental regulators with a diverse menu of pollution charges in order to provide a significant incentive to reduce emissions. *See id.* at 121-22.

[130] *Id.* at 122.

> For example, Sweden has placed charges on NO_x [nitrogen oxide] emissions, in order to speed up compliance with new emission guidelines . . . imposed in 1995. Charges are levied on the actual emissions of heat and power producers with a capacity of over 10 MW and production exceeding 50 GWh. The fees are then rebated to the facilities subject to the charge, but on the basis of their energy production. Thus funds are redistributed between high- and low-emitting facilities. In 1992 the actual emissions reduction was between 30 and 40 percent, exceeding the predicted 20 to 25 percent reduction. Several OECD member countries are also levying a pollution charge on landfilled and incinerated wastes, as well as experimenting with pay-per-bag systems.

Id.

[131] For a discussion of four major categories of chlorinated solvents, their major uses, and the chief health and environmental impacts, see ECONOMIC INCENTIVES, *supra* note 22, at 18-21 tbls.2-2 to 2-3.

transboundary toxic substances risk. As explained in a recent book published by the prestigious Washington, D.C.-based Resources for the Future ("RFF"),

> [o]ne approach is to levy a virgin product tax on providers and importers of virgin chlorinated solvents. Ideally, the tax would be set at a level equal to the marginal environmental and health damages associated with solvent emissions. The size of the tax would vary by solvent to reflect the relative differences in damages associated with emissions of different solvents. Levying different tax rates on different solvents might lead consumers to substitute one solvent for another, but presumably this substitution would be away from a higher-taxed and thus more-damaging solvent toward the lesser-taxed and thus less-damaging one.
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> To the extent possible, the tax might also vary by solvent application to reflect the different marginal emission damages associated with different uses. This type of tailoring may be difficult, since a consumer could purchase a low-taxed solvent for a stated use and then actually use it in a riskier application. If the costs of policing such substitution in use are high, an identical tax schedule across the relevant set of applications may be desirable. The tax would not be levied on sales of recycled solvent, because the damages associated with releases of any recycled solvent would presumably be captured in the tax levied initially on the virgin solvent from which the recycled solvent is derived.[132]

In theory, pollution or substance charges may also be suitable, at strategic points of the substance life cycle, to create incentives for reducing risk from other types of toxic substances like formaldehyde. For example, while an American substance tax on

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[132] *Id.* at 31-34 (footnote omitted). "The incentive effects of this tax will depend on the application of the solvent and the potential for containing the resulting air emissions. The tax will increase the cost of solvent use in all applications and, thus, will encourage users to search for [alternative substances]." *Id.*

primary producers of formaldehyde at the front end of the substance life cycle would probably make economic sense,[133] an excise tax on consumers of final formaldehyde products would likely be ineffective.[134] By way of another case of toxic substance use, an input tax on manufacturers of cadmium coatings, pigments, and stabilizers would be a potentially effective incentive to reduce cadmium use and disposal externalities. However, given that many inputs of cadmium at the manufacturing stage of various products may be inelastic, the effectiveness of a cadmium input tax is problematic.[135]

While it is conceptually conceivable to envision various internationally-structured pollution and product charges on toxic substances likely to cross national borders, a number of drawbacks exist to such a scheme. First, an epistemic problem exists. Economists have considerable difficulty understanding the

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[133] *See id.* at 61.

> An appealing incentive-based approach to limit formaldehyde emissions into air and water during production processes is a product tax that equals the marginal environmental and health damages associated with the emissions. Because the number of primary producers of formaldehyde [in the United States] is fairly small compared with the number of intermediate producers who use formaldehyde in their products, a tax levied on primary producers may be administratively easier than a tax levied on intermediate producers. The disadvantage of a tax levied on primary producers, however, is that it will be passed forward more heavily to applications for which there are few substitutes rather than to applications whose environmental and health effects are largest.

Id.

[134] *See id.* at 75-76.

> [A final formaldehyde products] tax, if sufficiently high in relation to demand elasticities for these products, could operate to better ensure that consumers reduce their use of the products. . . . [T]axes that increase the price of products can significantly influence behavior.
>
> There are several disadvantages to an excise tax on formaldehyde products, however. First, product off-gases and user sensitivity are likely to vary widely; thus a uniform tax falls disproportionately on all consumers and products and can generate a large excess burden. . . . [P]roduct-specific taxes varied to reflect off-gassing [variations among different formaldehyde products] would be administratively complicated (although less complicated than emission taxes or emission permits). Second, a tax does not encourage consumers to take mitigating actions such as opening a window or applying a varnish or veneer or other source barrier.

Id.

[135] *See id.* at 94 tbl.4-5.

domestic market dynamics of the production and consumption of toxic substances within a single country, let alone understanding the global market dynamics of production and demand curves for toxic substances. Second, and related to the first point, this lack of knowledge of the workings of the marketplace, and its likely iterations given toxic substance charges or taxes, would add to the complexity of setting a suitable charge. Third, equity issues exist in imposing similar charges on developed versus developing nations. Yet, without rough uniformity in charges, there would be a tendency for producers and consumers of toxic substances to engage in tax-avoidance behavior by structuring transactions to take place in the country or region with the lowest substance tax rate. Finally, given the general public unpopularity of taxes, major industrial players would likely fiercely resist international toxic substance or pollution charges.

3.1.3. Subsidies

The flip side of pollution or substance charges[136] is subsidies. Environmental "[s]ubsidies are policy instruments that provide various forms of financial assistance, which can act as an incentive for entities to change their behavior or help entities having difficulty complying with imposed standards."[137] Subsidy providers might consist of a government agency or agencies disbursing various grants, preferential tax treatments, or no-interest loans. Private parties can also be subsidy providers through such mandatory government programs as deposit-refund systems.[138]

Public environmental subsidies are not generally perceived as being appropriately distributed to private parties, however, since,

> [t]he use of subsidies historically has been affected by the 'polluter pays' principle, which says that entities should be responsible financially for cleaning up the pollution they cause. Subsidies run counter to this principle. As a result, many [environmental] public grant programs have subsidized public facilities' pollution control efforts, such as

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[136] *See supra* notes 121-35 and accompanying text.

[137] ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 133.

[138] *See id.* at 133-35.

> publicly owned wastewater treatment plants, but left private sources of pollution largely on their own. Justifications for this differential treatment tend to focus on the public nature of pollution from public sources, arguably appropriate candidates for the use of public funds. Also, public sources generally are not operating to make a profit, unlike private facilities which at least in theory could consider pollution control as part of the cost of doing business.[139]

In the United States, environmental subsidy programs have been employed extensively in a variety of contexts: these range from the Clean Water Act's publicly owned wastewater treatment works construction grant program to local American communities, to EPA's Pollution Prevention Incentives for States ("PPIS") grant program; from Design for Environment ("DFE") grants by EPA to universities to research alternative chemical manufacturing methods that would reduce the generation of harmful wastes while simultaneously increasing industrial productivity, to favorable tax breaks for firms investing in environmentally benign technologies or engaging in environmentally appropriate behavior.[140]

On a theoretical level, international subsidy schemes might be used to encourage better private management of certain toxic substances. A deposit-refund program for chlorinated solvent disposal, for example, would provide an incentive for proper disposal.[141] As explained in a recent study:

> To remove . . . [the] incentive [for illegal dumping of chlorinated solvents] and avoid the social costs of illegal disposal, a deposit-refund system might be imposed on all parties accepting spent solvent for recycling and disposal of residuals. Under this system, the solvent waste handler would be required to pay a deposit to the government for every pound of spent solvent accepted for recycling (or still bottoms accepted for disposal). This deposit would be

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[139] *Id.* at 133-34.

[140] *See id.* at 135-36.

[141] *See* ECONOMIC INCENTIVES, *supra* note 22, at 33 tbl.2-6.

> refundable in exchange for proof of recycling or proof of legal disposal at a licensed hazardous waste incinerator.[142]

A key advantage of subsidy schemes in encouraging responsible private management of toxic substances risk is their unusual administrative flexibility; the diverse micro-economic characteristics of different toxic substance producing industries can, theoretically, be efficiently addressed by a spectrum of individually-tailored subsidies. To illustrate this point, two additional toxic substance subsidy models are instructive and will be discussed below: (a) a modified deposit-refund system for nickel-cadmium batteries and (b) a customized deposit-refund or performance bond scheme targeted at producers of brominated flame retardants ("BFR"s).

A modified deposit-refund program, with the goal of encouraging private parties to recover cadmium from nickel-cadmium batteries, would promote the "least-cost means for collection of batteries."[143] A typical deposit-refund mechanism is targeted at the end-user and operates to increase the incentive of the consumer to return the product in an environmentally appropriate manner. The traditional approach, however,

> has two disadvantages in its application to nickel-cadmium batteries. Reliance on the consumer to return batteries to the retailer or manufacturer may not be the least-cost means for collecting batteries. Further, given . . . disposal problems . . . it seems appropriate that there should be some net tax to discourage overall use. If this is appropriate, then the deposit on batteries might be less than 100 percent fully refunded, even if 100 percent of the batteries were returned.[144]

An intriguing profit motive incentive for "collection enterpris-

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[142] *Id.* at 43 (discussing in a note to the text that "[t]he proposed deposit-refund system [for toxic wastes] is analogous to an environmental bond . . . .").

[143] *Id.* at 103. For a discussion of the major uses of cadmium, including its primary use in the rechargeable nickel-cadmium battery, as well as the benefits of this battery and possible substitutes for cadmium in these batteries, see *id.* at 84-85

[144] *Id.* at 104.

es" would differentiate a nickel-cadmium battery subsidy arrangement from a traditional deposit-refund subsidy. As ingeniously explained by authors writing in a recently-published RFF book,

> [t]he [nickel-cadmium battery modified] deposit-refund could work as follows. A product tax on cadmium used in the manufacture of batteries would serve as the deposit. Refunds from these tax revenues would be paid out *to collection enterprises, which might include any local government or private firm*, with payment based upon *the number of batteries collected and verification of their appropriate disposal. The collection enterprises would themselves decide how to best ensure the return of batteries. They might elect to compensate retail stores, or other local groups, or municipal waste collectors for their collection efforts.*[145]

The economic advantage of the aforementioned nickel-cadmium battery modified deposit-refund idea is that it combines the incentive-based strengths of the profit motive with the demand-shifting potency of a pollution tax for those battery consumers who choose, for one reason or another, not to return nickel-cadmium batteries. "For the consumer who chooses not to return batteries, the tax passed on in higher battery prices acts to reduce use and shift demand toward less toxic substitutes."[146]

BFRs consist of organic chemicals added to plastic and textiles

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[145] *Id.* (emphasis added).

The profit motive should drive the search for least-cost means of collection. For example, suppose an incinerator plant finds that it can mechanically remove batteries from the waste stream at a modest cost. A collection enterprise may find that buying batteries from these plants is less costly than trying to encourage customer returns. (The collection enterprise and the waste plant might be the same entity.) Curbside pickup programs may similarly be found to be effective means for collection and, if so, would be supported by the collection enterprises. A retail store or manufacturer choosing to participate in the battery collection program would transfer the batteries to the collection enterprises and be compensated at a negotiated rate. The store or manufacturer, in turn, might find it effective to encourage consumer returns by refunding money to customers who return batteries in the manner of the traditional deposit-refund system.

Id.

[146] *Id.* at 105.

in the course of manufacture in order to retard flammability. A unique public policy concern is raised by BFRs: while their use affords direct safety benefits to the purchasers of certain textile and plastics products, BFR production and disposal creates external costs upon non-consuming third parties. This is due to the environmental risks created at the production and disposal phases of the BFR life cycle.[147] Moreover, four troubling characteristics of the flame-retardant industry, under existing command and control regulatory strictures, complicate policy intervention options: (1) "a large and expanding number of BFR-related chemicals" allowing plastics and textile manufacturers to easily substitute another brominated hydrocarbon if one BFR is legally banned or restricted; (2) scant scientific knowledge of the chronic toxicities and environmental transport pathways of newer and infrequently used BFRs; (3) "a considerable range of toxicity within the group of BFRs;" and (4) high toxicities of functional BFR substitutes such as recently favored phosphorous-based compounds.[148]

In order to respond to the unique aspects of the BFR products market, a creative experimental approach advocates a "producer deposit-refund and performance-bond" strategy.[149] As explained by the authors of this modified subsidy strategy, in language worthy of extended quotation:

> For this case, in which new BFR products may play an important role, where there is considerable uncertainty as to product damages, and where these damages may occur well after the period of production, producer deposit-refund systems can be valuable tools. Such generalized deposit-refund systems can move the incentives for ensuring product safety from the regulator to the producer. Similarly, these systems can shift much of the burden of

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[147] *Id.* at 108 ("Therefore, fire safety codes and other safety measures promoting the use of BFRs must be balanced with regulation to protect health and the environment."). "Many brominated organic compounds can be used as flame retardants. . . . However, recent concerns over the potential long-term risks associated with these and other BFRs now in common use have triggered yet another search for substitutes." *Id.*

[148] *Id.* at 108-09.

[149] *Id.* at 120.

proof from the public to the producer in resolving uncertainty as to damages associated with new products. The systems may also be designed to avoid some of the difficulties that can be associated with assessing ex-post liability for long-term damages linked to persistent chemicals.

Under a producer deposit-refund scheme, manufacturers of BFRs and related flame retardants would be required to make deposits based on the anticipated environmental or health effects of their production. The deposits would be refunded at some future time, depending on the extent to which the producer acts to reduce damages or to demonstrate product safety.

The initial deposit rate would be based on estimates of the present value of marginal damages expected under unregulated production. The actual level for this deposit could be negotiated, with lower deposits called for when a firm provides convincing evidence of new product safety. Further deposits would be paid periodically, based on current production levels, with the rate for new deposits adjusted to reflect product-safety knowledge gained from continuing production and use, health studies, and evidence of the manufacturer's care in controlling emissions. The pool of deposits would be held in an interest-bearing account.

Deposits would be returned at periodic intervals and could be based on the meeting of clearly defined conditions as to the control of releases, results of health studies, and the decay rate of the product. In a simple approach, the refund would occur if certain negotiated conditions had been met over the time interval. *For example, a producer might be eligible for a full refund of the previous year's deposit if BFR levels measured in nearby soils and streams had been held below some agreed-upon level.* This approach makes the mechanism for refunds well defined, but the overall success of such an approach relies upon a good correlation between meeting the measured criteria and the desired reduction in third-party damages.

Under a more ambitious approach, the regulator might attempt to maintain a pool of deposits sufficient to cover fully future health and environmental damages. . . . The

deposit on hand would then cover the present value of the potential risk from both extant products and potential emissions as well as from current output. Refunds from past deposits would be paid back to the extent that the existing deposit pool exceeded the amount of anticipated damages. Evidence from health studies and product experience presented by the producer would provide the basis for gradual refinement in the estimates of anticipated product damages.

In some cases, firms might find themselves able to insure against the loss of deposits. For a premium, an insurance or bonding company could assume liability for the deposit and rights to the refunds. The producing firm could then post a performance bond with the government, guaranteeing insurance up to the amount of the required deposit . . . . Of course, *an insurance company would take on such a liability only if it was reasonably sure of the product's safety. The insurer would also then assume an interest in seeing that the manufacturer took all appropriate steps to limit emissions and ensure product safety.* The producer would find it advantageous to act to ensure product safety and emissions control, because these steps would reduce future insurance premiums.[150]

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[150] *Id.* at 120-21 (emphasis added) (citations and footnotes omitted).

The primary advantage of the producer deposit-refund or performance-bond system is that it gives incentives to the producer for ensuring product safety (not unlike product liability law, but in the case of deposit-refund or bonds, the liability link is perhaps more explicit ex ante). Both the return of current deposits and the level of deposits on future production are made to depend upon the producer's control over plant emissions and the demonstrated safety of product use and disposal. In addition, under these schemes, new products may be introduced at relatively low costs, especially when there is convincing evidence of safety. Since deposits are based on output levels, deposits are less of a hurdle to new-product entry than are high fixed costs of mandatory product testing. On the other hand, once there proves to be a potential for large sales, the producers themselves then have incentives to act to demonstrate and ensure product safety.

Under the producer deposit-refund system, uncertainty as to damages associated with new products is dealt with by the adaptive manner in which deposits or premiums are set and by the association of refunds with measurable performance. The risks associated with these uncertainties are largely shifted to the producers. Because of

While deposit-refund schemes are potentially attractive for a number of toxic substances, production and use of other toxic substances, such as formaldehyde, would not benefit from these approaches because of different market and industry variables as well as different production and consumption characteristics.[151]

Subsidies and analogues of subsidies present exciting possibilities for encouraging responsible private management of transboundary substances risk on the international level. Many subsidy techniques, like performance bonds, deposit-return laws, and insurance are already familiar to national and local governments and businesses. However, the more ambitious strategies discussed herein have little, if any, empirical track records. The challenge in deploying subsidies for the purpose of encouraging private solutions to transboundary toxic substances risk is to find ways to unleash the power of the profit motive to encourage private parties to accomplish the public goals of reducing the use of toxic substances which present significant international risks of harm.

3.1.4. Challenge Regulations

This policy tool is named after its central feature: the "government *challenges* a group of sources to take the lead in designing and implementing a program for meeting environmental

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limited information, difficulties in the estimation of damages would remain, however; thus, periodic administrative reviews would be necessary to resolve the required level of deposits. Particularly with long-lived products, it could be hard for firms to establish the absence of potential damages. A less ambitious program that links deposits and refunds to the meeting of very specific and measurable criteria would seem more practical than the alternative in which the deposits are intended to fully cover estimated damages.

And, finally, the link between the pool of deposits and the actual liability of damages is also of concern. . . . A key question, however, is whether the easy availability of a pool of deposits might encourage excessive liability judgments in the repair of environmental damages.

Id. at 121-22.

[151] *See id.* at 62-63 tbl.3-5. While not traditionally thought of as a subsidy, environmental citizen suit statutes, like those passed over the last 25 years in the United States, are alternative subsidy models. *See generally* Robert F. Blomquist, *Rethinking the Citizen as Prosecutor Model of Environmental Enforcement Under the Clean Water Act: Some Overlooked Problems of Outcome-Independent Values*, 22 GA. L. REV. 337 (1988) (collecting statutes, cases, and articles on American citizen suits).

goals."[152] Challenge regulation is characterized by four key features:

- government establishes clear, measurable targets, either risk-based or technology-based, with a timetable for implementation;
- the targets are defined for multiple sources, usually at the industry sector or geographic level, rather than for individual facilities;
- these sources are given the collective responsibility for designing and implementing a program for meeting the targets; and
- government specifies a credible alternative program or sanction, which will be imposed should progress toward targets be unsatisfactory.[153]

Challenge regulations are fundamentally different from government-imposed command and control regulation. Challenge regulations have the potential to entice and stimulate creative, innovative, and cost-effective experimentation by private industrial firms. This approach relies upon the private industry's perception that there are implicit economic, organizational, engineering, and psychological advantages to achieving environmental improve-

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[152] ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 113. For a discussion explaining challenge regulations and linking them to integrated permitting and liability, two other incentive-based tools not discussed in detail in this Article, see *id.* at 84-85 tbl.3-1.

Since challenge regulations theoretically need to be available as "hammer" provisions in the event that challenge targets are not met by particular firms, these coercive or punitive techniques also implicate traditional command and control regulatory tools. For a discussion of four specific types of comand and control tools available to governments in the event that internationally-based challenge regulations were not met, see *id.* at 84 tbl.3-1.

For a critique of command and control regulation, *see supra* notes 80 to 101. For a discussion of American common law and statutory pollution control techniques, see generally Blomquist, *The Beauty of Complexity*, *supra* note 2. For an interesting comparative law discussion of environmental statutory commands, see generally Symposium, *Statutory Interpretation and Environmental Law*, 5 N.Y.U. ENVTL. L.J. 292-689 (1996). For a discussion of international customary liability, see generally Franz X. Perrez, *The Relationship Between "Permanent Sovereignty" and the Obligation Not to Cause Transboundary Environmental Damage*, 26 ENVTL. L. 1187 (1996).

[153] ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 115.

ments in their operations through their own "bottom-up" flexible plans, rather than the heavy hand of "top-down" inflexible government micro-mandates. Thus, for the pollution sources, "a challenge regulation functions like a 'meta-performance standard' for which a targeted group of sources has the flexibility to choose whatever means — not only technological, but institutional as well — they believe would be best for meeting the target."[154]

Challenge regulations may be fruitfully combined with other incentive-based policy tools like information reporting[155] and technical assistance programs.[156] While "[c]hallenge regulation has not yet been extensively adopted by any country,"[157] various American, European, Canadian, and Japanese environmental programs, initiated in recent years, use methods similar to challenge regulations.[158] Indeed, both the United States EPA's 33/50 program (adopted during the Bush Administration) and the Common Sense Initiative (adopted during President Clinton's first term) have sought to encourage flexible industry approaches to pollution prevention and control with special emphasis on toxics.[159] Moreover, Germany's Green Dot program,[160] and

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[154] *Id.* at 115 (citing R.J. Lifset, *Take It Back: Extended Producer Responsibility as a Form of Incentive-Based Environmental Policy*, 21 J. RESOURCE MGMT. & TECH. Dec. 1993, 163-75).

> Although the sources may choose to adopt a familiar approach such as design standards, they may also come up with innovative or varied approaches, such as a trading program or a fee system to meet the established targets. If allocation of responsibility for reductions in emissions or discharges is required, the sources will have to determine how to make those allocations themselves. The industry may also decide to use the challenge to share information, technologies, or personnel to solve common problems.

Id.

[155] *See infra* notes 163-73 and accompanying text.

[156] *See infra* notes 174-79 and accompanying text.

[157] ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 115.

[158] *See id.* at 116.

[159] *See id.* at 115-16. For a comparison between the EPA's 33/50 program and their Common Sense Initiative and challenge regulations, see *id.* at 115-16; compare REDUCING TOXICS, *supra* note 19, at 79-83, which discusses some of the policy problems with the EPA's 33/50 Program.

[160] *See* ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 116 (discussing Germany's Green Dot Program).

the Netherlands' National Environmental Policy Plan[161] exemplify challenge regulation policy approaches to toxics and other residuals.

Using challenge regulations as an incentive-based technique of inducing private international management of transboundary toxic substances risk may present some difficult policy problems. First, since experience with this tool is limited, even at the domestic level of environmental law within nation-states, private industry might not necessarily be more adept than government at designing pollution prevention and control programs. Second, competition among firms within a particular industrial sector (for example, the pharmaceutical industry) may occasionally make it difficult to satisfy all of the firms which have responsibilities to meet challenge targets. Third, the relevant government oversight agency would have to design an alternative coercive set of regulations or sanctions to be deployed should firms fail to meet relevant targets.[162] Finally, domestic antitrust laws of different nation-states may impose barriers to international coordination and cooperation among differently-owned firms within particular industrial sectors.

3.1.5. Information Reporting

Information reporting is an incentive-based environmental tool whereby the government "requires firms to provide specified types of information, either to a government agency or to the public directly. Required information typically involves activities affecting environmental quality, such as emissions, product characteristics, or ambient environmental data."[163]

Precedents for three categories of information reporting mandates exist. First, some domestic environmental laws require industries to report pollution emissions to the government for purposes of compliance and enforcement.[164] Second, reporting mandates "help both government and polluters better understand

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[161] *See id.* (discussing the Netherlands' National Environmental Policy Plan).

[162] *See id.* at 118.

[163] *Id.* at 127.

[164] *See id.* For a general description of the enforcement challenges of the U.S. EPA in recent years, see JOEL A. MINTZ, ENFORCEMENT AT THE EPA (1995).

and respond to problems."[165] These two categories of information reporting mandates provide modest incentives for private firms to properly monitor and manage their production residuals. The third category requires public dissemination of information concerning health risks or environmental threats "posed by a firm's products or activities,"[166] thereby providing a potent incentive for responsible private management of potentially harmful substances generated by the enterprise.

The theory behind mandated information reporting is that accurate disclosure and reporting of pollution externalities will create public relations opportunities for "clean" corporate environmental citizens, while generating public relations problems for "dirty" firms. While,

> changes in pollution practices are not made mandatory by these right-to-know laws, firms face a variety of motivations to reduce pollution. These include the desire to be good neighbors and responsible corporate citizens, as well as fear of adverse publicity or loss of sales. In addition, the public's heightened awareness of polluting activities due to information disclosure increases the possibility of regulatory agencies establishing stricter or more comprehensive regulatory requirements, another incentive for firms to pursue more proactive pollution reductions.[167]

"The appropriate form and extent of public information-based environmental mandates is a contested policy question."[168] Among the potential drawbacks of mandatory environmental

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[165] ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 127.

[166] *Id.*

[167] *Id.* at 127-29.

> For example, California's Air Toxics 'Hot Spots' Information and Assessment Act set up a toxics reporting program that required facilities to identify potential health risks posed by emissions. The 'Hot Spots' Act was amended five years after implementation. Instead of simply reporting risks, owners of 'significant risk' facilities are now required to reduce the risk posed by toxics below the state-determined level of significance.

Id. at 129.

[168] *Id.*

disclosure laws are possible misunderstandings by the public of the meaning and significance of raw environmental data; the increased burdens and costs on industry of gathering and interpreting information; confidentiality concerns about sensitive corporate information and trade secrets; and the questionable relevance of some mandated information on the effective accomplishment of specific environmental policies.[169]

On a degree-of-difficulty scale, the environmental policy tool of information reporting appears theoretically easier to implement on the international level than other incentive models previously discussed such as tradeable permits,[170] pollution or substance charges,[171] subsidies,[172] and challenge regulations.[173] While governments would be spared many of the ambiguities of setting appropriate artificial markets, or establishing a baseline charge, or tax, for pollutants, information mandates may still prove to be quite difficult to properly craft and implement on the international level. Implementation of an international incentive-based toxics information program to encourage private management of transboundary toxic substances risk would include the following: setting appropriate units of measurement of pollution loads; establishing common parameters for reporting; interpreting climatic and geophysical impacts on long-range transboundary transport of toxic pollutants from various emitting locations on the globe to various receptor locations; establishing the basis for expanding the chemical list of toxics to be reported; establishing the basis and number of regulated industries subject to mandatory reporting laws; and resolving the issue whether or not peak emissions data should also be required.

3.1.6. Technical Assistance

Technical assistance, "help [to] targeted entities [to] prevent or reduce pollution,"[174] is a common incentive-based environmental

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[169] *See id.* at 129-31; *see also* Robert F. Blomquist, *The Logic and Limits of Public Information Mandates Under Federal Hazardous Waste Law: A Policy Analysis*, 14 VT. L. REV. 559 (1990).

[170] *See supra* notes 109-20 and accompanying text.

[171] *See supra* notes 121-35 and accompanying text.

[172] *See supra* notes 136-51 and accompanying text.

[173] *See supra* notes 152-62 and accompanying text.

[174] ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 85 tbl.3-1.

policy tool that is often combined with other policy tools. "These programs educate sources that might not be fully aware of the environmental consequences of their actions or of techniques or equipment to reduce those consequences."[175] The incentive-based concept behind government technical assistance programs is that private firms, being equipped with better information, training, and insight, will make better choices in dealing with the environmental impacts of their operations.[176]

> Technical assistance may take many forms, including manuals and guidance, training programs and materials, information clearinghouses, facility evaluations, and technology R&D. The latter may be conducted in house or through grants or loans to regulated entities or universities. Many functions of [existing] environmental agencies can be called technical assistance. . . . Most technical assistance services are provided at no cost to the user. Yet sometimes technical assistance is offered in exchange for a prior agreement from the facility to implement any recommendations. For example, in the federal Green Lights program, EPA performs an onsite [sic] evaluation to identify ways in which a facility could reduce energy consumption, in exchange for a promise from the facility to install recommended equipment.[177]

The policy tool of environmental technical assistance on the international level, aiming to provide incentives for private firms to manage transboundary toxic substances risk more responsibly, seems promising. The existing international organizational structure of the United Nations and various regional, bilateral, and federal governmental organizations already provide a great deal of information and technical assistance on a variety of subjects.[178] Potential challenges, however, to conceiving and implementing an effective transboundary toxics technical assistance program or programs do exist. They include: whether the

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[175] *Id.*

[176] *See id.* at 137.

[177] *Id.* at 138-39.

[178] *See infra* notes 180-214 and accompanying text.

technical assistance programs can measurably reduce significant transboundary toxics flows; the potential of other incentive-based environmental policy tools to significantly enhance the effectiveness of technical assistance programs; whether environmental equity and justice values compel balanced international technical assistance programs to private industrial firms versus private indigenous citizen groups; whether international toxics reduction technical assistance programs have a point of reducing cost-effectiveness beyond which scarce international funds should not be allocated; and whether national and international governmental organizations have the institutional capacity to run and manage technical assistance programs or whether these functions should be privatized in non-governmental third parties.[179]

3.2. Institutional Metaphors

This Article now considers some available institutional metaphors for encouraging private environmental stewardship of toxic substances through incentives. Five broad types of existing institutions which might conceivably assist and coordinate private solutions to public transboundary risk are briefly reviewed before concluding with a theoretical synthesis.

3.2.1. Global Intergovernmental Organizations: The United Nations System

Ever since the 1972 Stockholm, United Nations Conference on the Human Environment,[180] the international community has recognized the importance of international organizations in playing a "dynamic role [in] the protection and improvement of the [global] environment."[181] Indeed, in Rio de Janeiro, twenty years after Stockholm, the delegates to the 1992 United Nations Conference on Environment and Development ("UNCED"), in Chapter 38 of *Agenda 21*, reaffirmed the crucial implementational role of "international institutional arrangements" in order "to promote sustainable and environmentally sound development in

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[179] *See* ENVIRONMENTAL POLICY TOOLS, *supra* note 109, at 140-42.

[180] *See supra* notes 27-28 and accompanying text.

[181] INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 55 (quoting Principle 25 of the Stockholm Declaration); *see generally supra* note 27 (discussing the Stockholm Declaration).

all countries."[182]

3.2.1.1. The United Nations Environmental System

It is logical to presume that any initiative to institutionally encourage more responsible private management of transboundary toxic substances risk through incentive-based environmental experimentation would rely, to some extent, upon the existing United Nations system.[183] Intergovernmental and inter-institutional arrangements to launch such a project would seemingly benefit by working within the framework of the United Nations system. The General Assembly would act as the supreme policy-making forum and could provide overall guidance to governments, United Nations organizations, relevant treaty bodies, and private organizations.

Within the United Nations environmental system proper, a number of key institutions provide possible "homes" for an international set of experiments to encourage private management of transboundary toxic substances risk: (a) the United Nations Environment Program ("UNEP"), (b) the Commission on Sustainable Development ("CSD"), (c) the United Nations Development Program ("UNDP"), and (d) the International Law Commission ("ILC"). For various reasons, however, these existing bureaucratic components of the United Nations system provide less than ideal institutional structures to launch and carry forward an incentive-based private toxic substances risk project.

The UNEP already has a full agenda of environmental projects. These include responsibility for "management of international conventions such as the Convention on International Trade in Endangered Wild Species (CITES) and the Bonn Convention on Migratory Species,"[184] as well as coordinating a far-flung constellation of regional bureaus in places such as New York, Geneva, Bahrain, Bangkok, and Mexico, and specialized units for dealing with specific issues (like the Bureau of Industry in Paris and a coordinating unit for the Caribbean in Kingston,

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[182] *See Agenda 21, supra* note 31, ¶ 38.1. *See also supra* notes 31-45 (discussing various additional provisions of *Agenda 21*).

[183] *Cf. Agenda 21, supra* note 31, ¶ 38.2 (discussing the restructuring and revitalization of the United Nations with regard to implementing *Agenda 21*).

[184] INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 59.

Jamaica).[185] Moreover, UNEP has arguably already overextended its institutional capacity, having "undertaken some thousand projects during its first fifteen years, most of which do not directly concern the development of environmental law."[186] Importantly, UNEP was unsuccessful in its "attempt to build on Principle 22 of the Stockholm Declaration, which calls for the development of international rules concerning the responsibility of states and indemnification of victims of transfrontier pollution."[187] Nevertheless, one should remember that UNEP has achieved some important successes. For example, its development of guidelines for the regulation of transport and disposal of toxic wastes led to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.[188]

The Commission on Sustainable Development, like the UNEP, suffers from a bloated agenda and a set of responsibilities which prevent it from leading a serious incentive-based approach to encouraging private responsibility for management of transboundary toxic substances risk.[189] Indeed, the CSD seems to be a largely bureaucratic conduit for issuing reports to the UN Economical and Social Council and to the General Assembly.[190] A promising feature of CSD's institutional structure, however, is its specific charge, contained in *Agenda 21*, to cooperate with nongovernmental organizations.[191]

The United Nations Development Program ("UNDP"), like the UNEP, is expected to play a crucial follow-up role to the Rio Conference, and to the promotion of the aspirational goals of *Agenda 21*. Since UNDP is expected, "[t]hrough its network of field offices [to] . . . foster the United Nations system's collective

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[185] *See id.*

[186] *Id.* at 60. "As a whole, the areas of UNEP action can be classified in six groups . . . : 1) human establishments; 2) human and environmental health; 3) terrestrial ecosystems; 4) oceans; 5) environment and development; and 6) natural disasters." *Id.*

[187] *Id.* at 62.

[188] *See id.* at 63, 326-28. The drafters of *Agenda 21* also expect UNEP to take a proactive and vigorous role in following up the Rio Earth Summit. *See generally Agenda 21*, *supra* note 31, ¶ 38.21.

[189] *See Agenda 21*, *supra* note 31, ¶ 38.13 (discussing the functions of the Commission on Sustainable Development).

[190] *See id.* ¶ 38.13(g).

[191] *See id.* ¶ 38.14.

thrust in support of the implementation of *Agenda 21*, at the country, regional, interregional and global levels, drawing on the expertise of the specialized agencies and other United Nations organizations and bodies involved in operational activities,"[192] it may be a better structural metaphor for implementing an international private toxic risk management project than either the UNEP or CSD. However, because the language of *Agenda 21* implies that an unrealistic level of additional international financial support and organizational restructuring is advisable for the organization,[193] the UNDP is probably not an apt prototype for an international incentive-based private toxics management project.

Finally, the structure and approach of the International Law Commission ("ILC"), a thirty-four member group of international legal and policy experts established by the United Nations General Assembly "to work for the codification and progressive development of international law,"[194] is probably too cautious, conservative, and lawyer-dominated to provide an appropriate analogue for an international institution which would seek to provide private incentives for better managing risks from transboundary flows of toxics.[195]

3.2.1.2. Miscellaneous Ad Hoc International Agencies in the United Nations System

Various organizations within the United Nations' system deal, from time to time, with environmental issues.[196] Certain structural and operational features of these ad hoc international

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[192] *Id.* ¶ 38.24.

[193] *See id.*

[194] INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 63.

[195] Entering the 1990s, the majority of subjects on the agenda of the ILC directly involve the development and codification of international environmental law: state responsibility, the draft code of crimes against the peace and security of mankind, non—navigable uses of international water—courses, and international liability for injurious consequences arising out of acts not prohibited by international law.

Id.

[196] *See generally id.* at 64-70 (discussing how the United Nations Education, Science and Culture Organization ("UNESCO"), Food and Agriculture Organization ("FAO"), World Health Organization ("WHO"), World Meteorological Organization ("WMO"), and the World Bank all have dealt with environmental issues at various times).

agencies provide inspiration for designing an appropriate international vehicle to implement an incentive-based approach to better private management of transboundary toxic risk. Of particular relevance is the World Health Organization's ("WHO"'s) Prevention of Environmental Pollution Unit activities,[197] the global pollution monitoring activities of the World Meteorological Organization ("WMO"),[198] and the special regional environmental lending policy initiatives of the World Bank.[199]

3.2.2. Global Non-Governmental Organizations

During the last two decades, global non-governmental organizations ("NGOs") have assumed a prominent role in the advancement of responsible and far-sighted international environmental laws and policies. Indicative of this special status is the fact that the Rio Convention's *Agenda 21* text devotes an entire segment, Chapter 27, to the topic entitled "Strengthening the Role of Non-Governmental Organizations: Partners for Sustainable Development."[200] As expressed, in relevant part, in Chapter 27 of *Agenda 21*:

> 27.1 Non-governmental organizations play a vital role in the shaping and implementation of participatory democracy. Their credibility lies in the responsible and constructive role they play in society. Formal and informal organizations, as well as grass-roots movements, should be recognized as partners in the implementation of *Agenda 21*. The nature of the independent role played by non-governmental organizations within a society calls for real participation; therefore, independence is a major attribute of non-governmental organizations and is the precondition of real participation.
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> 27.2 One of the major challenges facing the world community as it seeks to replace unsustainable development patterns with environmentally sound

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[197] *See id.* at 66.

[198] *See id.* at 67.

[199] *See id.* at 70.

[200] *Agenda 21*, *supra* note 31, at 230.

> and sustainable development is the need to activate a sense of common purpose on behalf of all sectors of society. The chances of forging such a sense of purpose will depend on the willingness of all sectors to participate in genuine social partnership and dialogue, while recognizing the independent roles, responsibilities and special capacities of each.
>
> 27.3 Non-governmental organizations, including those non-profit organizations representing groups addressed in the present section of *Agenda 21*, possess well-established and diverse experience, expertise and capacity in fields which will be of particular importance to the implementation and review of environmentally sound and socially responsible sustainable development, as envisaged throughout *Agenda 21*. The community of non-governmental organizations, therefore, offers a global network that should be tapped, enabled and strengthened in support of efforts to achieve these common goals.
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> 27.4 To ensure that the full potential contribution of non-governmental organizations is realized, the fullest possible communication and cooperation between international organizations, national and local governments and non-governmental organizations should be promoted in institutions mandated, and programmes [sic] designed to carry out *Agenda 21*. Non-governmental organizations will also need to foster cooperation and communication among themselves to reinforce their effectiveness as actors in the implementation of sustainable development.[201]

Two examples of prominent NGOs that could provide models for a newly-conceived and focused NGO are: (a) the World Conservation Union (the "Union")[202] and (b) the Worldwide

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[201] *Id.* ¶¶ 27.1-.4 (discussing objectives for NGO's regarding future implementation of *Agenda 21*).

[202] The World Conservative Union, prior to 1988, was called the International Union for the Conservation of Nature and Natural Resources.

Fund for Nature ("WWF").

"Created in 1948 at the initiative of the French government, [the Union] has the unique quality of being a non-governmental organization made up of conservation groups, states and public law entities."[203] As of 1990, the Union "was composed of 62 States, 108 public law entities, such as universities and research institutes, and more than 400 non-governmental organizations, most of which are national but including at least 30 international organizations."[204] Interestingly,

> [t]he objectives of the Union are . . . to encourage the preparation of conservation measures, and education about conservation, and to provide information to members of [the Union] and different groups which collaborate with the Union. Among the work assigned the organization is consultation with governments and different institutions in regard to conservation, collection and analysis of information and its diffusion among members and affiliates, elaboration of measures of conservation to propose to governments, provision of technical support in regard to treaties to be adopted or already concluded in the field, and encouragement of research into and application of new techniques relating to conservation.[205]

The Worldwide Fund for Nature, officially created as a private foundation with headquarters in Switzerland, helps finance conservation projects throughout the world.[206]

3.2.3. Regional Organizations

A variety of regional intergovernmental organizations have become increasingly involved in international environmental

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See INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 1, at 70 n.27.

[203] *Id.* at 70.

[204] *Id.*

[205] *Id.*

[206] *See id.* at 72 (discussing funds allocated by the Worldwide Fund for Nature to different environmental projects).

policy in recent years.[207] European-dominated organizations, such as the United Nations Economic Commission for Europe ("UNECE"), the Council of Europe, the Organization for Economic Cooperation and Development ("OECD"), the European Communities, and the Conference on Security and Cooperation in Europe ("CSCE"), have been unusually active in environmental issues.[208] Moreover, the Organization of American States ("OAS") and the South Pacific Regional Organization have both made important contributions to advancing conservation and environmental protection policies in the Americas and the South Pacific.[209]

Of particular relevance to issues of transboundary pollution risk prevention are the UNECE's role in "elaborating and implementing the Convention on long-range transboundary air pollution [in 1979];"[210] the UNECE's 1987 promulgation of "principles concerning cooperation for the protection of transboundary waters against pollution;"[211] the Council of Europe's 1980 preparation of a "European Outline Convention on Transfrontier Cooperation between Territorial Communities or Authorities, . . . explicitly designat[ing] environmental protection and mutual assistance in case of accidents among the topics which may be the object of joint action;"[212] and the OECD's declaration of principles "of emerging fundamental norms of international environmental law including the obligation to inform and consult, to notify of emergency situations, the principle of equality of access between residents and nonresidents, nondiscrimination in the application of [environmental] legislative rules, and the polluter-pays principle."[213]

3.2.4. Subregional and Bilateral Organizations

"Bilateral and subregional treaties which are partly or wholly devoted to environmental protection frequently establish perma-

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[207] *See id.* at 73-91 (describing the involvement of several intergovernmental organizations in international environmental policy).

[208] *See id.* at 73-85.

[209] *See id.* at 85-91.

[210] *See id.* at 75.

[211] *Id.*

[212] *Id.* at 76-77.

[213] *Id.* at 78.

nent agencies to assure equitable sharing and efficient utilization of resources."[214] An example of a subregional organization of this nature is the Niger River Commission, initiated in 1964 by nine riparian nation-states in Africa to effect cooperation concerning the consumption of river basin resources.[215] An example of a bilateral organization is the International Joint Commission ("IJC"), established between Canada and the United States in 1909 to protect the boundary waters between the two countries.[216]

The attractiveness of a regional or bilateral approach to the matter of fashioning an incentive-based approach to encourage private management of toxic substances risk is that the relatively smaller scale of the undertaking more likely will be easier to implement than global or multinational/multi-continental approaches. Moreover, it is more probable that bordering nations, or regionally proximate countries, will share environmental and health interests to prevent and manage common types of toxic substances.

3.2.5. Federal Political Systems

Countries with constitutional federal political systems, such as the United States and Germany, theoretically are capable of formulating and implementing creative, efficient, and responsive public policies due to the complementary and specialized functions of the national and state or regional governments. Further, "environmental federalism" allows each part of a federal republic to enjoy a minimum level of environmental protection. Despite parochial local interests, problems of transboundary pollution between states can also be fairly and effectively dealt with in a federal system.[217] Yet, environmental federalism also creates many points of friction and conflict between national and state governments.

Many of the presuppositions regarding the local and national

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[214] *Id.* at 91.

[215] *See id.*

[216] *See id.* at 93.

[217] *See generally*, Adam Babich, *Our Federalism, Our Hazardous Waste, and Our Good Fortune*, 54 MD. L. REV. 1516 (1995); Robert V. Percival, *Environmental Federalism: Historical Roots and Contemporary Models*, 54 MD. L. REV. 1141 (1995).

interests are currently being reexamined in the United States.[218] This system can act as a potential metaphor for international arrangements to create incentives for better private management of transboundary toxic substances risk. It is arguable that federal systems, like the United States, allow a greater flexibility in meeting baseline environmental quality standards by permitting the states, in many instances, to use alternative means to achieve national environmental objectives (for example, the Clean Air Act). However, this is not necessarily so and varies from statute to statute.

4. CONCLUSION

Despite the complexity of understanding the nature of toxic substances and the *transsectoral environmental problematique*, it is apparent that there is a need to move beyond traditional techniques of command and control regulation of transboundary toxic substances risk under international environmental law. Drawing inspiration and insights from a variety of non-command and control policy tool models[219] and international institutional metaphors,[220] this Article will end by sketching some theoretical principles which could serve as a foundation for building a theory of international incentive-based environmental experimentation for more responsible private management of transboundary toxic substances risk.

4.1. The Principle of Market Primacy

At the outset, international environmental law policymakers must insist that, when intergovernmental intervention in the production, distribution, and consumption of toxic substances is justified, "government should adopt regulatory tools that most efficiently ensure that the benefits of the intervention outweigh its costs."[221] Thus, with command and control regulation as a last resort or as a backstop mechanism, transboundary "market-based

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[218] *See* Percival, *supra* note 217, at 1182.

[219] *See supra* notes 109-79 and accompanying text.

[220] *See supra* notes 180-218 and accompanying text.

[221] Thomas O. McGarity, *The Expanded Debate Over the Future of the Regulatory State*, 63 U. CHI. L. REV. 1463, 1496 (1996).

programs,"[222] such as pollution or substance charges on toxic substances[223] and tradeable emission permits,[224] should be crafted and implemented by international governmental institutions as a first resort.[225]

4.2. The Principle of Multiple Ownership

Closely related to the principle of market primacy is the principle of multiple ownership. Essentially, this principle calls for a purposeful policy decision by the community of nations to divide conceptually the *transsectoral environmental problematique* of transboundary toxic substances risk into "encompassable pieces" through the power of a marketplace of assorted incentives.[226] Maximizing participation through a rich and varied assortment of market-based incentives would encourage joint-ownership of the international problem of transboundary toxic substances risk by a variety of public and private institutions and ad hoc groups of individuals.[227] Just as stock exchanges, commodities futures markets, and other trading systems spread responsibility and interest in the opportunities and challenges of business enterprises and concomitantly provide a staggering source of capital and creative ideas to respond to these opportunities and challenges, the expansion and proliferation of marketplaces providing solutions to transboundary toxic substances risk would "allow greater customization in dealing with . . . [these international environmental problems], and increase the flexibility to move from

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[222] *Id. But see* ROBERT KUTTNER, EVERYTHING FOR SALE: THE VIRTUES AND LIMITS OF MARKETS (1997) (arguing that market-based ideas do not always solve public problems).

[223] *See supra* notes 121-35 and accompanying text; *see also* Mcgarity, *supra* note 220, at 1496 n.155 (explaining the potentcy of market-based solutions such as pollution charges on firm choice and social behavior).

[224] *See id.* (discussing the tradeable emmission marketable permit approach).

[225] For a sampling of free market environmental and regulatory writings, see generally Stephen Breyer, *Analyzing Regulatory Failure: Mismatches, Less Restrictive Alternatives, and Reform*, 92 HARV. L. REV. 549 (1979); Robert W. Hahn & Robert N. Stavins, *Incentive-Based Environmental Regulation: A New Era From an Old Idea?*, 18 ECOLOGY L.Q. 1 (1991); Richard B. Stewart, *Economics, Environment, and the Limits of Legal Control*, 9 HARV. ENVTL. L. REV. 1 (1985); Richard B. Stewart, *Reconstitutive Law*, 46 MD. L. REV. 86 (1986).

[226] *See* Kenneth H. Keller, *Unpackaging the Environment*, 13 WORLD POL'Y J. 11, 21 (1996).

[227] *See id.*

policies based primarily on regulatory approaches to those that rely more heavily on incentives, education, or technological ingenuity."[228]

4.3. The Principle of Strategic Experimentation

The community of nations should not eschew experimentation in pursuing the principles of market primacy and multiple ownership. For example, the further elaboration and clarification of what one author calls "ideas futures"[229] may help to ameliorate transboundary toxic substances risk for various wastes and products. Various public or private foundations, think-tanks, governments, or industry associations also could encourage private solutions to international transboundary toxic substances risk by offering various types of prizes (monetary or non-monetary) for specific accomplishments in this regard.[230]

4.4. The Principle of Cost-Effective Targeted Incentives of the Specific Life-Cycle Stages of Toxic Substances

As the authors of the Resources for the Future book on using economic incentives to regulate toxic substances[231] point out, "[t]argeting [environmental policy tool] intervention to focus on

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[228] *Id.*

[229] *See generally* Russ Ray, *Ideas Futures: Gambling on Science*, 31 FUTURIST 25 (1997) (explaining the concept of "ideas futures").

[230] *See, e.g.*, 1 *Fourth SONREEL Proceedings*, *supra* note 100, Tab 4, Legal Implications of ISO 14000 Implementation (discussing a prestigious professional certification that manufacturers can achieve throughout the world from the International Organization For Standardization for implementing environmental management systems that meet world-class standards); ROBERT ZUBRIN, THE CASE FOR MARS: THE PLAN TO SETTLE THE RED PLANET AND WHY WE MUST 283 (1996) (discussing the interesting idea, which could be modified regarding transboundary toxic substance risk reduction, for the U.S. government, or other public or private entity, to "post a $20 billion award to be given to the first *private organization* to successfully land a crew on Mars and return them to Earth, as well as several prizes of a few billion dollars each for various milestone technical accomplishments along the way"); P.N. Grabosky, *Regulation by Reward: On the Use of Incentives as Regulatory Instruments*, 17 LAW & POL. 257 (1995) (reviewing the advantages and potential shortcomings of regulatory incentives, and suggesting principles by which incentive instruments—material and non-material—can be used as part of an overall regulatory regime); Keller, *supra* note 226, at 21-22 (discussing the functional equivalent of the U.S. Commerce Department's Baldridge Awards, which recognize excellence in manufacturing quality).

[231] *See* ECONOMIC INCENTIVES, *supra* note 22, at 7-8.

specific life-cycle stages or end uses [of various toxic substances] is likely to be desirable. However, such targeting may entail significant administrative and enforcement costs."[232] Accordingly, policy intervention must be carefully weighed by "balancing of the benefits of a targeted approach against its administrative costs."[233]

4.5. The Principle of Preferring Self-Enforcing Incentive Strategies Over Government-Enforcing Strategies

If possible, international environmental law policymakers should structure self-enforcing, incentive-based approaches to reduce transboundary toxic substances risk. Indeed,

> [t]he property of self-enforcement is clearly desirable for all types of regulation (whether command and control or incentive-based) and in all circumstances (whether a single-source, homogenous pollutant or a multiple-source, multimedia pollutant), but this property is particularly important in the case of toxic substances, given their ubiquity and heterogeneity. Opportunities may well arise—and be easy to exploit—for evading a toxic substance tax or operating in such a manner as to elude the purchase of a permit. The large numbers of intermediate producers may make it easy, for example, to resell untaxed or nonpermitted quantities ostensibly intended for benign uses to a producer who uses the substance in a riskier process or final product. Or, in deposit-refund schemes, some chemicals may be readily and relatively undetectably diluted so as to increase refunds.
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> For these reasons, intervention strategies that might be self-enforcing, such as deposit-refund schemes modified to reduce counterfeiting, or taxes or permits that allow cost-effective monitoring (perhaps making use of the delivery manifests that are already required to track the distribution of many chemicals) are [preferable]. Strategies to penalize violators by increasing the probability that they will be

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[232] *Id.* at 7 (emphasis in original omitted).
[233] *Id.* at 8.

> monitored in the future . . . might also prove quite useful.[234]

4.6. The Principle of Vigilance in Avoiding Unintentional Second-Order Policy Consequences

As elucidated in the RFF study, incentive-based policy intervention "at one stage of the [toxic substance] life cycle requires caution to ensure that it does not unintentionally increase exposure at another."[235] For example,

> [i]n the case of formaldehyde . . . product labels and standards may reduce potential customer exposure to the 'off-gassing' of formaldehyde contained in various household products. Suppose producers store these products in warehouse inventories for a longer period, so that when the products are eventually delivered to retailers, sufficient off-gassing has already occurred to meet or exceed household standards. An unintended effect of intervention at the end-use level would be that the warehousing may expose warehouse workers to higher levels of off-gassing.
>
> Another example involves incentives to encourage recycling of chlorinated solvents and cadmium. Although incentives may reduce harmful exposure (from disposal) to society in general, emissions during recycling operations may increase harmful exposure to society.[236]

Any international scheme dealing with risk reduction from transboundary toxic substance use must take this principle into account.

4.7. The Principle of Corporate Sustainability

The ultimate incentive for manufacturers of toxic substances world-wide should be the expected payoff from developing a corporate vision of sustainability. As noted in two recent articles

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[234] *Id.* at 8-9.

[235] *Id.* at 9 (emphasis in original omitted).

[236] *Id.*

in the *Harvard Business Review*, businesses need to realize that those firms that create a vision of sustainability will be ready to take advantage of the potentially staggering opportunities for profits and customer allegiance presented by the impending need for a sustainable global economy.[237]

[237] *See* Stuart L. Hart, *Beyond Greening: Strategies for a Sustainable World*, HARV. BUS. REV. Jan.-Feb. 1997, at 67, 76; Joan Magretta, *Growth Through Global Sustainability: An Interview With Monsanto's CEO, Robert B. Shapiro*, HARV. BUS. REV. Jan.-Feb. 1997, at 79.