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INTEGRATED POLLUTION CONTROL: THE WAY FORWARD

Lakshman Guruswamy*

Resumen

Este Artículo trata sobre la potencial aplicación en los Estados Unidos de una política integrada de control de contaminación. Su enfoque principal es en las ventajas prácticas y económicas de tal política. Actualmente, en los Estados Unidos se aplica un modelo incremental de control de contaminación a medios ambientales separados, ya sean el aire, el agua o la tierra. Por el contrario, la Comunidad Europea, Inglaterra y Suecia han empezado a implementar una política integrada de control de contaminación que toma en consideración la transferencia de contaminación entre distintos medios ambientales. Este artículo examina el experimento de la Comunidad Europea, Inglaterra y Suecia y como sus políticas ambientales pueden proveer un marco de referencia adecuado para la implementación en los Estados Unidos de un control de contaminación integrado. El artículo también examina como leyes actualmente en vigor en los Estados Unidos pueden proveer la base para una política integrada de control de contaminación. Finalmente, examina el rol de la "Environmental Protection Agency" (Agencia de Protección Ambiental) en la implementación de una política integrada de control de contaminación en los Estados Unidos.

INTRODUCTION

The first and second laws of ecology, dictate that "everything is connected to everything else," and that "everything must go somewhere."¹ Thus, the universal, ubiquitous, and incessant demands of ecology's laws compel the adoption of an integrated approach to pollution control. The development of integrated pollution control (IPC), however, has been thwarted by exceptionally demanding and difficult questions about its practical applicability.

The environment could be compared to an immensely intricate, fragile and sensitive mobile. To the extent that everything is connected to everything else, a touch at one point could send tremors through other parts. If everything

*Visiting Professor of Law, University of Iowa. This article is a sequel to, and develops upon a number of the arguments that first appeared in *Integrating Thoughtways: Re-Opening of the Environmental Mind*, 1989, Wisc. L. Rev. 463. I am indebted to Professor Jonathan Carlson for his comments and to Andrew Hall, James Roswold and Mollie Weighner for their research help. A preliminary version of this article was presented at a faculty seminar at the University of Arizona. I am grateful for the comments received at this seminar.

1. B.COMMONER, THE CLOSING CIRCLE 33, 39 (1971).

must go somewhere, there is no place, area or region free of environmental impact, and nothing really goes away. Ideally, action affecting the environment should be taken only after a comprehensive evaluation and full understanding of all the complexities and variables. There are numerous obstacles, however, that can frustrate a decision-maker's attempt to adhere to the tenets of such a comprehensively rational model. According to Charles Lindblom, it is precisely because everything is connected to everything else that environmental problems elude comprehensive analysis. The problems are so complicated as to lie beyond our capacity to control them through one unified policy.² Instead, critical points of intervention must be found. According to Lindblom's view, a pragmatic, step-by-step or incremental approach to policy making will solve problems more effectively than an idealistic "holistic" model incapable of practical application.³

There is little doubt that the incremental model of "muddling through"⁴ has prevailed over an integrated approach.⁵ Stringent, though fragmented, bodies of legislation dealing with air, water and land seek to address the widespread problems of pollution that we have encountered.⁶ This body of legislation has resulted in impressive gains.⁷ Unfortunately, the goals of

2. Lindblom, *Incrementalism and Environmentalism*, in *MANAGING THE ENVIRONMENT* 83 (1973).

3. See e.g., D. BRAYBROOKE & C. LINDBLOM, *A STRATEGY OF DECISION* 37-57, 61-110 (1963); R. DAHL & C. LINDBLOM, *POLITICS, ECONOMICS AND WELFARE* 82-88 (1953).

4. Lindblom, *The Science of Muddling Through*, 19 *PUB. ADMIN. REV.* 79-82 (1959); Lindblom, *Still Muddling, Not Yet Through*, 39 *PUB. ADMIN. REV.* 517, 521 (1979).

5. For a fuller consideration of the factors leading to a fragmented approach to pollution control, see Guruswamy, *Integrating Thoughtways: Re-Opening of the Environmental Mind*, 1989 *WISC. L. REV.* 463, 476-492 (1989).

6. Clean Air Act of 1970, Pub. L. 91-604, 84 Stat. 1676-1713 (1970); Clean Air Act of 1977, Pub. L. 95-95, 91 Stat. 685-796 (1977), Pub. L. 95-190, 91 Stat. 1399-1404 (1977); Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (1982 & Supp. III 1985); Safe Drinking Water Act of 1974, 21 U.S.C. § 349 (1988), 42 U.S.C. §§ 201, 300f-300j-9 (1982); Safe Drinking Water Act of 1977, 42 U.S.C. §§ 300f, 300j-1 (1982); Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §§ 136-136y (1982); Resource Conservation and Recovery Act, 16 U.S.C. §§ 3401-3473 (1988); Marine Protection Research and Sanctuaries Act of 1972, 16 U.S.C. §§ 1431-1439 (1988), 33 U.S.C. §§ 1401-1445 (1982); Food, Drug and Cosmetic Act of 1938 (FDA), 21 U.S.C. §§ 301-392 (1988); Food Additives Amendment of 1958, 21 U.S.C. § 346(a) (1988); Color Additive Amendments of 1960; U.S.C. § 348 (1988); New Drug Amendments of 1962, Pub. L. 87-781, 76 Stat. 780 (1962); New Animal Drug Amendments of 1968, 21 U.S.C. § 360b (1988); Medical Device Amendments of 1976, Pub. L. 94-295, 90 Stat. 539 (1976); Wholesome Meat Act of 1967, Pub. L. 90-201, 81 Stat. 584 (1967); Wholesome Poultry Products Act of 1968, Pub. L. 90-492, 82 Stat. 791 (1968); Occupational Safety and Health Act of 1970, Pub. L. 91-596, 84 Stat. 1590 (1970); Federal Hazardous Substances Act of 1966, 15 U.S.C. §§ 1261-1265, 1273 (1988); Consumer Products Safety Act of 1972, 5 U.S.C. §§ 5314-5315 (1988), 15 U.S.C. §§ 2051-2081 (1988); Poison Prevention Packaging Act of 1970, Pub. L. 91-601, 84 Stat. 1670 (1970); Lead Based Paint Poison Prevention Act of 1973, Pub. L. 91-695, 84 Stat. 2078 (1973); Lead Based Paint Poison Prevention Act of 1976, Pub. L. 94-317, 90 Stat. 705, 706 (1976); Hazardous Materials Transportation Act of 1970, Pub. L. 93-633, 88 Stat. 2156 (1970); Federal Railroad Safety Act of 1970, 45 U.S.C. §§ 431-441 (1982), 39 U.S.C. §§ 442-444 (1982); Ports and Waterways Safety Act of 1972, 33 U.S.C. §§ 1221-1232 (1982), 46 U.S.C. § 341(a) (1982).

healthy air and swimmable, fishable waters, envisioned by such legislation, have not been achieved, while the costs of pollution control have escalated.

A major, and unavoidable, reason for the absence of further success lies in the inherent weakness of a fragmented system. These deficiencies have given rise to a reexamination of the character of an integrated approach and led to the forging of a strong case for its adoption.⁸ Proposed legislation⁹ boasting a good prospect of becoming law¹⁰ has given IPC an impressive boost. The media, however, has focussed only on those parts of the proposed legislation that seek to elevate the Environmental Protection Agency (EPA) to a cabinet level department,¹¹ and glossed over equally important features directed at reorganizing EPA (or the new Department of the Environment as it will become). The portentous provisions of the proposed legislation which seek to establish a commission on environmental improvement and administration herald the emergence of IPC. They also offer strong evidence that IPC has won a place on the environmental agenda of the nation. The commission will be empowered to assess the presently fragmented and programmatic administration of the EPA¹² and the desirability of improving environmental protection by "integrating Federal environmental law ..."

7. Reilly, *The Future of Environmental Law*, 6 YALE J. ON REG. 352 (1989).

8. Guruswamy, *supra* note 5; CONSERVATION FOUNDATION, CONTROLLING CROSS-MEDIA POLLUTANTS (1984) [hereinafter CROSS-MEDIA POLLUTANTS]; CONSERVATION FOUNDATION, NEW PERSPECTIVES ON POLLUTION CONTROL: CROSS-MEDIA PROBLEMS (1985); CONSERVATION FOUNDATION, STATE OF THE ENVIRONMENT: AN ASSESSMENT AT MID-DECADE (1984); CONSERVATION FOUNDATION, THE ENVIRONMENTAL PROTECTION ACT (SECOND DRAFT, 1988); B. RABE, FRAGMENTATION AND INTEGRATION IN STATE ENVIRONMENTAL MANAGEMENT (1986); INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA (N. Haigh & F. Irwin eds. forthcoming 1990) [hereinafter INTEGRATED POLLUTION CONTROL]; The National Research Council and National Academy of Public Administration, after studying the subject, have lent their weighty support towards the adoption of an integrated approach to pollution control. See NATIONAL RESEARCH COUNCIL, MULTIMEDIA APPROACHES TO POLLUTION CONTROL: A SYMPOSIUM PROCEEDINGS (1987); NATIONAL ACADEMY OF PUBLIC ADMINISTRATION, STEPS TOWARD A STABLE FUTURE (1986). In the United Kingdom, the Royal Commission on Environmental Pollution (RCEP) has taken the lead in advocating an integrated approach. See ROYAL COMMISSION ON ENVIRONMENTAL POLLUTION, BEST PRACTICABLE ENVIRONMENTAL OPTION (Rep. No. 12, 1988) [hereinafter RCEP, No. 12]; ROYAL COMMISSION ON ENVIRONMENTAL POLLUTION, MANAGING WASTE: THE DUTY OF CARE (Rep. No. 11, 1985) [hereinafter RCEP, No. 11]; ROYAL COMMISSION ON ENVIRONMENTAL POLLUTION, TACKLING POLLUTION — EXPERIENCES AND PROSPECTS (Rep. No. 10, 1984) [hereinafter RCEP, No. 10]; ROYAL COMMISSION ON ENVIRONMENTAL POLLUTION, AIR POLLUTION CONTROL: AN INTEGRATED APPROACH (Rep. No. 5, 1976) [hereinafter RCEP, No. 5]. See also, DEPARTMENT OF THE ENVIRONMENT (UNITED KINGDOM), INTEGRATED POLLUTION CONTROL (1988).

9. S. 2006, 101st Cong., 2d Sess.; H.R. 3847, 101st Cong., 2d Sess., 136 CONG. REC. S98, H36 (daily ed. Jan. 23, 1990).

10. N. Y. Times, Jan. 22, 1990, at 1, col. 1. The House of Representatives has voted for the bill by an overwhelming majority. N. Y. Times, Mar. 29, 1990, at 1, col. 1.

11. N. Y. Times, Jan. 22, 1990, at 1, col. 1.

12. H.R. 3847, *supra* note 9, § 303(a)(3) (as ordered reported by the Committee on Government Operations).

through "administrative and legislative reforms...."¹³ These developments throw the concept of IPC into sharp relief and highlight its weaknesses. While it is relatively easy to accept the principle of integration, the difficulties of implementation which thwarted adoption in the great environmental decade of the 1970's must still be confronted and overcome. This article offers a preliminary analysis as to how an integrated approach might be implemented. The article begins by summarizing the case for an integrated approach within the U.S., as well as internationally, and argues that IPC is a concept whose time has come.

It next examines the difficulties in understanding and implementing an integrated approach and demonstrates how a comparative perspective can illuminate the path to overcoming such difficulties. The article reviews the comparative evidence in order to lay the foundations of IPC in the U.S. It argues that the first moves towards IPC should assume a modest operational character rather than a grand strategic design. An "operational" model of IPC is concerned with the regulating of the design and technology of industrial plants, and harmful substances. The essential features of such a system consist of a unified pollution control agency, environmental impact assessment, and coordinated permits and licenses.

Finally, it is argued that all of these features presently exist in U.S. law and policy, and that it is time to use them constructively and imaginatively. The EPA originally was conceived of as a unified, integrated agency, and it should be recalled to its original mandate. Furthermore, the EPA should robustly and creatively apply the National Environmental Policy Act (NEPA) and the Toxic Substances Control Act (TSCA) to help create a stable foundation for a bolder, more comprehensive version of IPC.

I. THE CHALLENGE

A. The Disadvantages of Fragmentation

It is not proposed to exhaustively argue the case for an integrated approach. It is necessary, however, to review the arguments for contending that integration is a concept whose time has come. The existing fragmented approach to pollution control is both ineffective and inefficient. The present fragmented regime concentrates on moving the pollution generated by polluting activities from one place to another.¹⁴ Unfortunately, such pollution

13. S. 2006, *supra* note 9, § 503.

14. This is because the laws aimed at reducing or removing pollutants from specific media treat symptoms or effects that take the form of pollution rather than the causes or sources that create the residuals or wastes in the first place. As a result, pollution controls do not restrict, *per se*, the production of goods, such as, cars, paper or energy, that are the reason for the production processes causing pollution, or even the processes themselves.

transfers ignore the basic law of physics that matter is indestructible and does not go away.¹⁵ The initial destination of pollutants may be altered, but ultimately they re-enter the flow of material within the environment.

Limitations on discharges in one medium, such as air, while correcting the immediate pollution problem within that medium, often do little more than shift the pollution from air to land without recognizing the adverse impact of transferred pollution. Such transfers can create even greater problems in the medium to which they are moved. Thus, control technologies aimed at achieving specific limits to pollution generate new streams of residuals which have adverse effects on other media. This is evidenced by the massive quantities of sludge created by existing pollution controls. For example, the provisions of the Clean Air Act directed at reducing sulphur dioxide require the use of 'scrubbers'¹⁶ in smoke stacks. Huge quantities of lime, limestone solution, and water are sprayed on exhaust gases as they flow up power plant smokestacks. Sulphur dioxide in the gas reacts with the spray and forms a solution from which sulphur dioxide is later removed, strained, and disposed of in the form of sludge.¹⁷ EPA has estimated that three to six tons of scrubber sludge may be produced for each ton of sulphur dioxide removed from the flue gas.¹⁸ Consequently, the problem of sulphur dioxide in the air is replaced by the problem of sludge disposal. Municipal wastewater treatment and sewage treatment plants also produce large quantities of sludge. Some of this sludge contains toxic substances¹⁹ which are non-degradable and bioaccumulable. In all it is estimated that over 118 million metric tons of sludge are produced annually.²⁰

Direct transfers are compounded by indirect transfers resulting from physical, chemical, and biological forces.²¹ Physical processes include leaching, volatilization, and deposition. Leaching occurs when pollutants, particularly toxics, are dissolved and percolate or move from waste disposal sites into groundwater.²² Volatilization is the process of vaporization that

15. A. KNEESE & B. BOWER, ENVIRONMENTAL QUALITY AND RESIDUAL MANAGEMENT 1-12 (1979); Kneese, *Pollution and a Better Environment*, 10 ARIZ. L. REV. 11 (1968); A. KNEESE, ECONOMICS AND THE ENVIRONMENT 16-73 (1977); M. HUFSCHEIDT, D. JAMES, A. MESITER, B. BOWER & J. DIXON, NATURAL SYSTEMS AND DEVELOPMENT 73-113 (1983); L. ORTALANDO, ENVIRONMENTAL PLANNING AND DECISION MAKING 25-34 (1984); J. LOWE, D. LEWIS & M. ATKINS, TOTAL ENVIRONMENTAL CONTROL III (1982).

16. The Clean Air Act provided that new coal-fired electricity generators should use "the best technological system of continuous emission reduction . . ." 42 U.S.C. § 7411 (1982). EPA has determined that this necessitates the use of scrubbers.

17. See Ackerman & Hassler, *Beyond the New Deal: Coal and the Clean Air Act*, 89 YALE L. J. 1466, 1481 n.56 (1980).

18. CROSS-MEDIA POLLUTANTS, *supra* note 8, at 8-9.

19. *Id.* at 9.

20. *Id.*

21. *Id.* at 14-20.

22. E.A. KELLER, ENVIRONMENTAL GEOLOGY 275 (1976); CROSS-MEDIA POLLUTION, *supra* note 8, at 15-16.

shifts pollutants from land or water to the air.²³ Deposition is the transfer of pollutants from the air to land and water. The problems caused by depositions are illustrated by acid rain.²⁴ In Chesapeake Bay where excessive nutrients, including nitrogen, are a major problem, 25% of nitrogen generated by human activity reaches the bay through the atmosphere. The atmosphere also serves as a medium of transfer for volatilizing fertilizers and manure.²⁵ In 1981, estimates showed that air deposition accounted for 90% of polychlorinated biphenyls (PCB's) entering the Great Lakes.²⁶ Furthermore, the pollutant's chemical structure may change as it moves through the environment.²⁷ Biological processes in which microorganisms break down toxic compounds also present new problems.²⁸

Congress admits that a problem exists. The findings embodied in the Resource Conservation and Recovery Act, now the Solid Waste Disposal Act, acknowledge that the Clean Air and Clean Water Acts have created problems of solid waste disposal which in turn have created problems of air and water pollution.²⁹ A clearer recognition of the nature of cross-media or inter-media transfers led the British Royal Commission on Environmental Pollution to conclude that "most of the present and future problems in environmental pollution will be of this cross-media type."³⁰ In a similar vein

23. NATIONAL RESEARCH COUNCIL, COMMITTEE ON REVIEW METHODS FOR ECOTOXICOLOGY, TESTING FOR EFFECTS OF CHEMICALS ON ECOSYSTEMS 16-18 (1981).

24. Acid rain, or more accurately, acid deposition, results from the emissions of sulfur oxides, nitrogen oxides, and to a lesser extent, hydrocarbons into the atmosphere. Sulfur dioxide (SO₂), which is largely produced by the burning of coal containing sulfur in power generation and smelting processes, and combustion of other fossil fuels by industrial, commercial, and residential users, gives rise to the greatest concern, both as a gas and as a transformed product (sulfate). Nitrogen oxides are emitted by the combustion of fossil fuels at high temperatures. The main sources of man made nitrogen oxides are motor vehicles and fossil fuel power plants. See THE NATIONAL ACID PRECIPITATION ASSESSMENT PROGRAM, INTERIM ASSESSMENT: THE CAUSES AND EFFECTS OF ACIDIC DEPOSITION (1987) (executive summary) [hereinafter NAPAP, executive summary].

25. ENVIRONMENTAL DEFENSE FUND, POLLUTED COASTAL WATERS: THE ROLE OF ACID RAIN (1988).

26. INTEGRATED POLLUTION CONTROL, *supra* note 8, at 30.

27. For example, sulfur dioxide transforms into sulfate through several different chemical processes, while sunlight acting on unburned hydrocarbons and nitrogen oxides creates smog.

28. For example, microorganisms can change mercury into the highly toxic methyl mercury, while toxics could continue to accumulate in fish even though its concentration in water has been reduced.

29. "[A]s a result of the Clean Air Act, the Water Pollution Control Act, and other Federal and State laws respecting public health and the environment, greater amounts of solid waste (in the form of sludge and other pollution treatment residues) have been created. Similarly, inadequate and environmentally unsound practices for the disposal of solid waste have created greater amounts of air and water pollution and other problems for the environment and for health." Solid Waste Act, 42 U.S.C.A. § 6901(b)(3)(1982).

30. RCEP, No. 10, *supra* note 8, ¶ 6.35 (emphasis added).

the National Research Council, in the United States, notes that "multimedia transport of pollution appears to be the rule rather than the exception."³¹

Furthermore, fragmented controls usually assess the risk of a pollutant on the basis of a single chemical causing exposure in a single medium. Regulations under the Clean Air Act, for instance, typically consider the risk of exposure from a specific source through the air. Regulations evaluate the risk to people who mix chemicals, spray chemicals, and eat food containing chemical residues. But they do not usually consider the risk to people who do all three. Human exposure to pollutants can take place through three routes. A person may inhale a substance, ingest it through water or food or absorb it through the skin. A study of cadmium exposure in Montana, where inhalation exposure was the basis for limits on air emissions, showed that there was more risk through food (ingestion) than through inhalation.³² Plants and animals are subject to similar exposure. Absorption occurs when pollutants settle on plants or marine animals which are surrounded by polluted water. Ingestion and inhalation occurs when contaminated prey or food is consumed or inhaled. Present environmental laws ignore the multi-media risk posed by even a single substance. The bewildering and aggravated risk presented by the synergistic effects of thousands of substances present in the environment³³ simply fall outside the pale of reckoning.

The present fragmented approach also lacks economic efficiency. Pollution controls already in place ensure that wastes cannot be discharged according to the best environmental option. This may lead to inefficient use of the assimilative capacity of the environment. In the example previously considered, this Article observed how the implementation of the Clean Air Act might lead to the creation of large quantities of sludge. Sludge can be disposed of in a number of ways. It can be discharged into a river or directly into the sea, or piped into a lagoon to settle and dry out as solid waste. What is germane is the possibility that current air pollution requirements might lead to water discharges, or solid waste disposal problems that cause greater overall damage to the environment than might be the case if the air pollution standards had been cognizant of cross media impacts. In addition, water pollution and land waste disposal laws could also prevent the discharge into water or disposal as solid waste without further treatment. Setting independent standards for each medium that ignore the assimilative capacity of

31. MULTIMEDIA APPROACHES TO POLLUTION CONTROL, *supra* note 8, at 4.

32. Rupp, *Composite Hazard Index for Assessing Limiting Exposures to Environmental Pollutants: Application Through a Case Study*, 12 ENVTL. SCI. & TECH. 806 (1978); CROSS-MEDIA POLLUTANTS, *supra* note 8, at 22.

33. This may occur because of chemical reactions between the substances or because the presence of one substance in the body increases the toxicity of another. For example, asbestos is estimated to be about 10 times as dangerous to smokers as to nonsmokers. NATIONAL RESEARCH COUNCIL, IMPROVING RISK COMMUNICATION 43 (1989) [hereinafter IMPROVING RISK COMMUNICATION].

the environment imposes unnecessary and unjustified costs thereby making the manufacturing process inefficient.

A more efficient³⁴ and cost effective way of pollution control would be to distribute the wastes between the three media of water, air, and land, in a manner that makes optimum use of the environment, and of any special or particular assimilative capacity it might possess. This policy would lead to a balanced approach to pollution control, which would avoid the problems of standards that are over-stringent in some areas and unduly lax in others.³⁵

B. The Advantages of Integration

In order to determine the way forward it is necessary to identify why pollution laws are ineffective and inefficient. In essence, it is because they address the effects rather than the source of the problem. This section will, therefore, examine the advantages of addressing the sources and causes of pollution. By addressing the sources and causes of pollution, we are able to uncover and attack the underpinnings rather than the external manifestations of pollution.

Pollution results from the staggering range of domestic and industrial activities that maintain the astonishingly good quality of life we enjoy. The exacting demands on energy and raw materials made by these activities inflict punishing costs. All those comforts of modern living that we take for granted give rise to enormous quantities of wastes, residuals, and pollutants. They include the energy consumed for heating and cooling and rapid transportation. They also include chemicals (pesticides, fungicides, and insecticides) used in producing clean, long lasting food, and the luxurious materials used in building and furnishing our homes and attiring ourselves. Goods are dispensed with and replaced, long before the expiry of their use life, for new and different goods. We appear to be inexorably locked into this profligate cycle of waste.

The matter and energy used to satisfy our life styles are neither created nor destroyed; they are merely transformed. Massive quantities of wastes or residuals are, therefore, the unavoidable by-products of today's living.³⁶ A

34. Apart from the inefficiency being discussed in the text, the present control could be inefficient in other ways. The National Academy of Public Administration has pointed out that statutory and administrative fragmentation has led to budgeting rigidities, caused confusion and generally impeded efficient administration. NATIONAL ACADEMY OF ADMINISTRATION, *STEPS TOWARD A STABLE FUTURE* 5 (1984).

35. See, e.g., B. ACKERMAN & W. HASSLER, *CLEAN COAL/DIRTY AIR* 10-12 (1981); A. KNEESE & C. SCHULTZE, *POLLUTION, PRICES, AND PUBLIC POLICY* 81 (1975); Krier, *The Irrational National Air Quality Standards: Macro- and Micro-Mistakes*, 22 UCLA L. REV. 323, 324-30 (1974).

36. A. KNEESE & B. BOWER, *supra* note 15; B. RABE, *supra* note 8, at 15 n.46; Kneese, *supra* note 15; A. KNEESE, *supra* note 15; M. HUFSCHMIDT, D. JAMES, A. MESITER, B. BOWER & J. DIXON, *supra* note 15; L. ORTOLANDO, *supra* note 15; J. LOWE, D. LEWIS & M. ATKINS, *supra* note 15.

strategic approach to pollution control would raise questions about the need and importance of the end product, or group of products, such as cars, paper, or disposable razors, and the process or group of processes that cause residuals or wastes. A strategy of waste reduction that addresses the causes rather than the symptoms of pollution would inquire into the need and place of the product. The Netherlands and Sweden have adopted variations of such a strategic approach.³⁷

Second, an integrated approach facilitates good management, in contrast to a fragmented approach that encourages poor management. IPC recognizes that product and process are inextricably interdependent in modern manufacturing industries. Both a product line and an associated production process must be taken together as a unit of analysis.³⁸ Integration generates good management because it takes account of all relevant factors and alternatives before imposing a particular regulation. For example, an integrated approach considers inputs in the creation of residuals. A fragmented approach, because it is concerned with effects, does not. The relationship of inputs to residuals can be illustrated by the coal electric industry. In a coal burning power plant, the combustion of coal to create electricity produces sulfurdioxide (SO₂), oxides of nitrogen (NO_x), particulates, bottom ash, and other unwanted materials. The quantity of SO₂ generated in combustion is a function of the sulfur content of raw coal and the extent, if any, of its removal in coal processing or by washing. The extent to which the sulfur content of the coal (the input) determines the nature of the residuals has been vividly demonstrated.³⁹ The gains achieved by simple and cheap washing techniques used on high sulfur coal, prior to its use in production, varied from 20% to 40%, compared to less than 50% gained from employing billion dollar scrubbers. Similarly, the burning of high quality natural gas releases even fewer harmful residues.⁴⁰

Apart from considering inputs, an integrated approach, as distinct from a fragmented one, generally embraces end products when dealing with harmful residuals. The extent to which the final product influences the residuals discharged is considerable. For example, the production of a highly bright bleached white paper⁴¹ requires substantially greater quantities of chemicals,

37. Irwin, *Introduction to Integrated Pollution Control*, in INTEGRATED POLLUTION CONTROL, *supra* note 8, at 26.

38. Utterbach, *Innovation and Industrial Evolution in Manufacturing Industries*, in TECHNOLOGY AND GLOBAL INDUSTRY 17 (B.R. Guile & H. Brooks eds. 1987) A corollary of this union of product and process is that key productive units can be arranged in a dependent hierarchy from final market demand to equipment and material suppliers. Thus, what is viewed as a product innovation by a unit at one level is part of the production process or product of a unit at the next higher level.

39. Ackerman & Hassler, *supra* note 17, at 1481-82.

40. A. KNEESE & B. BOWER, *supra* note 15, at 44.

41. General Electric Brightness 80.

water, and energy, resulting in the generation of larger amounts of residuals than an unbleached paper.⁴² One study found that the liquid residuals were reduced by 85-90%, while gaseous residuals were reduced by 50% when the unbleached paper is used.⁴³ The same argument applies to a wide variety of end products. Accordingly, the environmental costs of the bewildering and often unnecessary products that are paraded on the market are often ignored. Where the end product is a chemical substance, it is possible for an integrated approach to evaluate how a substance, such as cadmium, enters more than one medium at the source, moves across medial boundaries and reaches the receptor through more than one medium. The substance in question could be banned or controlled on the basis of the risk it poses.

Finally, integrated policies lead to good management because they focus attention on how changes in process and plant design can reduce pollution. For example, in order to comply with air, water and waste laws, U.S. power plants resorted to increasing numbers of technological fixes such as cooling towers, scrubbers, and electrostatic precipitators. The resulting pollution control equipment can amount to 45% of the capital cost and 30% of the operating cost of a coal fired plant. Pilot projects indicate that integrating controls into the design of the plant could cut these costs by as much as half.⁴⁴ The experience of the United Kingdom emphasizes the importance of addressing pollution control decisions at the stage of plant design.⁴⁵ It shows that appropriate plant design can achieve substantial reductions in operating costs.

C. The Difficulties of Implementing IPC

The case for adopting an integrated approach will be significantly weakened unless we surmount the difficulties obstructing its implementation. "Socio-political" difficulties surround the meaning of integration and "socio-scientific" difficulties beset the application of the concept. The socio-political uncertainties surrounding the meaning and nature of an integrated approach are considerable. The meaning of an integrated approach ranges over a confusing spectrum. At its broadest strategic level, it is possible to include grand or macro policy making that addresses pollution caused by national and even international energy, agricultural and industrial policies. Those advocating the strategic view also seek to intervene within markets to restrict or disallow preferences for certain products.

42. General Electric Brightness 25.

43. A. KNEESE & B. BOWER, *supra* note 15, at 64-75.

44. Carr, *Integrated Environmental Control in the Electric Utility Industry*, 36 J. AIR POLL. CONTROL A. 652-58 (1986); Irwin, *Introduction to Integrated Pollution Control*, in INTEGRATED POLLUTION CONTROL, *supra* note 8, at 25.

45. Irwin, *Introduction to Integrated Pollution Control*, in INTEGRATED POLLUTION CONTROL, *supra* note 8, at 25.

At the opposite end of the spectrum, a narrow and strictly operational view of IPC locates and confines it within the factory fence. Such a view restricts IPC to the management of residuals, or the waste stream, so as to secure an optimal distribution. The changing of policies responsible for the waste, interfering with demand for products, or substituting inputs that produce less waste fall outside the province of an integrated approach. Other interpretations, occupying the middle ground, enable an integrated approach to deal, *inter alia*, with the choice of sites so as to take advantage of the environmental capacities of differing locations. From this standpoint, IPC focuses on technologies and processes that minimize undesirable residuals, disposal methods that take account of cross-media effects, and optimal distribution of waste.

To illustrate the nature of the socio-political difficulties concerning the scope and meaning of IPC, suppose that a plant and process consists of a coal burning electric generator, and that it discharges unacceptable levels of sulphur dioxide. Management proposes to install flue gas desulphurization to deal with the problem. One of the desulphurization technologies envisaged is the application of pulverized limestone which results in the creation of gypsum rich sludge waste. Large quantities of such waste are expected. How might the concept of integration be applied in such a situation?

At the narrow and strictly operational level, an integrated approach would accept and plan for such residuals or wastes, and seek to find the optimal balance for disposing of them, whether to air, land or water through the use of, say, a coordinated permit. A second, extended version of IPC would evaluate the decision to undertake flue gas desulphurization within a broader context. Such an inquiry would involve an investigation of the environmental effects of limestone quarrying. This approach may consider the effect limestone quarrying would have on the area from which it is removed, particularly if limestone is found in a national park or an area of outstanding natural beauty. Furthermore, it would consider the effects of transporting limestone across unspoiled countryside, and the environmental consequences of having to store limestone in large quantities. Finally, it would consider the environmental impact of disposing of the sludge created by this particular technology. Having assessed the environmental impact of the proposed changes, this version of integration would consider whether a case could be made for a different method of desulphurization based on an alternative technology.

Advocates of a third, more strategic concept of IPC would argue that it is necessary to go further and consider the broader socio-economic question as to the acceptability of coal fired generators. In order to answer this question, coal burning electricity generation would be balanced against other alternative sources of energy such as nuclear power, fusion, solar, wind, geothermal and hydroelectric power and fuel cells. Another perspective, within the

strategic genre, inquires whether generators are necessary at all when better energy conservation and energy efficiency would cut down the need for electric energy.⁴⁶

The strategic approach could be extended much further. Most human activities result in the creation of residuals or wastes, therefore, most social and economic activities have environmental and ecological repercussions. Because of this, anything less than an integrated environmental resource strategy which comprehensively plans and completely integrates environmental factors into its decision making would be inadequate.⁴⁷ Thus, an integrated approach must be defined so as to overcome the socio-political uncertainty surrounding its meaning.

Socio-scientific difficulties compound the socio-political ones. Evaluating the impact of a waste stream can be a daunting task. To begin with, ascertaining the impact of a pollutant on receptors — whether humans, fauna or flora — is an exceptionally difficult undertaking. The control of toxic chemicals illustrates the problem. We live in a world in which chemicals play an inevitably important part. In the U.S. about 250,000 new chemicals are produced annually of which about 1000 find their way into the commercial market place.⁴⁸ The population of the United States is exposed to about 60,000 to 70,000⁴⁹ out of a mind boggling universe of 5 million known chemicals.⁵⁰ A National Research Council (NRC) panel concluded that

46. This was the argument in *Vermont Yankee Nuclear Power Corp. v. Natural Resources Defense Council, Inc.*, 435 U.S. 519, (1978). The arguments for energy efficiency and alternative sources of energy are forcefully employed by those proposing a cut in the emission of carbon dioxide in order to avert global warming. See e.g., S. 324, 101st Cong., 1st Sess., 135 CONG. REC. S1024 (daily ed. Feb. 2, 1989); H.R. 1078, 101st Cong., 1st Sess., 135 CONG. REC. H370 (daily ed. Feb. 22, 1989).

47. See J. FORRESTER, *WORLD DYNAMICS* (1981); Norton, *Towards a Concept of Strategic Resource Planning*, 4 INT'L J. OF ENVTL. STUDIES 189 (1973). The case for an integrated environmental resource strategy has been cogently argued in the World Conservation Strategy (WCS). INTERNATIONAL UNION FOR CONSERVATION OF NATURE AND NATURAL RESOURCES-UNITED NATIONS ENVIRONMENT PROGRAMME-WORLD WILDLIFE FUND: *WORLD CONSERVATION STRATEGY* (1980), reprinted in 23 *INTERNATIONAL PROTECTION OF THE ENVIRONMENT* (B. Ruster & B. Simms eds. 1981). Put starkly, WCS warns that an increasing pollution burden, together with the depletion of vital natural resources and the destruction of critical ecosystems cannot continue unabated. It argues that further development and progress will depend on how society faces up to the frightening fact that natural resources and ecological processes which support and sustain human communities and the environment are being appropriated for consumption on the one hand while being damaged on the other by pollution resulting from the burden of residuals. Any satisfactory answer to these problems can only be found within the parameters of a strategy which seeks (1) to manage and conserve natural resources so as to extend and prolong their life cycle, (2) to preserve ecosystems and genetic diversity, and (3) to minimize the impact of pollutants and wastes. The WCS reasons that all of these undertakings should form part of an integrated strategy.

48. W.M. RODGERS, *ENVIRONMENTAL LAW, PESTICIDES AND TOXIC SUBSTANCES* 373 (1988).

49. CONSERVATION FOUNDATION, *STATE OF THE ENVIRONMENT: AN ASSESSMENT AT MID-DECADE 65* (1984).

50. NATIONAL ACADEMY OF SCIENCES COMMISSION ON LIFE SCIENCES, *TOXICITY TESTING: STRATEGIES TO DETERMINE NEEDS AND PRIORITIES 3* (1984) [hereinafter *TOXICITY TESTING*].

toxicity studies have not been done on the majority of chemicals — amounting to tens of thousands — now in industrial use in the United States.⁵¹

Ascertaining the synergistic effects of all these chemicals is bafflingly difficult. There is very little knowledge about how frequent or how strong synergistic or blocking effects might be. There is an equal paucity of knowledge of the combinations of substances and activities that are likely to give rise to adverse synergistic effects.⁵² Secondly, there is little data about a pollutant's transport and fate once it enters the environment. Information about the transfer, degradation, accumulation and interaction of a chemical with other pollutants is sparse.⁵³ These difficulties are multiplied by the fact that many hazards produce their effects by exposure over time.⁵⁴ It is not known how much difference this time dimension makes for particular hazards or which rate of exposure carries the greatest risk.⁵⁵ Finally, there are a cluster of difficulties surrounding the uncertainties of risk assessments and the need for a common measurement, unit or metric if one is to embark on IPC. These difficulties will be discussed when dealing with environmental impact assessment.

II. THE INTERNATIONAL AND COMPARATIVE DIMENSION

Nature's writs are ubiquitous and universal. The laws of nature give rise to identical bio-physical reactions in Los Angeles, Birmingham, Dusseldorf, Oslo or Auckland. When discharges of wastes or residuals lead to pollution, common bio-physical reactions take place regardless of where in the world the environment is abused. Given the unique commonality and universality of environmental problems, the need for comparing indigenous solutions with those of other jurisdictions within a common domain is inescapable.⁵⁶

The common domain of environmental problems calls for a comparative approach to both national and international problems. The wide and varied claims made for comparative law may, with some impunity, be placed in two broad categories: jurisprudential and practical. The jurisprudential approach takes a variety of forms but is ultimately concerned with evaluating whole

51. *Id.*

52. IMPROVING RISK COMMUNICATION, *supra* note 33, at 43.

53. CROSS-MEDIA POLLUTANTS, *supra* note 27; IMPROVING RISK COMMUNICATION, *supra* note 33, at 40-41. Thus, the hazardous substance released at source may be different in quantity and kind from those to which people are ultimately exposed. Measurement of exposure, for the purpose of determining effects to human health are, therefore, best determined at the places where people live and work. Such an exercise can be very expensive.

54. Exposure to radiation for example, will have different effects depending on whether it occurs at once, is spread over several smaller exposures, or is continuous at a low rate over a long period of time. IMPROVING RISK COMMUNICATION, *supra* note 33, at 41.

55. TOXICITY TESTING, *supra* note 50, at 60.

56. The problem oriented approach to comparative law is well established. See e.g., Howard, *International Legal Studies* 26 U. CHI. L. REV. 577, 584 (1959); K. ZWEIGERT & H. KOTZ, *INTRODUCTION TO COMPARATIVE LAW* 1-27 (1987).

legal systems, the cosmic whole as distinct from improving discrete areas of substantive or procedural law. The purpose of engaging in a comparative study of different legal systems is primarily to discover values and principles that are universally and generally valid.⁵⁷

The jurisprudential approach is illustrated by article 38 of the Charter of the International Court of Justice which identifies "the general principles of law recognized by the civilized nations" as one of the sources of public international law. Comparative law is essential to a study and understanding of the supposedly vast reservoir of legal concepts and precepts shared by national legal systems.⁵⁸

The practical claims of comparative law are considerably more modest, and were succinctly articulated by Henry Maine nearly a century and a quarter ago. Maine wrote that the chief function of comparative law "[i]s to facilitate legislation and the practical improvement of law."⁵⁹ The legal systems of every society face a common array of problems that are solved by different means and with contrasting results. Similar problems frequently find similar answers, and the practical benefits of comparative law were brought home with homely wisdom by the German jurist Rudolph von Jhering. He observed that "[n]o one will fetch a thing from abroad when he has as good or better at home; but only a fool will reject the bark of the chinchona because it did not grow in his vegetable garden."⁶⁰ By liberating herself from the narrow confines of an individual system, and examining how

57. The earlier English jurists such as Pollock, Holland and Allen identified comparative law with comparative legal history which they perceived and defined as the historical study of laws in general. See Pollock, *The History of Comparative Jurisprudence*, 5 J. COMP. LEGIS. & JURISP. 74 (New Series, 1903); T.E. HOLLAND, *THE ELEMENTS OF JURISPRUDENCE* 8 (9th ed. 1900); ALLEN, *LAW IN THE MAKING* 21-22 (7th ed. 1964). They adhered to a strong continental tradition which explained the nature of law within a framework of common, universal legal history. See Zweigert & Siehr, *Jhering's Influence on the Development of Comparative Legal Method*, 19 AM. J. COMP. L. 215 (1971). Others, such as SALMOND, *JURISPRUDENCE* 8 (10th ed. 1947), viewed it as the study of the resemblances and differences between different legal systems. For a review of these earlier views, see H.C. GUTTERIDGE, *COMPARATIVE LAW* 3-4 (1946). One contemporary writer sees comparative law, first, as being legal history concerned with the relationship between systems, and secondly, as exploring the nature of law and the nature of legal development. See A. WATSON, *LEGAL TRANSPLANTS* 6-7 (1974). Von Mehren places Roscoe Pound within the jurisprudential tradition. See Von Mehren, *Roscoe Pound and Comparative Law*, 13 AM. J. COMP. L. 507, 509, 514 (1964). Von Mehren himself appears to identify with the jurisprudential tradition. Von Mehren at 514. Zweigert and Kotz see the purpose of comparative law as discovering universally valid norms and bring it very close to natural law principles, but are also mindful of its practical benefits to the legislator. See 1 ZWIEGERT & KOTZ, *supra* note 56, at 3, 15, 45.

58. Schlesinger, *Introduction*, in *FORMATION OF CONTRACTS: A STUDY OF THE COMMON CORE OF LEGAL SYSTEMS* 8 (R.B. Schlesinger ed. 1968).

59. H. Maine, *VILLAGE COMMUNICATIONS IN EAST AND WEST* 3-9 (1971).

60. Zweigert & Siehr, *supra* note 57. (citing *GEIST DES ROMISCHEN RECHTS* (pt.1), at 8-9 (9th ed. 1955)). In similar vein, Gutteridge inquired as to "[w]hat would have been the fate of the art of healing if our physicians and surgeons had disregarded the research of foreign workers in the same field?" H.C. GUTTERIDGE, *COMPARATIVE LAW* 24 (1946).

other jurisdictions treat common problems, the comparative lawyer becomes a better problem solver and law reformer. This Article falls within the practical, not jurisprudential, tradition of comparative law.

Some environmental problems lie outside the jurisdiction of national law, and fall within the realm of international law. Comparative law is of equal relevance even where the inability of national systems to cope with international problems calls for international solutions. A comparative approach recognizes no essential distinction between national and international problems, and easily surmounts the barriers between domestic and international law. Comparisons are capable of shadowing the various forms of law. Consequently, the comparative method can be used with equal facility in both international and national law. The distinct milieu of international law gives the comparative method a particular hue and binary quality, but leaves intact its essential character and integrity. For example, acid rain constitutes one of the major international environmental problems of our day.⁶¹ Comparing the experiences of other countries has become a central plank in the search for the causes, effects and remedies for acid rain in national and international regulation.⁶² Not surprisingly, IPC is an area in which the comparative method retains its relevance and validity both in international and national laws. A comparative study of the way in which the problem has been perceived and tackled by various countries may lead to a variety of results. First, nations may improve their own system by learning from the experience of other nations. Second, harmonization of the law dealing with environmental integration as between nations may result particularly among regions which are geographically or ecologically connected. Third, common methods of solving problems through integrated regulation may be embodied in an international treaty or convention. This may lead to a final stage where

61. See generally G.S. WETSTONE & A. ROSENCRANS, *ACID RAIN IN EUROPE AND NORTH AMERICA: NATIONAL RESPONSES TO AN INTERNATIONAL PROBLEM* (1983); B. BOLIN, *AIR POLLUTION ACROSS BOUNDARIES: THE IMPACT ON THE ENVIRONMENT OF SULPHUR IN AIR AND PRECIPITATION, SWEDEN'S CASE STUDY FOR THE UNITED NATIONS CONFERENCE ON THE HUMAN ENVIRONMENT IN STOCKHOLM* (1972); OECD, *THE STATE OF THE ENVIRONMENT* 17 (1985). See also J. REGENS & R. RYCROFT, *THE ACID RAIN CONTROVERSY* 6-7 (1988).

62. ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT, *THE OECD PROGRAMME ON LONG-RANGE TRANSPORT OF AIR POLLUTANTS* (1977). The OECD's findings offered the first independent verification of Scandinavian charges that imported air pollution was the primary source of sulfuric acid pollution in Sweden and Norway. Wetstone, *A History of the Acid Rain Issue*, in *SCIENCE FOR PUBLIC POLICY* 168 (H. Brooks & C. Cooper eds. 1987).

Negotiations between Canada and the United States led to the 1980 signing of the Memorandum of Intent Concerning Transboundary Air Pollution (MOI), reprinted in 20 I.L.M. 1371 (1981). The MOI expressed the signatories' intent to sign a bilateral agreement on acid rain, and set out a number of interim measures that would facilitate such an agreement. Pursuant to the MOI, joint scientific "work groups" were set up to begin the "cooperative action" envisaged by it. Work groups were constituted to investigate emission trends, atmospheric chemistry, environmental impacts, and control strategies. *Id.* at 173. See also J. BRUNNEE, *ACID RAIN AND OZONE LAYER DEPLETION* 198-207 (1988).

there is a unification of methods of integration. The objective of unification is to reduce or eliminate the discrepancies between national legal systems. Unification can be achieved by the implementation of treaties, containing the relevant measures, or the adoption of model laws, based upon comparative studies, that states voluntarily enact into their domestic law.

This Article is concerned with the improvement of U.S. law and progresses no further than the first stage in the measures referred to above. It will briefly review the methods of integration adopted by the European Communities (EC), the United Kingdom (UK) and Sweden. Each offers laws and policies that can be compared, adapted and profitably matched with those of the United States. The article will then refer to relevant U.S. laws and policies to demonstrate how home-grown measures can be revitalized by foreign initiatives that point the way forward.

A. The European Communities

The European Community (EC) is a supranational organization which is empowered to legislate for its member states in defined areas.⁶³ In the province of environmental policy it has legislated largely through directives that member states are obliged to implement. The EC decided to embark upon an environmental policy in 1972 and since then has adopted a large number of environmental directives. Most of these directives are confined to a single environmental medium. EC directives reflect the administrative structure of the Directorate-General for the Environment, which itself is divided into divisions dealing with water, air, waste and chemicals policy.

There were some doubts as to whether the EC possessed an environmental competence.⁶⁴ The Single European Act of 1 July 1987 (amending the Treaty of Rome) laid these doubts to rest. The Act includes a title headed "Environment." Article 130 R (2) stipulates that Community environmental action shall be based on preventive principles that rectify environmental damage at

63. The European Communities was created by treaty. See Treaty Establishing the European Economic Community as Amended by Subsequent Treaties. Rome, 25 March 1957 and the Single European Act, Luxembourg, 17 February 1986 and The Hague, 28 Feb. 1986., reprinted in B. RUDDEN & D. WYATT, BASIC COMMUNITY LAWS (1986). The EC is presently comprised of 12 nations. While the EC is a species of international organization, it is much more than an ordinary international organization created by international law. In reality, it is a new distinctive legal order or legal system. Community law possesses a number of properties which are foreign to traditional international law. The most important of these attributes is that community law is a common internal law among the member states rather than a law between those states. Furthermore, the object of community rules establishing and maintaining a common market is the regulation of the conduct of national governments as well as private persons. For an introduction to the differences between community and international law, see P. KAPTEYN & P. VERLOREN VAN THEMATAAT, INTRODUCTION TO THE LAW OF THE EUROPEAN COMMUNITIES 36-45 (L.W. Gormley 2d ed. 1989). For a general comparison of EC and U.S. environmental law, see E. REHBINDER & R. STEWART, ENVIRONMENTAL PROTECTION POLICY (1985).

64. E. REHBINDER & R. STEWART, *supra* note 63, at 15-32.

source. It further provides that environmental protection shall be a component of the Community's other policies. The new environmental jurisdiction of the EC encompasses both macro and micro concepts of IPC.

The macro policy ensures that environmental factors shall be a component of all other policies of the Community. As the Fourth Action Programme for the period 1987-1992 states,⁶⁵ this means that environmental protection policy could become "an essential component of the economic, industrial, agricultural and social policies implemented by the Community and its Member States."⁶⁶ Such a view is now embodied in the Single European Act which states that "[e]nvironmental protection requirements shall be a component of the Community's other policies."⁶⁷

Apart from such over-arching and strategic integration, the Single European Act, by providing that "environmental damage should as a priority be rectified at source...", refers to an operational concept central to cross-media pollution and IPC. The concept of pollution control at source was referred to in the First Action Programme of the EEC⁶⁸ but as the Fourth Action Programme points out, was not a policy on which much progress has been made.⁶⁹ It is a concept that warrants consideration.

While considering pollution control at source, it should be noted at the outset that the Commission (of the EC) regards an integrated approach to only be of limited applicability. The Commission believes that problems caused by the emission of pollutants from many sources into a single medium (with no significant cross-media effect) are appropriately controlled by emission limits or by environmental quality standards. Until now, the EC has tended to follow this approach.⁷⁰ The Commission argues, however, that piecemeal restrictions on discharges to air, land, and water, may have resulted in maximum pollution reduction not being achieved in the most economic manner.⁷¹ Accordingly, the Commission contends that a source oriented

65. *Resolution on the Continuation and Implementation of an Action Programme for the Period 1987-1992*, C 289 O.J. EUR. COMM. 3 (1987) (resolution of the Council of the European Communities adopted October 19, 1987). The text of the Action Programme is found in Commission of the European Communities, *Draft for a Resolution of the Fourth Action Programme*, C 30 O.J. EUR. COMM. 70 3-45 (1987) [hereinafter *Action Programme*]. Action Programmes are the instruments by which the Commission of the EC outlines its legislative intentions. There have been four such programmes in the last fifteen years, and they provide a policy framework within which EC environmental laws will be made. They are not legislative schedules, but incorporate broad formulations of policy. As we shall see, not all the policies set out in Action Programmes are the subject of legislation. These Action Programmes, nonetheless offer good evidence of the direction of EC policy and law. See N. HAIGH, *EEC ENVIRONMENTAL POLICY AND BRITAIN* 9-11 (2d ed. 1987).

66. *Action Programme*, *supra* note 65, ¶ 2.3.1.

67. Single European Act of July 1, 1987, art. 130 (R)(2).

68. C. 112 O.J. EUR. COMM. 1 (1973).

69. *Action Programme*, *supra* note 65, ¶ 3.4.1.

70. *Id.* ¶ 3.2.1.

71. *Id.* ¶ 3.2.3.

approach, aimed at individual industries or target groups of industries, and covering all discharges to air, land, or water is appropriate and worth reconsidering in "certain circumstances." In order to pursue such an approach, more comprehensive knowledge about the way in which wastes arise, as well as how they are disposed, is required.

The Commission is aware of the difficulties in adopting a source oriented approach. First, pollutants may already be regulated under sectoral legislation, and this could lead to charges of discrimination by those industries that will be controlled under two regimes. Second, there are great difficulties in making judgments as to what constitutes an optimal distribution of wastes. The Commission apparently thinks it is one thing to agree in principle to an optimal distribution of wastes, while it is altogether another thing to make decisions or judgments on how to put such an ideal into practice. Finally, the problems of enforcing IPC can be particularly intransigent in an international community such as the EC.⁷²

As for the control of single pollutants or "substance-oriented" controls, the Fourth Action Programme concedes that previous EC laws have tended to deal with discharges of a particular pollutant into one medium without considering its possible impacts on others. It continues that there has "not yet been a coherent attempt within the Community to assess substances on a cross-media basis or to devise control strategies on such a basis"⁷³ An integrated strategy would seek to: 1) assess how a particular substance affects "targets" (people or the environment) in the course of its various pathways; 2) account for the different routes through which targets are exposed; 3) assess the effects of such exposure; and 4) set standards designed to limit the impact of that pollutant wherever appropriate. Such a risk evaluation should lead to the creation of a list of substances or pollutants which need to be controlled. Pursuant to their resolve, the Commission made a proposal for legislation controlling asbestos pollution⁷⁴ which incorporated such an approach.⁷⁵ This directive has now been adopted.⁷⁶

The prospects for a cross-media approach to pollution control have been made easier by two other legislative acts of the EC, which owe their inspiration to U.S. legislation. The more important of these is the recently

72. *Id.* ¶ 3.4.4. The argument is that uniform standards are much easier to apply and to police. Even environmental quality objectives are more difficult to enforce than uniform emission or discharge standards. IPC will compound those difficulties.

73. *Id.* ¶ 3.3.2. It points out, however, that, in certain cases, the "haphazard" evolution of controls in various sectors may have actually led to effective control. *Id.*

74. C 28 O.J. EUR. COMM. 27 (1985).

75. *Action Programme*, *supra* note 64, ¶ 3.3.5.

76. *Council Directive on Prevention and Reduction of Environmental Pollution by Asbestos*, Mar. 28, 1987, L 85 O.J. EUR. COMM. 40 (1987). This is the first example of an EC directive setting control including numerical emission limits over three environmental media by one substance in a single directive.

adopted Directive on Environmental Impact Assessment.⁷⁷ It stipulates that public or private projects likely to have significant effects on the environment, by virtue of their nature, size or location, can be approved only after a prior assessment of their effects. The Directive requires mandatory environmental assessment for projects which are capable of causing serious environmental harm and lists these projects in Annex 1.⁷⁸ The projects listed in Annex 2 are not mandatory, and are subject to an assessment if member states consider they will have a significant effect on the environment. Where an environmental assessment is required, the developer shall supply information about its environmental impact.⁷⁹ This information is to be made available to the public, who must be given an opportunity to be heard before the project is initiated.⁸⁰ The resemblance between the EC Directive on environmental assessment and NEPA is not accidental. The Directive was inspired by NEPA.⁸¹

The other Directive which makes it easier for the EC to embark on a policy of cross media pollution control is the Sixth Amendment to the 1967 Directive on Dangerous Substances. This directive requires some form of risk evaluation and environmental assessment, though not in the same formalized manner as an environmental impact assessment, to be carried out before any new chemical substance is marketed.⁸² This piece of legislation was also influenced to some degree by the Toxic Substances Control Act 1976.⁸³

The Action Programme, therefore, seems to recognize the need for IPC, but is apparently daunted by the difficulties, especially with regard to the

77. *Council Directive on the Assessment of the Effects of Certain Public and Private Projects on the Environment*, June 27, 1985, L 175 O.J. EUR. COMM. 40 (1985) [hereinafter *Directive*]. The Directive is intended to put into practice the preventive policies of the EC. It states in its preamble that "the best environmental policy consists in preventing the creation of pollution of nuisances at source, rather than subsequently trying to counteract their effects...." *Id.*

78. *Id.* Annex 1. The projects within the scope of mandatory environmental assessment are: oil refineries, large thermal power stations and nuclear power stations and reactors, installations for storage or disposal of radioactive waste, iron and steel works, installations for extracting and processing asbestos, integrated chemical installations, constructions of motorways, express roads, railway lines and airports, trading ports and inland waterways and installations for incineration, treatment or landfill of hazardous waste. *Id.* In exceptional cases a project may be exempted from the provisions of the Directive. *See Id.* art. 2(3).

79. The required information includes: a description of the project comprising information of the site, design and size; an outline of the main alternatives and an indication of the main reasons for his choice having regard to environmental effects; a description of the environment likely to be significantly affected by the proposed project; a description of measures envisaged to prevent, reduce and, where possible, offset any adverse environmental effects, together with a non-technical summary of this information. *Id.* art. 5; *See also id.* Annex 3.

80. *Id.* art. 6(2).

81. This was clearly acknowledged in the Second Action Programme. C 139 O.J. EUR. COMM. 1 (1977); *see also* N. HAIGH, *supra* note 65, at 352; Wood, *Environmental Assessment-the E.C. Directive*, J. PLANNING L. 4 (1986).

82. L 259 O.J. EUR. COMM. 10 (1979).

83. N. HAIGH, *supra* note 65, at 241.

control of pollutants at source. Such a position is understandable given the difficulties surrounding the meaning and interpretation of IPC as well as the political problems surrounding the enactment of EC legislation. These problems were compounded by the absence of legislation dealing with environmental impact assessment. Now that such legislation has been enacted, the Commission may have difficulty in ignoring the obligation quite unequivocally contained in the environmental amendments to the Treaty of Rome. Article 130 R (2), as we have seen, requires that community laws "shall be based on the principle...that environmental damage should as a priority be rectified at source...." In the light of this mandate, pollution control at source could come to embrace more than single pollutants, and might constitute a broader foundation for future EC environmental law and policy.

The relevance of the EC experience for the U.S. arises in three ways. First, it illuminates the possibility of controlling the sources of pollution through a version of IPC that embraces other socio-economic policies. Second, by treating environmental policies as an integral part of broader governmental policies, the EC offers an invaluable example of a strategic commitment to IPC that cannot be ignored. Finally, the EC demonstrates the undeniably critical role that environmental assessment should play in the formulation of IPC.

B. United Kingdom

The United Kingdom has a long history of pollution control legislation, which began with public health⁸⁴ and grew into an extensive corpus of laws, policies and agencies spanning land use planning and the control of pollution in general.⁸⁵ These laws and policies, together with the bureaucracies created

84. Pollution control legislation is traceable, at least, to the Benthamite inspired reforms of Chadwick, such as the Public Health Acts of 1848, 1872, and 1875, during the middle of the Nineteenth century. See A.V. Dicey, *The Debt of Collectivism to Benthamism*, in *LAW AND PUBLIC OPINION IN ENGLAND* (Lec. XII) (2d ed. 1962).

85. Prior to the present developments on IPC, serious (usually non-combustible) air pollution was controlled under the Health and Safety at Work Act of 1974 together with the Alkali Works Regulation Act of 1906. Less serious pollution (usually combustible) was governed by the Clean Air Acts of 1956 and 1968. Emissions from motor vehicles came within the purview of the Road Traffic Act 1972, and the sulphur content of oil fuel used in furnaces was restricted by the Control of Pollution Act 1974.

Prior to the establishing of Her Majesty's Inspectorate of Pollution (HMIP) in 1987, the administration of the laws dealing with serious air pollution was vested in Her Majesty's Industrial Air Pollution Inspectorate (HMI-API). They have since been absorbed into HMIP. Non-combustible sources continue to be regulated by local authorities. Water pollution is controlled under the Control of Pollution Act 1974 (COPA), but certain "red list" substances have now been brought within IPC. COPA is administered by statutorily created Regional Water Authorities. The disposal of waste on land is controlled under the Control of Pollution Act 1974 and is administered by waste disposal authorities. Here again some processes generating large

by them, are encompassed within a legal and political tradition characterized by pragmatism and incrementalism. In general, legislation has attempted to locate, contain and control the diverse problems of pollution within just one of the media of land, air or water, with apparent disregard of cross-media implications.

The Fifth report of the British Royal Commission on Environmental Pollution (RCEP),⁸⁶ advocating the concept of the best practicable environmental option (BPEO), began a reassessment of the fragmented nature of British environmental policies.⁸⁷ Though the U.K.'s journey from fragmen-

amounts of waste have also been brought within IPC. The Radioactive Substances Act controls use and disposal of radioactive waste. It was administered and enforced by a separate inspectorate, now absorbed into HMIP. Commercial nuclear installations are governed by the Nuclear Installations Act 1965, and the Nuclear Installations Inspectorate. Planning controls under the Town and Country Planning Act of 1971 are carried out by local planning authorities. See THE CONTROL OF POLLUTION ENCYCLOPEDIA (J.F. Garner ed. 1976); ENCYCLOPEDIA OF PLANNING LAW AND PRACTICE (D. Heap ed. 1982); J. McLOUGHLIN & M.J. FORSTER, THE LAW AND PRACTICE RELATING TO POLLUTION CONTROL IN THE UNITED KINGDOM (2d. ed. 1982); U.K. DEPT ENV'T, POLLUTION PAPER No. 9, CONTROL OF POLLUTION IN THE UNITED KINGDOM: HOW IT WORKS (1978); A. WALKER, LAW OF INDUSTRIAL POLLUTION CONTROL (1980); A.S. WISDOM, THE LAW OF RIVERS AND WATERCOURSES (4th ed. 1979); DEPARTMENT OF THE ENVIRONMENT, INTEGRATED POLLUTION CONTROL (1988).

86. RCEP, No. 5, *supra* note 8. The RCEP is a prestigious, permanent, national, bipartisan body which was appointed in 1971 "to advise on matters, both national and international, concerning the pollution of the environment; on the adequacy of research in this field; and the future possibilities of danger to the environment." *Id.* The RCEP has no specific or restricted task. They are authorized to inquire into any matters on which they think advice is needed. See ROYAL COMMISSION ON ENVIRONMENTAL PROTECTION (Rep. No. 1, 1971).

The RCEP argued that the pollution or wastes generated by an industrial activity could potentially affect water and land as well as air. RCEP, No. 5, *supra* note 8. For example, in order to reduce atmospheric pollution, gases or dusts may be trapped in a spray of water or washed out of filters. This leaves polluted water which, if not discharged to a sewer or direct to a river or sea, can be piped into a lagoon to settle and dry out, leaving a solid waste disposal problem. In deciding where pollution should occur it is sensible that the form and medium of disposal should be such as to cause the least environmental damage overall. Decisions should be aimed at securing the best practicable environmental option (BPEO). Such an approach did not find support in law or administration. *Id.* ¶ 264. In order to achieve this, the RCEP recommended the creation of a new, unified inspectorate (Her Majesty's Pollution Inspectorate) which would undertake an integrated approach to difficult industrial problems. *Id.*

87. The belated response to the 1973 proposal came from the Thatcher Government in 1982 (the previous Labour Government, after prolonged consideration, had accepted the proposal, but were voted out of office in 1979). The proposal for a new unified inspectorate was rejected: the Government had no wish to add a further tier of administration and bureaucracy and, moreover, one which might be seen as usurping local government functions. U.K. DEPT ENV'T, POLLUTION PAPER No. 18, AIR POLLUTION CONTROL (1982). The concept of BPEO, however, was acknowledged to be one of "considerable power and utility," and one which is already encompassed in the Government's approach to the environment. *Id.* See also U.K. DEPT ENV'T, POLLUTION PAPER No. 22, CONTROLLING POLLUTION: PRINCIPLES AND PROSPECTS (1984). It added, in an important rider, that a BPEO approach was not one which could be applied often as there were not many situations in which major choices existed in practice as to what the medium or manner of waste disposal should be. U.K. DEPT OF ENV'T, POLLUTION PAPER No. 18. Five years later, the government changed its mind about the need for a unified pollution control agency, partly due to continued pressure from the RCEP, which returned to the theme of BPEO in its Tenth and Eleventh Reports. RCEP, No. 12, *supra* note 8.

tation to integration has spanned 17 years, the steps it now has taken herald a transition from a fragmented to a more integrated system.

In essence, the British realized that pollutants have effects in media other than those into which they are released, and that reducing the opportunities to dispose of a waste to one medium often increases the need to dispose of the waste (or its modified components) in another media. The British appreciated that the optimal disposal path for a particular waste will only be found if both these points are taken into account, and the option selected is one that causes least overall damage to the environment.

As a first step towards integrated pollution control the government created a new combined "Pollution Inspectorate" out of the existing separate inspectorates. The British acknowledged the absence of statutory authority which empowered such a balanced, cross-media approach to pollution control.⁸⁸ That shortcoming has been overcome by government proposed legislation that is expected to be enacted in 1990.⁸⁹ The main purpose of the new legislation is to introduce "an effective cross-media approach to pollution control leading to a real and lasting overall reduction of pollution."⁹⁰

The pending legislation modifies and extends the existing licensing system governing air pollution. That system would be enlarged to cover a wider range of processes and types of plants, and would include certain discharges

While the RCEP reports must have put some pressure on the Government, two other reasons are more striking. A new Minister, William Waldegrave, arrived in the Department of the Environment and soon made public his view that there was a strong case for establishing an independent, integrated environmental agency on the lines of EPA. 139 ENVIRONMENTAL DATA SERVICES (ENDS) 3 (1986). Finally, the Government, which was pursuing its drive to streamline and cut bureaucracy, appointed a committee to examine ways in which existing administrative arrangements for pollution control could be made more efficient and effective. The committee reported that these objectives could be achieved by the integration, with no increase in overall numbers, of various inspectorates dealing with air pollution, hazardous waste, water pollution and radiochemicals. U.K. DEP'T ENV'T, EFFICIENCY SCRUTINY REPORT, INSPECTING INDUSTRY: POLLUTION AND SAFETY (1987).

The Thatcher Government accepted the proposal for a unified inspectorate of pollution, and named it Her Majesty's Inspectorate of Pollution (HMIP). It did not, however, encompass all existing inspectorates and was not based upon a fresh legislative mandate. U.K. DEP'T ENV'T, HER MAJESTY'S INSPECTORATE OF POLLUTION (1987) [hereinafter HMIP]. The HMIP was superimposed upon the existing statutory overlay, and brought together HMIAP, the Radiochemical and Hazardous Waste Inspectorates, but did not embrace the environmental functions of the Ministry of Agriculture, Fisheries and Food, the Health and Safety at Work Executive or the Department of Energy. Neither did it include certain other inspectorates. Most importantly, it has hardly any control over water pollution. *See also* RCEP, Rep. No. 12, ¶ 4.6. Furthermore, the initial structure of HMIP was based on the separate inspectorates it has absorbed.

88. DEPARTMENT OF THE ENVIRONMENT, INTEGRATED POLLUTION CONTROL, *supra* note 85, at 5.

89. Environmental Protection Bill #14 (1989). The legislative process in the U.K. is quite unlike that of the U.S. The government of the day (the executive) controls the legislature. Consequently, legislation proposed by the government is almost invariably passed.

90. DEPARTMENT OF THE ENVIRONMENT, INTEGRATED POLLUTION CONTROL, *supra* note 85, at 8.

to waters and sewers as well as some hazardous wastes.⁹¹ The licensing authority of Her Majesty's Inspectorate of Pollution (HMIP) is further empowered to set specific conditions including the use of the "best available techniques not entailing excessive costs." In cases involving releases to more than one environmental medium, the conditions prescribed will ensure that pollution to the environment as a whole is minimized. The license further places a residual duty on the licensee to render harmless, using the best available techniques not entailing excessive cost, releases from any processes not covered by the specific conditions.⁹² In carrying out its mandate HMIP will ensure that no existing legislative, EC, or international standards are breached.

The system of integrated pollution control introduced by the U.K. is penned in by the factory wall. It is a socio-technical system largely confined to plant, process, and substance. It clearly is not a strategic system that attempts to integrate environmental policies with other governmental ones, nor is it one that deals with the broader socio-political issues. The experience of the United Kingdom, however, indicates that it is possible to bring sources and substances within a technology based system of integrated pollution control. It also reveals how IPC could be built around existing standards. There is, in other words, no need to relax or rewrite existing standards in order to establish IPC. What the U.K. experience further demonstrates is that the move to an integrated approach can be justified on efficiency grounds.⁹³ It is erroneous to equate integrated pollution control with greater bureaucracy. Indeed, the U.K. maintains that IPC would help industry by offering a streamlined authorization procedure. Furthermore, it would make more efficient use of pollution control resources by obviating the need for maintaining a structure based on regulating discharges to the three media separately.⁹⁴

C. Sweden

In Sweden,⁹⁵ a single body of legislation, the Environment Protection Act of 1969, laid the foundations for cross-media pollution control by providing that pollution should be controlled at source. This Act replaced the existing sectoral control and states that pollution "from land, buildings or

91. Environmental Protection Bill #14 (1989).

92. *Id.*

93. DEPARTMENT OF THE ENVIRONMENT, INTEGRATED POLLUTION CONTROL, *supra* note 85, at 1.

94. *Id.* at 7-8.

95. The section on Sweden is indebted to Hinrichson, *Integrated Permitting and Inspection in Sweden*, in INTEGRATED POLLUTION CONTROL, *supra* note 8. See also ORGANIZATION OF ECONOMIC CO-OPERATION AND DEVELOPMENT, ENVIRONMENTAL POLICY IN SWEDEN (1977).

installations" whether it be in water, air, or land or take the form of noise should come within its jurisdiction. The authority to grant permits to major polluting sources is placed in the hands of the National Franchise Board.⁹⁶ One permit covers discharges to air, water and land. In deciding what the permissible limits of pollution should be, Sweden does not rely upon predetermined standards, whether they be ambient or source related, but on the best practicable technological means.

Even though major pollutants are regulated according to the environmental medium of release, each waste stream is ultimately assessed according to its contribution to the totality of pollution. For example, if a waste incinerator is mandated by the permit to place filters on its exhaust stack to remove harmful residues of heavy metals from the flue gases, the technology used to accomplish this task is scrutinized very carefully. A wet process that removes trace metals but merely transfers pollution from air to water is not permitted.

An example of how the Saab-Scania truck manufacturing plant at Osharshamn on the Baltic coast is regulated is instructive on how IPC is implemented.⁹⁷ Under the Saab-Scania permit, emissions to air, water and land are stipulated in one document. The entire waste or residual stream is viewed in its totality and standards are set taking account of technology and environmental impact. Consequently, the Swedish system makes it possible to place stricter controls on some harmful pollutants (such as trichlorethylene, lead, and zinc) while being lenient on others, like nickel, which are not seen as posing as great a threat to the environment or human health.

The Swedish experience demonstrates the possibility of applying IPC to stationery sources and reveals how single permits can be employed. Although the U.K. did not model its system of IPC on the Swedish structure, there is no doubt about how much the two systems have in common. Both are regulated by unified environmental authorities and are based upon single permits. Technology based controls, albeit to a lesser degree in the U.K. than in Sweden, play a key role in both countries.

III. THE WAY FORWARD

A mottled picture emerges from the chrysalis of foreign experience. IPC may not be a modern highway but the road is clearly open. Pioneering difficulties are bound to arise but should not thwart the decision to travel the road of IPC, or to open up a new frontier that redefines and reprints the

96. Every time a large company or sewage treatment plant changes its production or manufacturing processes, builds a new plant or increases capacity by introducing new process technology, it must apply to the National Franchise Board for an alteration of the conditions of the permit.

97. Hinrichson, *supra* note 95, at 237, 239-242.

arc of pollution control. In the following sections this article will address policies and institutions, derived from the comparative review, that hold promise of being melded with what is administratively and legislatively possible in the U.S.

A. A Unified Agency

A unified pollution control agency is central to both the U.K. and Swedish systems. The U.S. pioneered the establishment of a unified Environmental Protection Agency, but the EPA flattered only to fail by not fulfilling the promise of integrated environmental management. In 1970, six months after the enactment of NEPA, President Nixon established two new agencies by executive order: the Environmental Protection Agency (EPA),⁹⁸ and the National Oceanic and Atmospheric Administration (NOAA).⁹⁹ In establishing these two agencies, Nixon made the case for IPC in a persuasive, succinct and cogent manner.

Nixon observed that since environmental problems should be "perceived as a single, interrelated system" the then existing piecemeal federal efforts were inappropriate.¹⁰⁰ A consolidation of anti-pollution activities into one agency, therefore, "would help assure that we do not create new environmental problems in the process of controlling existing ones."¹⁰¹ He hoped that by combining under one roof programs previously housed in several separate

98. For text of the plan, see MESSAGE FROM THE PRESIDENT OF THE U.S., REORGANIZATION PLAN No. 3, H.R. MISC. DOC. No. 364, 91st Cong., 2d Sess. (1970).

99. For text of the plan, see MESSAGE OF THE PRESIDENT OF THE U.S., REORGANIZATION PLAN No. 4, H.R. MISC. DOC. No. 365, 91st Cong., 2d Sess. (1970). The five major programs moved to EPA were: 1) water pollution, formerly carried out by the Federal Water Pollution Control Administration of the Interior Department; 2) air pollution, formerly executed by the National Air Pollution Control Administration in the Department of Health, Education and Welfare (HEW); 3) solid waste management, drinking water quality and radiological health also from HEW; 4) pesticides regulation and research from the Food and Drug Administration and the Agriculture Department; and, 5) ambient standard setting for radiation from the Atomic Energy Commission. See Message of the President Relative to Reorganization Plans Nos. 3 and 4 of 1970, July 9, 1970, reprinted in ENVIRONMENTAL QUALITY: THE FIRST ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY 295 (1970) [hereinafter FIRST ANNUAL REPORT].

For further information on the Reorganization Plans, see MESSAGE FROM THE PRESIDENT OF THE UNITED STATES, RELATIVE TO REORGANIZATION PLANS 3 AND 4 OF 1970, H.R. MISC. DOC. No. 366, 91st Cong., 2d Sess. (1970); COMMITTEE ON GOVERNMENT OPERATIONS, APPROVING REORGANIZATION PLAN No. 3 OF 1970, H.R. REP. NO. 1464, 91st Cong., 2d Sess. (1970); COMMITTEE ON GOVERNMENT OPERATIONS, APPROVING REORGANIZATION PLAN No. 4 OF 1970, 91st Cong., 2d Sess. (1970); *Reorganization Plans Nos. 3 and 4 of 1970, Hearings Before Subcomm. on Executive Reorganization and Government Research*, 91st Cong., 2d Sess. (1970).

100. Environmental Protection Agency and National Oceanic and Atmospheric Administration, The President's Message to the Congress Upon Transmitting Reorganization Plans to Establish the Two Agencies, July 9, 1970, 6 WEEKLY COMP. PRES. DOC. 908 (July 13, 1970).

101. *Id.* at 911.

agencies, the government would be able to "mount an effectively coordinated campaign against environmental degradation in all of its many forms."¹⁰²

Despite its complexity, for pollution control purposes the environment must be perceived as a single interrelated system. . . . A single source may pollute the air with smoke and chemicals, the land with solid wastes, and a river or lake with chemicals and other wastes. Control of the air pollution may produce more solid wastes which then pollute the land or water. Control of the water-polluting effluent may convert it into solid wastes which must be disposed of on land. . . . A far more effective approach to pollution control would: [i]dentify pollutants; [t]race them through the entire ecological chain, observing and recording changes in form as they occur; [d]etermine the total exposure of man and his environment; [e]xamine interactions among forms of pollution; and [i]dentify where in the ecological chain interdiction would be most appropriate.¹⁰³

Nixon returned to this theme in his President's Message accompanying the first report to Congress on the state of the Nation's environment, stressing how the setting up of the EPA would consolidate the fragmented responsibilities of various pollution control agencies. He emphasized again that, "[a]ir pollution, water pollution and solid wastes are different forms of a single problem" and that a different approach was necessary. He felt that reorganization under the EPA together with the Council on Environmental Quality (CEQ), which had been charged by the President with coordinating all environmental quality programs,¹⁰⁴ would make this possible.¹⁰⁵

EPA has not lived up to its expectations. It has not yet become an integrated agency, remaining half programmatic and half functional, and has been unable to adopt or implement an integrated approach.¹⁰⁶ There are organizational reasons as to why this happened,¹⁰⁷ but we have arrived at a situation where those reasons are being swept away by the winds of change.

102. *Id.* at 912.

103. FIRST ANNUAL REPORT, *supra* note 99, at 295.

104. *Id.* The CEQ also stressed the need for integration and coordination in its first report. *Id.* at 24-27.

105. FIRST ANNUAL REPORT, *supra* note 98, at viii.

106. Davis, *The United States: Experiment and Fragmentation*, in INTEGRATED POLLUTION CONTROL, *supra* note 8. Guruswamy, *supra* note 8, at 487-92.

107. Douglas Costle (who was himself later to become EPA's Administrator) directed the White House task force that handled the transition between Congressional approval of the reorganization and the actual start of EPA's operations. Costle concluded that although a reorganization along functional lines was the desired long term goal, an incremental strategy was to be preferred in the short term.

Costle recommended a three stage plan. Initially, the plan would preserve the five programs dealing with air, water, pesticides, solids waste and radiation, and noise. After a period of time, the plan would create three new assistant administrative offices dealing with Planning and Management, Standards and Compliance, and Research and Monitoring. The five individual programs would, however, be allowed to retain their separate identity in the remaining ad-

Integrated pollution controls have been advocated by academic commentators,¹⁰⁸ governmental organizations,¹⁰⁹ non-governmental organizations¹¹⁰ and even by EPA. The CEQ, which was established by NEPA to develop and advise the President on national environmental policy,¹¹¹ to report annually to the President on the quality of the nation's environment,¹¹² and to oversee federal action subject to NEPA¹¹³ has advocated the concept in recent reports. CEQ stated, "[p]erhaps the most disturbing weakness of the

ministrative offices. Finally, after the passage of a reasonable amount of time, the program distinctions were to be eliminated entirely.

There were a number of reasons for Costle's caution in pushing forward with integration. To begin with, the differing policy streams leading to the creation of EPA and the passage of the 1970 Clean Air Act proceeded along parallel paths. The White House's vision of comprehensive environmental management leading to the creation of EPA was not a vision shared by Congress or embodied in the Clean Air Act of 1970. Consequently, EPA mirrored a curious policy division. On the one hand it housed those loyal to the original philosophy of NEPA and EPA while on the other it was staffed by those committed to a programmatic administration based on fragmented policies. EPA was unprecedented in terms of the number and size of disparate agencies brought under a new organizational roof. In many cases the agencies had been rivals who enjoyed substantial autonomy. Costle reasoned that there would be resistance and disruption if integration were attempted immediately. Most bureaucrats within EPA had a program perspective. They were tied to specific legislation, functions, and appropriations. They took their cues from Congress and reflected the pragmatic, fragmented policies of that body.

Second, Costle feared that the agency would undergo a period of confusion and even chaos while its programmatic inheritance was broken down and rebuilt along functional lines. The resulting confusion would prevent it from meeting the obligations of its legislative mandates and particularly the inflexible demands of the Clean Air Act. He feared the agency would come out badly injured after such a baptism of fire. This difficulty was compounded by the fear that managers of EPA's program sections would not go along with a fully integrated plan.

Ruckelshaus, EPA's first Administrator, appeared to be even more apprehensive than Costle. He accepted and carried out the first two stages of Costle's plan, but not the third phase, which fully integrated EPA. It would appear that the primary reason for this was that even the limited division of duties Costle had brought about had led to conflict and restlessness. Apart from being nervous about their position and prospects in a new organization, the bureaucrats he had inherited from other departments and programs were loyal to specific statutes and programs and were unable to view the environment as a whole. These bureaucrats were familiar with and committed to these particular legislative mandates and feared that the concrete directives were in danger of being ignored in the move towards integration. They also had access to Senators and Representatives of Congressional Committees who had enacted such legislation, and continued to supervise their implementation. Faced by the prospect of bureaucratic resistance and Congressional criticism, Ruckelshaus decided to play safe. The initial rumblings of discontent, signifying a bureaucratic preference for fragmentation, led to a special pleading that EPA be excluded from NEPA, and set the stage for EPA's virtual rejection of an integrated approach.

108. See Rehbinder & Stewart, *Environmental Protection Policy*, in 2 *INTEGRATION THROUGH LAW* 1-13 (M. Cappellelli, M. Seccombe & J. Weiler eds. 1985); B. RABE, *supra* note 8.

109. See e.g., *infra* notes 113-114 and accompanying text.

110. NATIONAL RESEARCH COUNCIL, *MULTIMEDIA APPROACHES TO POLLUTION CONTROL: A SYMPOSIUM PROCEEDINGS* (1987); NATIONAL ACADEMY OF PUBLIC ADMINISTRATION, *STEPS TOWARD A STABLE FUTURE* (1986).

111. National Environmental Policy Act of 1969 § 204(1), 42 U.S.C. § 4344(1) (1982).

112. *Id.* § 204(7), 42 U.S.C. § 4344(7).

113. *Id.* §§ 202, 204(3), 42 U.S.C. §§ 4342, 4344(3).

environmental programs of the 1970's was their piecemeal approach to environmental protection, an approach that failed to recognize that the environment, by definition, is an integrated whole that must be protected comprehensively."¹¹⁴

Returning to the theme, CEQ has pointed out that "[a]ll parts of the environment are in some way connected, and it follows that the control of pollution should be integrated across program and disciplinary lines, so as to increase the efficiency of control from a whole-environment perspective and to prevent the unwanted transfer of pollutants from medium to medium."¹¹⁵ In the course of formulating a basis for a more effective and efficient environmental policy, the first principle CEQ adopted was that "[e]nvironmental protection policy must recognize the interconnectedness of the environment and emphasize multimedia approaches to pollution control."¹¹⁶

The EPA also has begun to move towards an integrated approach.¹¹⁷ Despite the problems in setting up a functional agency, which we have discussed, some recognition of the need for IPC came in the early 1970's when an EPA task force admitted to the existence of the agency's integrative mandate.¹¹⁸ Unfortunately, this internal recognition of the need for IPC was swept away by the decision that EPA was not bound by NEPA.¹¹⁹ The first significant step in the direction of integration was taken in 1978 when Administrator Costle appointed a "Task Force on EPA Permits Consolidation." The Task Force cryptically accepted that its long range and ultimate

114. COUNCIL OF ENVIRONMENTAL QUALITY, 14TH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY 7 (1983).

115. COUNCIL OF ENVIRONMENTAL QUALITY, 16TH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY 12 (1985).

116. *Id.* at 20.

117. Significant parts of the following account, dealing with the internal endeavors within EPA to move towards an integrated approach, are based upon Davis, *The United States: Experimentation and Fragmentation*, in *INTEGRATED POLLUTION CONTROL*, *supra* note 8. See also A. ALM, *THE EPA'S APPROACH TO CROSS-MEDIA PROBLEMS 7-13* (1985) (proceedings of a conference held at Washington, D.C., Nov. 13, 1984).

118. An internal task force, examining the extent to which EPA should be bound by NEPA, considered the nature of EPA's commitment to IPC. See ENVIRONMENTAL PROTECTION AGENCY, *APPLICATION OF THE NEPA TO EPA'S ENVIRONMENTAL REGULATORY ACTIVITIES: TASK FORCE REPORT* (1973). The task force recognized that at least one part of the rationale for EPA's creation was to promote a coordinated, multi-faceted approach to the solution of environmental problems. It noted, however, that the specific provisions of some statutory mandates may prevent EPA from undertaking the wider investigation demanded by NEPA. *Id.* at 46. It also drew attention to major unanswerable questions relating to the scope of impact statements under NEPA to which EPA might be subject. They included matters such as the extent to which EPA should consider effects not commanded by or inconsistent with specific statutory mandates, whether a broad scale cost benefit analysis is permissible or required and whether a final statement should be issued prior to proposing regulations. *Id.* at 48.

119. See *infra* notes 146-147 and accompanying text.

goal was that of "regulating pollutants of concern through all phases of air, water and solid waste cycles," but concluded that such a task was beyond its scope.¹²⁰

Costle's initiative led to a consolidated permit program in the early eighties which reformers hoped would synthesize the separate single-media permit systems to provide a more comprehensive environmental evaluation of industrial projects.¹²¹ The consolidated regulations clearly professed to be integrating in intent.¹²² Several environmentalist and industry petitioners challenged these regulations in court.¹²³ The environmentalist groups feared that consolidated regulations might lead to a lowering of existing pollution standards, but did not challenge the need for a comprehensive approach. The main challenge to the regulations came from industry groups who claimed that the regulations imposed additional burdens. President Reagan's Task Force on Regulatory Relief upheld the industry complaints, and the regulations were "de-consolidated" (i.e., repealed).¹²⁴

In 1980 Administrator Costle created a new Integrated Environmental Management Program (IEMP) in the Office of Policy Planning and Evaluation. In mid-1981 IEMP submitted a report to the new Administrator Anne Gorsuch.¹²⁵ The report recommended the institutionalization of toxics integration. The report was duly rejected by Gorsuch and IEMP lay moribund until the end of 1982.

IEMP was resurrected to undertake integrated studies of pollution control applicable to particular industries and particular geographic areas. The industry studies produced a "few interesting results" but for the most part

120. Sellers argues that the Consolidated Permit Program floundered because the original environmental objective of integrating all phases of air, water and solid waste cycles was lost in the effort to justify the program on efficiency and paper reduction grounds. Sellers, *The Rise and Fall of the Consolidated Permit Program — A Case Study of a Reform Effort Within EPA* 9-11 (1984) (unpublished paper submitted to Conservation Foundation).

121. *Id.* The regulations implementing the program, 45 Fed. Reg. 33,290 (1980), were aimed at governing the following: hazardous waste management program under the Resource Conservation and Recovery Act (RCRA); Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6991(i) (1982); the Public Health Service Act, 42 U.S.C. § 300(f)-300(j)(11) (1982) (formerly the Underground Injection Control (UIC) program of the Safe Drinking Water Act (SDWA)); the National Pollutant Discharge Elimination System (NPDES) and State Dredge or Fill programs under the Clean Water Act, 33 U.S.C. §§ 1251-1387 (1982); and the Prevention of Significant Deterioration (PSD) program under the Clean Air Act, 42 U.S.C. §§ 7401-7642 (1982).

122. The most important environmental benefit was listed as the "more comprehensive management and control of wastes." 45 Fed. Reg. 33,291 (1980).

123. *NRDC v. EPA*, 11 Env't. Rep. 1023 (BNA) (1981). See Sellers, *supra* note 120.

124. 13 Env't. Rep. 2205 (BNA) (1983).

125. Anne Gorsuch (later Burford) is notorious for her virulent anti-regulatory position. Taking over what was generally recognized as a comparatively efficient organization in May 1981, she departed EPA in 1983, after an acrimonious tenure leaving it "on the verge of spinning out of control". Davies, *Environmental Institutions and the Reagan Administration*, in *ENVIRONMENTAL POLICY IN THE 1980S: REAGAN'S NEW AGENDA* 143-160 (N. Vig & M. Kraft eds. 1984).

failed to change EPA policy.¹²⁶ The geographic studies are still ongoing. The focus of these studies is no longer to change the way EPA thinks so much as to educate state and local pollution control officials. A relatively new stimulus to an integrated approach was provided in the mid-1980's by the focus on waste reduction, and in 1988 EPA established an Office of Pollution Prevention separated from existing media programs. It is too early to evaluate the effect of this office on an integrated approach to pollution control.¹²⁷

Former Administrator of the EPA, Lee Thomas, unequivocally expressed his commitment to the concept of integration: "[s]urely that is what is needed. Surely that is what environmentalists want. If the Environmental Protection Agency is ever going to live up to its name in the fullest sense, if it is ever going to become more than a holding company for single medium programs, we are going to have to re-examine the roots of environmental policy."¹²⁸

We may now be witnessing significant new developments as the present Administrator, Mr. William Reilly, begins to introduce his own agenda.¹²⁹ In an important address, Reilly clearly reiterated his commitment to IPC. According to him: "[w]e have set our pollutant and medium-specific goals over the last 20 years without ever addressing our overall environmental quality objectives. We didn't assess the effects on ecosystems and human health from the total loadings of pollutants deposited through different media, through separate routes of exposure, and at various locations — in the home, on the job and in between."¹³⁰ The need for IPC, therefore, has become an important part of his vision for the 1990's.

The developments within EPA are accompanied by striking legislative initiatives moving in the same direction. Legislation to elevate EPA to a Cabinet-level department has been introduced in the House of Representatives¹³¹ and the Senate.¹³² President Bush is likely to accept such a Congressional decision.¹³³ The prospects of these proposals becoming law in 1990 are good.¹³⁴ The same legislation also establishes a Commission to study the possible reorganization of the EPA.¹³⁵ The House bill envisages

126. Davies, *supra* note 117, at 87.

127. *Id.*

128. Letter from Conservation Foundation to Hank Schilling, of the Environmental Protection Agency (accompanying the final draft of the Environmental Integration and Reformation Act) (Mar. 13, 1987).

129. Mr. Reilly is the immediate past president of the Conservation Foundation which has been in the vanguard of the move toward IPC. *See supra* note 8.

130. William K. Reilly, *The Turning Point: An Environmental Vision for the 1990's* (Marshall lecture presented to the Natural Resources Defense Council Nov. 27, 1989).

131. H.R. 3847, *supra* note 9.

132. S. 2006, *supra* note 9.

133. N. Y. Times, Jan. 22, 1990 at 1, col. 1.

134. *Id.*

135. H.R. 3847, *supra* note 9, tit. II; S. 2006, *supra* note 9, tit. V.

that the Commission will make findings about the "benefits and detriments of changes in organization of the Department by media and by function."¹³⁶ The Senate version is even more specific. It recognizes "problems with cross-media and residuals management,"¹³⁷ and the need for re-appraisal of EPA's mandate, and calls "for making recommendations on integrating Federal environmental law and other authorities to protect the environment."¹³⁸ Even more significantly, it charges the Commission with making recommendations on "the need for comprehensive pollution control administrative and legislative reforms...."¹³⁹ In light of all these developments, a real prospect exists for the metamorphosis of EPA from a fragmented to a functional and integrated agency. This a promising harbinger for IPC.

B. Environmental Impact Assessment

One of the principal weaknesses of the present fragmented system is its non-cognizance of the full cross-media impact of a waste stream. It is almost impossible to see how such an impact can be ascertained without some kind of environmental impact assessment (EIA). Conversely, EIA holds the most promise as an antidote for cross-media pollution. The U.S. pioneered this imaginative instrument of environmental control. The EIA has enjoyed significant international impact,¹⁴⁰ and has now been adopted by numerous other countries.¹⁴¹

The European Community (EC) sees EIA as the instrument best able to promote IPC.¹⁴² West Germany has proposed introducing environmental assessment into laws dealing with pollution and conservation.¹⁴³ It is difficult, if not impossible, to see how integration could proceed in the UK without it.¹⁴⁴

136. H.R. 3847, *supra* note 9, § 203(4).

137. S. 2006, *supra* note 9, § 501 (referring to the problems of cross-media pollution).

138. *Id.* at § 503.

139. *Id.* at § 503(1).

140. See generally, B.D. CLARK, R. BISSET & P. WATHERN, ENVIRONMENTAL IMPACT ANALYSIS (1980).

141. See e.g., Directive, *supra* note 77. The directive was directly influenced by NEPA. See N. HAIGH, EEC ENVIRONMENTAL POLICY 352 (2d ed. 1987). Australia, New Zealand and Canada adopted environmental impact assessments. Lesser developed countries, such as Malaysia, India, Indonesia, Sri Lanka, Singapore and Turkey have also adopted environmental impact assessments.

142. INTEGRATED POLLUTION CONTROL, *supra* note 8, at 56.

143. *Id.* at 38.

144. Wood, *E.I.A. and B.P.E.O.: Acronyms for Good Environmental Planning?*, J. PLAN. & ENVTL. L. 310, 315 (1988); Guruswamy & Tromans, *Towards an Integrated Approach to Pollution Control*, J. PLAN. & ENVTL. L. 643, 655 (1986); Guruswamy, *Air Pollution and B.P.E.O.*, in BEST PRACTICABLE ENVIRONMENTAL OPTION - A NEW JERUSALEM? 80-83 (1987).

Ironically, EIA in the United States has not been closely linked to the pollution control system.¹⁴⁵ This is despite the fact that all agencies of the Federal Government are apparently obliged to make impact assessments where their actions significantly affect the environment. A plain reading of Section 102 of NEPA demonstrates that the making of environmental regulations constitutes actions significantly affecting the environment. It seems to follow, therefore, that the EPA should be legally obliged to make environmental impact assessments when undertaking their regulatory functions.

Unfortunately, from an early stage in its history, EPA insisted that NEPA did not apply to its own regulatory activities. In several cases in which the issue was raised,¹⁴⁶ EPA persisted in claiming that it was not bound by the provisions of NEPA and sought to justify its position on broad policy grounds. The policy argument was based on the nature of the objectives and deadlines embodied in the statutes EPA administers, especially the Clean Air and Clean Water Acts. These acts require rapid and expeditious action that would be delayed by the time involved in complying with NEPA procedures. Further, EPA argued that both acts preclude consideration of the environment as a whole, and by implication, stand in the way of an integrated approach to pollution control.¹⁴⁷

Moreover, EPA determined that regulations under the Resource Conservation and Recovery Act of 1976, the Toxic Substances Control Act of 1976, the Safe Drinking Water Act, and the Noise Control Act are exempt from NEPA.¹⁴⁸ Although EPA's views prevailed in court, the opportunities for EIA have not been altogether closed. In fact, a promising opportunity for using EIA was created by one of the cases, *Portland Cement Ass'n v.*

145. Guruswamy, *supra* note 5. INTEGRATED POLLUTION CONTROL, *supra* note 8, at 26.

146. *Appalachian Power Co. v. EPA*, 477 F.2d 615 (4th Cir. 1973); *Buckeye Power, Inc. v. EPA*, 481 F.2d 162 (6th Cir. 1973), *cert. denied sub nom.*; *Big Rivers Elec. Corp. v. EPA*, 425 U.S. 934 (1976); *Duquesne Light Co. v. EPA*, 481 F.2d 1 (3d Cir. 1973), *vacated and remanded*, 427 U.S. 902 (1976); *Essex Chemical Corp. v. Ruckelshaus*, 486 F.2d 427 (D.C. Cir. 1973); *Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375 (D.C. Cir. 1973); *Anaconda Co. v. Ruckelshaus*, 352 F. Supp. 697 (D. Colo. 1972), *rev'd*, 482 F.2d 1301 (10th Cir. 1973); *Getty Oil Co. v. Ruckelshaus*, 342 F. Supp. 1006 (D. Del. 1972), *aff'd*, 467 F.2d 3449 (3d Cir. 1972), *cert. denied*, 409 U.S. 1125 (1973); *Env'tl. Def. Fund v. EPA*, 489 F.2d 1247 (D.C. Cir. 1973); *Wyoming v. Hathaway*, 525 F.2d 66 (10th Cir. 1975); *Maryland v. Train* 415 F. Supp. 116 (D. Md. 1976).

147. One case that went against the tide is *Kalur v. Resor*, 335 F. Supp. 1 (D.D.C. 1971) (which held that EPA was bound by NEPA). *Kalur* held that the Army Corps of Engineers was fully subject to NEPA in exercising its powers under the Refuse Act Permit Program. *Id.* The Corps of Engineers could not delegate its statutory authority under the Refuse Act to EPA. *Id.* at 14-15. Congress responded to *Kalur* by exempting EPA from such responsibilities. See, e.g., Clean Water Act § 511(c)(1), 33 U.S.C. § 1371(c)(1) (1982) (exempting EPA from preparing impact statements to accompany its actions except when dealing with grants to municipalities for waste treatment facilities and permits for discharges from new sources); Energy Supply and Environmental Co-Ordination Act of 1974, § 7(c)(1), 15 U.S.C. § 793(c)(1) (1982) (providing that no action taken by EPA under the Clean Air Act would require an environmental impact statement).

148. 44 Fed. Reg. 64,174 (1979).

Ruckelshaus,¹⁴⁹ which EPA won. *Portland Cement* held that EPA need not undertake environmental assessments under NEPA because it did in fact have to engage in the functional equivalent of an impact assessment when setting standards for new sources under section 111 of the Clean Air Act. In so determining the Court of Appeals opened the door to similar interpretations not only of other provisions of the Clean Air Act, but also of all acts administered by EPA. *Portland Cement* was a significant factor leading EPA to what has been described as the "giant practical step"¹⁵⁰ of issuing a policy statement stating that it would voluntarily prepare environmental impact statements in connection with certain major regulatory activities.¹⁵¹ If that be the case, the EPA should be confronting the wider environmental impacts of pollution regulation, and it is difficult to see how EPA can avoid recognizing both the wisdom and the necessity of an integrated approach.¹⁵² Whether they be EIA's under NEPA or their functional equivalents, impact assessment is an essential element of IPC.

C. Risk Management

A cluster of major questions arise for consideration when undertaking EIA. The first relates to the sheer difficulty of undertaking a comprehensive EIA. We have already noted the difficulties in identifying hazards, evaluating synergistic effects, and estimating exposure.¹⁵³ The second deals with environmental management, or the selection of pollution control alternatives, involved in IPC. It is quite obvious that any integrated prescription for the

149. 486 F.2d 375 (D.C. Cir. 1973); *cert. denied*, 417 U.S. 921 (1974). *Ruckelshaus* dealt with new source performance standards. The plaintiff industries argued, *inter alia*, that NEPA applied and that EPA should carry out a detailed cost-benefit analysis that evaluated pollution reduction levels against incremental increases in industry expenditure. *Id.* See also *Comment, Implementation of the Clean Air Act: Should NEPA Apply to the Environmental Protection Agency?* 3 *ECOLOGY L.Q.* 597, 617 (citing Brief for Portland Cement Ass'n, at 35, *Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375 (D.C. Cir. 1973) (No. 72-1073)). The court decided that it was not necessary to decide the broad question of NEPA's applicability to EPA on the ground that section 111 of the Clean Air Act constituted a narrow exemption from NEPA. *Ruckelshaus*, 486 F.2d at 384. Judge Leventhal resolved that any determination of the "best system of emission reduction," which took "into account the cost of achieving such reduction," constrained the Administrator to consider counter-productive environmental effects as well as the cost to industry. *Id.* at 384-85. Together with the need for a statement of reasons, these factors constituted the "functional equivalent" of a NEPA impact statement, and exempted EPA from the stricter requirements of NEPA. *Id.*

150. *Comment, Coordinating the EPA, NEPA, and the Clean Air Act*, 52 *TEX. L. REV.* 527, 529 (1974).

151. 39 *Fed. Reg.* 16186-87 (1974).

152. In a promising development, the proposed Global Environmental Research and Policy Act would require federal agencies to ensure that the effects of their action, including extraterritorial effects on other countries and the global commons, be considered. See H.R. 3332, 101st Cong., 1st Sess., § 301, 135 *CONG. REC.* H5898 (daily ed. Sept. 25, 1989).

153. See *supra* section I A.

defects of the present fragmented system involves the examination and adoption of alternatives. Alas, we live in an industrial society in which pollution risks cannot be totally eliminated. A careful and analytical examination of the hazards posed by each alternative is required. The problems that arise in such an undertaking are illustrated by two examples. The first example deals with different alternatives affecting human health while the second calls for the balancing of human health alternatives, as well as evaluating harm to human health against damage to nature.

The first example considers efforts to control harm posed to human health by unsafe drinking water. In order to kill organisms that cause typhoid and other diseases, water has been chlorinated since the turn of the century. This policy has resulted in chemical reactions producing chloroform and other carcinogenic chlorinated hydrocarbons. The risk of typhoid has been replaced by that of cancer. To choose between the dangers, one must answer difficult questions. Which disease presents the greater danger? How much decreased danger from typhoid is sufficient to justify an increased danger of cancer?¹⁵⁴ What are the alternatives to chlorination and what hazards do such alternatives pose?¹⁵⁵

The second example concerns sulphur dioxide which combines with nitrogen oxides to create acid rain. The adverse effects of acid rain on sensitive aquatic and terrestrial ecosystems and buildings have been established.¹⁵⁶ In recent years we have come alive to the international implications of acid rain.¹⁵⁷ Several thousand lakes in Europe, particularly in Scandinavia,¹⁵⁸ and several hundred in North America,¹⁵⁹ have registered

154. Among the factors to be considered are: 1) that typhoid is an acute disease and cancer is a chronic one; and 2) that typhoid is more treatable.

155. See *IMPROVING RISK COMMUNICATION* *supra* note 33, at 31.

156. E. EL HINNAWI & M. HASHMI, *THE STATE OF THE ENVIRONMENT*, A UNEP REPORT 23 (1987).

157. We have witnessed mounting evidence of the adverse effects of the problem on sensitive aquatic and terrestrial ecosystems and buildings. *Id.* at 23. Acid depositions have been responsible for increasing amounts of pollution across national boundaries in North America and Europe, causing considerable damage to lakes, soils, and communities of plants and animals. NATIONAL RESEARCH COUNCIL, *ACID DEPOSITION: LONG TERM TRENDS* (1985); OECD, *STATE OF THE ENVIRONMENT* (1985).

158. 18,000 of Sweden's 85,000 medium or large lakes are acidified. In southern Norway over 1750 out of 8000 Norwegian lakes suffered from acidification damage. ROYAL SWEDISH MINISTRY OF AGRICULTURE, *ENVIRONMENT '82 COMMITTEE ACIDIFICATION TODAY AND TOMORROW* 40-41 (1982); See generally Muniz & Liverstad, *Acidification Effects on Freshwater Fish*, in *ECOLOGICAL IMPACT OF ACID PRECIPITATION* (D. Drabos & A. Tollan eds. 1980).

159. It is estimated that between 10,000 and 40,000 lakes will eventually become acidic in Canada, while about 200 lakes in northern New York State no longer support fish. Muniz & Liverstad, *supra* note 158.

steady increases in acidity levels resulting in damage to, or death of, fish.¹⁶⁰ The damage primarily affects nature and natural resources,¹⁶¹ leading to

160. Acid precipitation can affect fish directly through the alteration of blood chemistry or the retardation of egg development. Indirect effects range from the disruption of the food web, impediments to reproduction caused by snow melts, and to suspected aluminum poisoning, caused by acid water run off or leaching caused by acid water. ROYAL SWEDISH MINISTRY OF AGRICULTURE, ACIDIFICATION - A BOUNDLESS THREAT TO OUR ENVIRONMENT 8 (1983); FEDERAL/PROVINCIAL RESEARCH AND MONITORING COORDINATING COMMITTEE (CANADA), ASSESSMENT OF THE STATE OF THE KNOWLEDGE ON THE LONG RANGE TRANSPORT OF AIR POLLUTANTS AND ACID DEPOSITION: AQUATIC EFFECTS 30-33 (1986) [hereinafter RMCC].

161. It can be argued that the acidification of lakes involves changes that go beyond the lowering of pH levels and the elimination of fish species. Toxic metals such as aluminum, lead, and mercury may be washed or leached from soils and enter the water. Aluminum, lead, and mercury, which are "cations" can be leached from soils through a process known as cation exchange. Cation exchanges between water flowing through a soil and the soil itself can take place when acidified water, with a higher concentration of aluminum, lead, and mercury, moves through soil. The hydrogen ions in the water are absorbed by the soil in exchange for aluminum, lead, and mercury ions which then dissolve into the water. The result is that the water exits the soil with a higher concentration of aluminum, lead, and mercury. The soil is left with a higher concentration of hydrogen ions and, is thus, more acidic. See 4 NATIONAL ACID PRECIPITATION PROGRAM, EFFECTS OF ACIDIC DEPOSITION 8.6 (1987) [hereinafter EFFECTS OF ACIDIC DEPOSITION]. The toxic metal could affect plants, bacteria, invertebrates, amphibians and fish. L.N. OVERREIN, H.M. SEIP & A. TOLLAN, ACID PRECIPITATION - EFFECTS ON FOREST AND FISH 43-51 (1980). Leaching of heavy metals and toxins can also affect groundwater. Groundwater acidification has been documented in eastern North America, Sweden, West Germany, and Czechoslovakia. RMCC, *supra* note 160, at 6.

It is feared that acidification of the zone of aeration (the soil above the zone of saturation or aquifer) will lead to the leaching of toxic metals such as mercury, cadmium and lead into groundwater. See EFFECTS OF ACIDIC DEPOSITION. Once groundwater has been polluted by toxins it is extremely difficult and costly to clean up. Unlike surface waters that tend to cleanse themselves by breaking down pollutants through agitation, aeration, evaporation and sedimentation, most pollutants introduced into ground water do not go away. Restoration of a polluted aquifer is an exceptionally costly venture that requires bringing the groundwater to the surface, purging it of contaminants and reinjecting it into the ground. J.L. SAX & R.H. ABRAMS, LEGAL CONTROL OF WATER RESOURCES CASES AND MATERIALS 909-910 (1986).

Groundwater supplies drinking water to 40-50% of the population of the U.S. and almost 97% of all rural populations. Olsenius, *Soil Erosion, Agrichemicals and Water Quality: A Need for a New Conservation Ethic*, PROCEEDINGS OF THE NINTH ANNUAL SUMMER PROGRAM NATURAL RESOURCES LAW CENTER UNIVERSITY OF COLORADO (1988). While acid deposition is not the chief cause of groundwater contamination, the aggravation or facilitation of groundwater contamination by acid deposition must add to worries about groundwater pollution in this country. In this context, it is worth noting that hazardous waste dump sites throughout the country are safe only so long as the soil on which the wastes are dumped does not allow toxic leachates to percolate into ground water. Where leaching occurred, as in Love Canal in 1978, the lives of many people were endangered and the President declared a national emergency. J.M. PETULA, ENVIRONMENTAL PROTECTION IN THE UNITED STATES 57 (1987). The effect of acid rain in removing the absorptive and filtering capacity of soil is, therefore, a considerable source of worry. It is not surprising that a recent poll of environmental health officers in state health departments revealed that water quality was their number one concern. Olsenius, *Soil Erosion, Agrichemicals and Water Quality: A Need for a new Conservation Ethic*, PROCEEDINGS OF THE NINTH ANNUAL SUMMER PROGRAM NATURAL RESOURCES LAW CENTER UNIVERSITY OF COLORADO 13 (1988). Sulphur and nitrogen oxides are known to adversely effect the respiratory system and lungs and there is concern about the harm that may be caused to human health. RMCC, *supra* note 160, HUMAN HEALTH EFFECTS (pt. 5), at 10-12. See also EFFECTS OF ACIDIC DEPOSITION, at 10.1-10.56.

major effects on plants and forests.¹⁶² In recent years the architectural heritage of the world has been assailed by corrosion.¹⁶³

As noted earlier,¹⁶⁴ there is evidence that the use of wet scrubbers to reduce sulphur dioxide has led to the creation of vast quantities of sludge that could pose environmental damage of a different kind. Sludge, when discharged into water or disposed of as solid waste, can cause human health problems. If that be the case and IPC is to be applied to this problem, how is the damage to human health through one medium to be balanced against harm caused to nature and natural resources in a different medium?

It becomes evident that any assessment of environmental harm, whether in the context of the search for healthy water, or the redistribution of wastes produced by coal burning power plants, cannot be undertaken without a common framework of analysis. Even where a framework exists, a common "util", "metric" or other measure is needed to evaluate different kinds of harm. In order to make reasonable and rational choices between the different risks to human health and to nature, we need a common unit of measurement that will facilitate a clear analysis of the options.¹⁶⁵ Risk assessment offers both a framework and a quantitative measure for evaluating environmental risk.

Risk analysts treat pollution as a "hazard" because it has the potential to produce harm or other undesirable consequence to some person or thing. The magnitude of the hazard is the amount of harm that may result. Magnitude includes the number of people or things exposed and the severity of the consequences. The concept of "risk" then quantifies hazards by attaching the probability of being realized to each level of potential harm. The first step in risk assessment, therefore, is to measure the size of the hazard. The next step lies in quantifying the probability of the hazard. For example, take two

162. Sulfurous acid can react with chlorophyll in a plant and change it to pigments which are photosynthetically inactive (they cannot convert sunlight into energy that a plant can utilize). P. CONNELL & G. MILLER, *CHEMISTRY AND ECOTOXICOLOGY OF POLLUTION* 337 (1984). Acidification of soils can also leach essential nutrients and aluminum from the soils which can be toxic to the plants roots. *EFFECTS OF ACIDIC DEPOSITION*, *supra* note 161, at 7.25. For other potential effects of acidic deposition on vegetation, see P. CONNELL & G. MILLER, *CHEMISTRY AND ECOTOXICOLOGY OF POLLUTION* 337-38 (1984).

163. The Parthenon in Athens, Cologne Cathedral, buildings in Venice, London and Krakow together with City Hall in New York City have been under attack from acid rain and other pollutants. RMCC, *supra* note 160 (pt. 6), at 15-16.

164. See *supra* notes 16-20 and accompanying text.

165. The reference is to a common unit or measure by which the policy maker could make public choices. This is quite distinct from the search for a measure for interpersonal comparisons. Some economists claim that a given criteria or measure, such the Kaldor-Hicks efficiency criteria, could be used to measure subjective utility. We are not discussing interpersonal comparisons which seek to compare A's pain with B's pleasure. For an excellent exploration of criteria for interpersonal comparison, see Hovenkamp, *Legislation, Well-Being and Public Choice*, CHL. L. REV. (forthcoming 1990).

areas in which flash floods occur. One area experiences a flash flood once every 100 years while the other faces it once every ten years. Both areas face the same "hazard" but the first area runs only one tenth of the "risk" of the second area. The result evaluates and quantifies the size of the hazard and the probability of its occurrence, usually in a single measure.¹⁶⁶

According to an influential report of the National Research Council (NRC)¹⁶⁷ risk evaluation embraces two distinct and different exercises: risk assessment and risk management. Risk assessment uses objective scientific facts to define the health effects of exposure of individuals, or populations to hazardous material and situations. Risk management is the process of weighing policy alternatives and arriving at policy decisions.¹⁶⁸ The need for risk assessment has been endorsed by a wide range of environmental policymakers¹⁶⁹ including a notable non-governmental environmental organization — the Conservation Foundation.¹⁷⁰ It has also found favor with EPA. The agency has attempted to apply the principles of risk assessment and risk management to the broad range of issues that it confronts.¹⁷¹ In fact, EPA and the Conservation Foundation have yoked risk management to IPC.

EPA argues that risk management represents a return to first principles. The general mission of EPA is to protect human health and other environmental values from the harmful effects of pollutants. Since such pollutant effects are typically ringed with some uncertainty, "it follows that ... [e]very direct action EPA takes can be associated with reduction in some risk to health or environmental value, and risk reduction may thus be considered a common

166. IMPROVING RISK COMMUNICATION, *supra* note 33, at 32-33.

167. NATIONAL RESEARCH COUNCIL, RISK ASSESSMENT IN THE FEDERAL GOVERNMENT: MANAGING THE PROCESS (1983) [hereinafter RISK ASSESSMENT].

168. *Id.* at 3.

169. See, e.g., *Risk Assessment in Environmental Law*, 14 COLUM. J. ENVTL. L. 289 (1989) (the majority of the contributors to this symposium, Barry Commoner being the most notable exception, uncritically accepted the desirability of risk assessment).

170. CONSERVATION FOUNDATION, THE ENVIRONMENTAL PROTECTION ACT (SECOND DRAFT) (1988).

171. COUNCIL ON ENVIRONMENTAL QUALITY (CEQ), ENVIRONMENTAL QUALITY 1984, SPECIAL REPORT: RISK ASSESSMENT AND RISK MANAGEMENT 211-246 [hereinafter CEQ, 15TH REPORT] (setting forth the theoretical framework for conducting risk assessments and applying it to risk management decisions, as conceived and practiced by EPA). See also EPA Overview Report, in UNFINISHED BUSINESS: A COMPARATIVE ASSESSMENT OF ENVIRONMENTAL PROBLEMS 1- 4 (1987).

The emphasis on such a methodology is borne out by the fact that EPA Guidelines for Carcinogen Risk Assessment, 51 FED. REG. 33,992, 33,992-3 (1986) provide that risk assessments must "use the most scientifically appropriate interpretation" and should be "carried out independently from considerations of the consequences of regulatory action." Howard Latin perceptively observes that EPA's present preoccupation with "good science" reflects a commitment to risk assessment grounded exclusively on the best available scientific theories even if the scientific theories lack the certainty required for valid scientific conclusions. Latin, *Good Science, Bad Regulation, and Toxic Risk Assessment*, 5 YALE J. ON REG. 89-90 (1988).

measure of all Agency action."¹⁷² The risk management approach has two major ends: setting priorities among the risks presented by pollution and choosing the appropriate reduction actions for the risks so selected.¹⁷³ In the case of priority setting, risk management would enable the agency as a whole to direct its energies against the worst set of risks susceptible to its control. It is important that EPA should define its priorities.

Despite the differences in approach of its mandating statutes, "EPA programs are part of a single national effort embodied in a single Agency. The Agency in turn must respond to a basic requirement of good public policy: to establish the connection between some expenditure and some recognized public good."¹⁷⁴ EPA management needs to know if the resources of EPA are being directed at the right targets. While the Agency must enforce the statutes as presently written, it needs to select the set of actions that most efficiently reduces environmental risk as a whole. "This is a difficult task, but it can be done. Indeed it must be done if one of the primary purposes of EPA's existence is to be achieved — the development of a coherent environmental program out of an array of disparate legislative mandates."¹⁷⁵ The reasoning of both EPA¹⁷⁶ and CEQ¹⁷⁷ reveals that risk management is an integrating concept. In fact, the thrust of the arguments advanced by EPA for risk management appear to dovetail with those for IPC advocated by this article.

There are, however, significant limitations to risk management. Consequently, it is necessary to examine and criticize the unqualified acceptance of the concept. This Article lauds the logic and the wisdom of EPA's objective of acting in a way that most effectively and efficiently reduces environmental risk as a whole. The qualifications lodged are not aimed at the integrating principle underlying risk management but at the methods used in applying such a principle.

It is necessary to begin by distinguishing this Article's criticism of risk management from a clutch of arguments about the uncertainties surrounding risk assessment.¹⁷⁸ These same arguments can equally be levelled against

172. *Id.* at 226.

173. *Id.* at 227.

174. *Id.* at 231.

175. *Id.* at 227.

176. *Id.* at 215.

177. *Id.* at 200-207.

178. Uncertainties surrounding risk evaluation exist and relate to data uncertainty, indeterminacy, historical uncertainty, and transcientific or global policy choice. See Rodgers, *Guerilla Decisionmaking: Judicial Review of Risk Assessments*, 15 J. OF HAZARDOUS MATERIALS, 205 (1987).

Data shortages include uncertainty about groups exposed, routes of exposure, patterns and practices of uses and behavior of chemicals within the environment. See, e.g., OFFICE OF SCIENCE AND TECHNOLOGY POLICY, *Chemical Carcinogens: Review of the Science and Its Associated Principles*, 49 FED. REG. 21,594 (1984) [hereinafter *Chemical Carcinogens*]. The review is one

IPC. It is not denied that substantial uncertainties exist. What is contended instead is that decisionmaking — of which risk management and IPC are species — must progress despite such uncertainties. Uncertainty is inherent to environmental decision making and cannot act as a conclusive constraint on action.

The reservations entered by this Article attach to different issues. First, the view that risk assessment is based on objective science has been trenchantly criticized¹⁷⁹ and has now been substantially qualified by a recent report

of the most important references on the subject) and provides a well referenced "semi-technical" account of the physical, chemical and biological data on which decisions are made.

An exposure assessment involves an estimate of the amount of a given chemical substance that is absorbed by an individual over time. This is a highly complex technical specialty. *Id.* at 21,599. The process involves consideration of the magnitude, frequency, and duration of encounters between individuals and the chemical in question. This exercise is often associated with a dearth of data. While some data may be available on the direct exposure by breathing the emissions from a manufacturing plant, estimates of the indirect exposure resulting from potential bioaccumulation in the food chain may be less precisely known.

Indeterminacy embraces the shape of the dose-response curves, the relevance of animal studies, the relationship of exposures to effects observed in epidemiological studies, and even whether there are safe threshold levels of exposures to given substances. Indeterminacy abounds when extrapolating from high dosage representative samples to low dose exposures in large populations. No single mathematical procedure is recognized as the most appropriate for low dose extrapolation in carcinogenesis. *Id.* at 21,649-52. For a given exposure source, the concentration or amount of the chemical in that medium is determined by measurement, estimated by modeling, calculated from physical-chemical properties and other information on the agent, or projected from data on surrogate chemicals. Indeterminacy continues into hazard or dose response assessment. This is a quantitative exercise that attempts to describe the expected human response to any given level of carcinogenic exposure. *Id.* at 21,657.

Rodgers describes historical uncertainties arising out of attempts to understand events that are non-recurring and non-replicable. Saccharine was banned because it was found to be carcinogenic, but even this easy example, Rodgers argues, offers a virtual blank in assessing the costs and benefits of a product used for years by over 50 million people. Rodgers at 205.

Whether a chemical should be banned despite its benefits is a trans-scientific question. It generally involves a total evaluation of the qualitative evidence, the exposure information, and the quantitative results. The final product of this evaluation is, typically, the generation of a quantitative estimate of the human cancer risk associated with the projected exposure profile. Such a qualitative estimate is arrived at by resolving scientific uncertainty on the basis of judgement. In the result, we receive further confirmation that risk assessment is an amalgam of scientific data, assumptions, and judgments based upon prevailing scientific thought and policy decisions. *Chemical Carcinogens* at 21,660.

179. Professor Horing, an eminent scientist, observes that decisive data concerning the harmful health effects of chemicals at low doses are unavailable and will never be determined. He argues that, as a result, extrapolations rest on "uncertain scientific foundations." Hornig, *Science and Government in the USA*, in *SCIENCE FOR PUBLIC POLICY* 22-23, (H.L. Brooks & C.L. Cooper eds. 1987). In fact, EPA admits that risk assessments, although conducted by scientists, are not "science" and that no one should be misled into believing that results using present techniques have the status of scientific findings. CEQ, 15TH REPORT, *supra* note 171, at 217. Even the National Research Council explicitly and unequivocally admitted to "great" and "pervasive" uncertainty. See *RISK ASSESSMENT*, *supra* note 166, at 11. Indeed the National Research Council referred to the many policy decisions that may need to be taken at the risk assessment stage. *Id.* at 33-37.

of the NRC.¹⁸⁰ That report draws attention to the uncertainties and the fallible judgments of scientists engaged in the process.¹⁸¹ A second, searching criticism of risk management relates to the exercise of quantifying the probability of a hazard. Risk assessment often deals with hazards based upon theoretical estimates, where the damage may be very great, but the probability of that occurrence is very small (one in a million or even a billion). Applying a probability calculus to such a situation is far too sophisticated an exercise for all but a small minority of expert practitioners. In light of this situation, one commentator argues that such risks are in fact "incalculable".¹⁸² Another commentator, having demonstrated by empirical evidence that statistical variables (such as gains, losses, and probabilities) do not describe risk perception in simple situations (like gambling), argues that they are "clearly insufficient in the case of vastly more complex technological risks."¹⁸³

Most quantitative measures of risk combine the undesirability of a hazard and the probability of its occurrence in a single measure.¹⁸⁴ In doing so the special qualities of a hazard that make it particularly feared or unacceptable are ignored. When assessing risk, most risk analysts choose mortality or morbidity as the objective "util" or "metric" of measurement. Gillette and Krier point out that technical experts rank risks of various activities and technologies, implicitly or explicitly, by using body counts as the relevant measure. Technical experts insist "that a death is a death is a death — 1,000 lives lost in a single anticipated annual catastrophe, or through many accidents expected every year, or lost ten-fold but only once every decade on average, or lost in a single community or across the country, are all the same to them."¹⁸⁵

The public's perception of risk is influenced as much by the statistical probability of risk as by its quality.¹⁸⁶ There is a "qualitative" aversion to

180. IMPROVING RISK COMMUNICATION, *supra* note 33.

181. *Id.* at 37-47.

182. Ravetz, *Public Perceptions of Acceptable Risks as Evidence for Their Cognitive, Technical and Social Structure*, in *TECHNOLOGICAL RISK* 47 (M. Dierkes, S. Edwards & R. Coppock eds. 1980).

183. Olway, *The Perception of Technological Risks: A Psychological Perspective*, in *TECHNOLOGICAL RISK* 37 (1980).

184. IMPROVING RISK COMMUNICATION, *supra* note 33, at 32.

185. Gillette & Krier, *Risk, Courts and Agencies* (1990)(unpublished manuscript).

186. For an elegant and fuller exposition of a number of these points, see *id.* at 49-66.

risks, for example, that are unnatural,¹⁸⁷ involuntary,¹⁸⁸ irreversible,¹⁸⁹ inequitable, and catastrophic.¹⁹⁰ We are beginning to recognize that risk should be characterized to take public perception into account.¹⁹¹ The risk evaluation required by IPC demands the institutionalization of competing norms that countervail the body counts on which risk assessment is primarily based. Such countervailing norms would reflect public preferences, perceptions, and opinions. Risk assessment, therefore, should incorporate competing rationalities and policy preferences based on public aversion to various aspects of risk based on factors other than expected annual mortality.

187. The aversion is to risks that are made by humans as opposed to those caused by nature. Natural floods cause more deaths than broken dams. We mourn the deaths from a natural flood but resent, deeply, the ones from a broken dam. *Id.* at 57. It is not irrational to demand tighter regulation of dams. First, the government is responsible for regulating what people do. Second, man made dangers threaten autonomy; finally, it is right to hold people responsible for their actions.

188. The voluntariness, as opposed to the involuntariness, of risk underlies the greater acceptance of occupational risks as against non-occupational ones. One reason for acceptance is that voluntary exposure is undertaken with knowledge of the consequences, and involves choice on the part of a risk taker. Involuntary exposure does not.

189. The ability to influence events is a good reason for disliking irreversible and long term latent effects. It is not possible to take steps to correct or avoid a harm if the effects are latent or long-term, or even worse, irreversible. The effects deny us the opportunity of acting when it is possible to do so. Instead, we are presented with a *fait accompli* that we are obliged to live with or die from. Similar reasoning applies to risks that are unforeseeable.

190. The importance attached to the "kill size" or the "catastrophe potential" is often cited as an example of public irrationality. ROYAL SOCIETY, RISK ASSESSMENT 116 (1983). The fact that the simultaneous death of 1,000 people is somehow worse than the isolated deaths of the same number is doubted. Gillette & Krier, *supra* note 185, at 63-64. There are, however, reasons for cultivating our revulsion of large scale tragedies. They help us to focus our minds on the calamity or tragedy of simple death caused by risks. They signal that we should be more alive to what might otherwise pass as a motley aggregate of individual experiences of death. ROYAL SOCIETY, RISK ASSESSMENT 116-18 (1983). Calamitous events stir the public conscience to take stronger precautions in order to avoid a repetition, not only of calamity, but of deaths or accidents in general. In seeking to avoid tragedy, the public is actually signaling the need to avoid death.

191. IMPROVING RISK COMMUNICATION, *supra* note 33, at 31.

An oft mentioned example is revealing. It is claimed that plane travel is much safer than motor car travel. Huber, *Safety and the Second Best: The Hazards of Public Risk Management in the Courts*, 85 COLUM. L. REV. 177, 301 (1985). Those who feel otherwise are viewed as irrational. But is the claim really so? A person driving an automobile is in charge of it. She can maintain, service and repair her car as much as she wants, doing it personally or choosing where to have it done. There is no way she can exercise such control over the maintenance, repair and service of the plane she boards. As the driver of an automobile she can decide which route to take, at what speed to drive, and which dangerous roads to avoid. A plane traveler is wholly in the hands of the pilot and the crew of the plane. Thirdly, a car driver is on familiar terra firma on the road, whereas she is in the big sky above when flying. There is a feeling of safety and security when traveling on the ground, borne of the fact that the human body is designed to travel on the ground and not to fly. Finally, the chances of survival in a plane crash are considerably smaller than in a car crash. Correspondingly, the "kill size" of a plane crash is much higher. Recent studies confirm have confirmed the instinctive public feeling about the greater safety of motor cars.

Risk assessment is built upon a utilitarian and anthropocentric¹⁹² concept of harm. The foundations of risk assessment have been engineered to determine the effects of risks on humans. Consequently, risk management displays an absence of a generally applicable methodology for evaluating ecological risk.¹⁹³ The U.S. boasts a considerable body of law that protects nature, species, plants, and ecological systems - independent of whether or not humans are affected. For example, NEPA clearly requires consideration of adverse environmental effects on natural areas.¹⁹⁴ Among the goals of the Clean Water Act are the attainment of water quality "which provides for the protection and propagation of fish, shellfish, and wildlife."¹⁹⁵ The Clean Air Act contains provisions protecting parks and wilderness areas.¹⁹⁶

The Endangered Species Act of 1973 finds that various fish, wildlife, and plants in the U.S. are in danger of extinction, and seeks to provide a means whereby the ecosystems upon which endangered species depend may be conserved.¹⁹⁷ It pledges that the U.S., as a sovereign state in the international community, will conserve to the extent practicable various species of fish, wildlife and plants that face extinction.¹⁹⁸ The U.S. Supreme Court has held that section 7 of the Endangered Species Act allows no exceptions and required all federal agencies and departments to insure that actions authorized, funded, and carried out by them do not jeopardize the continued existence of any endangered species.¹⁹⁹

What all this points to is a need to incorporate adverse effects on nature in the assessment of risk. It is not proposed to examine the philosophical or ethical theories underlying the protection of nature except to indicate that there are three broad theories. The protection of nature can be subsumed under one or more of three rationales: utilitarian, altruistic and nature centered.²⁰⁰

192. Anthropocentric is used co-terminously with "homocentric," "human chauvinism" and "humanism". See B.G. NORTON, *WHY PRESERVE NATURAL VARIETY* 136 (1987).

193. EPA, *UNFINISHED BUSINESS: A COMPARATIVE ASSESSMENT OF ENVIRONMENTAL PROBLEMS* 43 (1987).

194. National Environmental Policy Act of 1969, 42 U.S.C. § 4331 (1982).

195. Clean Water Act, § 101(a) (1), 33 U.S.C. § 1251(a)(1) (1982).

196. 42 U.S.C.A. §§ 7470-71 (1982).

197. 16 U.S.C.A. § 1531(a)(b) (1982).

198.. *Id.* at § 153 (a)(4).

199. *Tennessee Valley Auth. v. Hill*, 437 U.S. 153 (1978). Following the outcome in *Hill*, Congress amended the Endangered Species Act in 1978 to include procedures for exempting agency actions, in some situations, from rigid compliance. 16 U.S.C.A. § 1537 (7) (e)-(p) (1988).

200. For a more extensive review, see Guruswamy, *Global Warming: Integrating United States and International Law*, ARIZ. L. REV. (forthcoming 1990). For an excellent introduction to the debate on how to value nature, see E. Ashby, *The Search for an Environmental Ethic* (Tanner Lectures 1979); see also Stone, *Should Trees Have Standing? Towards Legal Rights for Natural Objects*, 45 S. CAL. REV. 450 (1972); Meyers, *An Introduction to Environmental Thought: Some Sources, Some Criticisms*, 80 IND. L. REV. 426 (1975); Sagoff, *On Preserving the Natural Environment*, 84 YALE L. J. 205 (1974); Tribe, *How Not to Think About Plastic Trees: New Foundations for Environmental Law*, 83 YALE L. J. 1315 (1974). For a contemporary review

Risk assessment seems oblivious of these philosophical underpinnings for the protection of nature.

Risk management has been examined and found lacking in two critical areas. As presently practiced, it does not take account of qualitative values and public perceptions of risk, and is unable to deal with damage to nature and ecology. If these deficiencies can be cured, risk assessment is destined to play a pivotal role in IPC.

D. Ambit and Scope of IPC

The logic of a strategic approach to IPC is impeccable. Since consumption and production necessarily involve the use of resources and the discharge of potentially polluting wastes, most social and economic activities will have environmental and ecological repercussions. This Article has noted the argument of the World Conservation Strategy (WCS) that, almost invariably, economic development is based upon natural resources.²⁰¹ Consequently, the WCS calls for a comprehensive environmental strategy in which all social and economic policies are built upon environmental foundations.

Both the U.K. and Sweden, however, have given IPC an operational or socio-technical clothing, and apparently disregarded its strategic or socio-political character. It is understandable why they have done so. We have observed the difficulties in applying IPC even at an operational level. These difficulties are compounded with every move beyond factory and plant towards the unexplored domain of strategic decision making and planning. Given the nature of these problems it is prudent to begin by confining IPC to sources and substances. In the U.S., it is particularly appropriate to begin with substances because the U.S. has already enacted legislation that brings toxic chemicals within the ambit of IPC.

This Article argues that a modest version of IPC based on plant and product constitutes a reasonable and practicable first step. This approach recognizes present realities, but ought not to obscure the vision of strategic integration. The Single European Act embodies the concept of strategic or socio-political integration by referring to environmental policy as an aspect of other community policies. It is not yet clear, however, as to how this might be implemented. The Netherlands is experimenting with a somewhat dif-

of the arguments and a rationale that the "transformative values" of nature offers a basis for its protection, see B.G. NORTON, *WHY PRESERVE NATURAL VARIETY* (1987).

201. See *supra* note 47.

ferent strategic approach based on planning.²⁰² Neither the U.K. or Sweden have incorporated a strategic dimension to their versions of IPC.

In the U.S., there are proposals to coordinate energy with environmental policy but there is no evidence that they will receive congressional endorsement.²⁰³ Strategic principles are advanced by two bills with similar provisions currently being considered in the Senate and the House. Both these bills envisage integrated environmental and energy planning at the federal and state levels so as to minimize carbon emissions. They seek to do so through a national energy plan. The absence of enacted legislation requiring strategic planning, and administrative policies that implement such strategies, is critical. It is impossible to design strategic policies for IPC without the necessary legislative mandate. It is possible, however, to proceed in an incremental fashion by implementing existing integrating statutes and policies which focus on substance and source. In this way it may even be possible to lay the foundations for a broader, more comprehensive institutionalizing of IPC.

1. IPC Through Control of Substances: TSCA

We have noted how a fragmented system is unable to control the cross-media transfer of chemicals. A substance can be released into more than one medium, move across medium boundaries, or cause exposure through more than one medium. One way to deal with these problems is by directing controls at the substance rather than at the medium into which it is released. This is precisely what the Toxic Substances Control Act (TSCA) does.²⁰⁴

TSCA has institutionalized an integrated approach to the control of chemicals. It embraces the entire environment, together with total human exposure, and is not confined to the usual divisions between air, land and water, or to particular routes of exposure.²⁰⁵ It focuses on the full cycle of a substance from manufacture through disposal, and provides a viable

202. The Netherlands employs comprehensive planning, consisting of a strategic environmental policy integration plan and rolling operational plans. The strategic plan sets out a broad environmental policy framework for a period of 8-10 years within an even broader timeframe of 10-30 years. It deals both with "internal" integration (of environmental policy itself) and "external" integration of environmental policies with policies in other areas. The operational plans focus on the implementation of the strategic plan over a period of four years, subject to revision every year. Bennett, *Policy Planning in the Netherlands*, in *INTEGRATED POLLUTION CONTROL*, *supra* note 8, at 300.

203. H.R.1078, *supra* note 46, § 2(b); S. 324, *supra* note 46, § 2(b)(1).

204. 15 U.S.C. §§ 2601-2654 (1982).

205. The term "environment" is defined to include "water, air, land and the interrelationship which exists among and between water, air and land and all living things." TSCA § 3(5), 15 U.S.C. § 2602(5) (1982).

baseline from which to move toward the administrative implementation of an integrated approach.²⁰⁶

The Toxic Substances Act has three objectives.²⁰⁷ One objective is to prevent unreasonable risks of injury to health or the environment and to take action about imminent hazards from the chemicals referred to²⁰⁸ without unduly impeding or unnecessarily creating economic barriers to technological innovation.²⁰⁹

206. This is borne out by the history of TSCA. In 1971, President Nixon submitted the Toxic Substances Act to Congress, seeking to integrate the way in which toxic substances were controlled. CEQ, which had researched and drafted the bill, set out their reasoning and conclusions in an influential report on Toxic Substances. See COUNCIL ON ENVIRONMENTAL QUALITY, TOXIC SUBSTANCES (1971). CEQ argued that most toxic substances are not exclusively air or water pollutants, but are found in varying quantities in air, water, soil, food, and industrial and consumer products. *Id.* The multiplicity of ways by which society is exposed to toxics makes it difficult for the media-oriented authorities to consider the total exposure of an individual to a given substance, a consideration necessary for the establishment of adequate environmental standards. *Id.* In terms of human health, total exposure of a human being to a given substance from all parts of his environment — air, water and food must be considered, and the interaction of these substances both within and outside the body must be evaluated. Similar consideration must be given to other living organisms. Since no agency had considered itself completely responsible for all such substances in all media, CEQ recommended that a new legal authority, EPA, should take over that function. *Id.*

The Toxic Substances Act was passed in 1976. It had a troubled history marked by disagreements between the House and Senate. See HOUSE COMMITTEE ON INTERSTATE AND FOREIGN COMMERCE, LEGISLATIVE HISTORY OF THE TOXIC SUBSTANCES CONTROL ACT 409 (Comm. Print 1976) [hereinafter LEGISLATIVE HISTORY]; R. DRULEY & G. ORDWAY, THE TOXIC SUBSTANCES CONTROL ACT 9-26 (1981); K. Gaynor, *The Toxic Substances Control Act: A Regulatory Morass* 30 VAND. L. REV. 1149-1152; R. FINDLEY & D. FARBER, ENVIRONMENTAL LAW 445 (2d ed. 1985). H.R. REP. NO. 1341, 94th Cong., 2d Sess., at 7-8 (1976); What is important for our purposes is that the disagreement between House and Senate did not turn on the need for, or relevance of, integration. The Senate favored a restrictive approach to the marketing of chemicals based upon pre-registration similar to that contained in the Federal Insecticide, Fungicide and Rodenticide Act. The House desired that all new chemicals be marketed without notification or registration, unless the Administrator had already placed such new chemicals on a "black list". The compromise eventually reflected in TSCA rejects a rigid preclearance regulatory scheme, found in pesticide and drug laws, in favor of a system of notice and selective interdiction. See RODGERS, ENVIRONMENTAL RECD. 898-901 (1977). In fact, on the key provisions defining the "environment" (Toxic Substance Control Act §3(5), 15 U.S.C. § 2602(5) (1982)), there was no disagreement. DRULEY & ORDWAY at 9-25. Nor were there any significant differences on the need for the collection of information that would reveal the total exposure to a chemical and the monitoring of its total effect on health and environment. *Id.* There was also agreement on the critical provisions (of section 9), dealing with the relationship of TSCA to other laws.

207. TSCA § 2(b), 15 U.S.C. § 2601(b) (1982).

208. *Id.* §§ 5(f), 6, 7, 15 U.S.C. §§ 2604(f), 2605, 2606.

209. *Id.* § 6(a), 15 U.S.C. § 2605(a). Manufacturers are required to give notice to the Administrator before manufacturing a new chemical substance or putting an old substance to a significant new use. *Id.* at § 5, 15 U.S.C. § 2604. The Administrator is empowered to delay or restrict the manufacture of a new chemical. *Id.* § 5(e)(1)(A), 15 U.S.C. § 2604(e)(1)(A). The Administrator can adopt rules to prohibit manufacture and processing. *Id.* § 5(f)(2), 15 U.S.C. § 2604(f)(2). The Administrator can also obtain injunctive relief. *Id.* § 5(e)(2)(A), (B), 15 U.S.C. § 2604(e)(2)(A), (B). To date, the U.S. has reviewed about 13,000 notifications under TSCA

The second objective is in many ways the centerpiece of TSCA. Industry is required to test a chemical substance if the TSCA Administrator finds that the substance (a) may present an unreasonable risk of injury to health or the environment, or (b) will be produced in substantial quantities and enter the environment in substantial quantities, or (c) will be produced in substantial quantities and result in significant or substantial human exposure, and (d) there is insufficient data on which the effects of the substance could be determined. The purpose of the testing is to determine whether the manufacture, distribution in commerce, processing, use, or disposal of the substance presents an unreasonable risk of injury to health or the environment.²¹⁰ The third objective is to screen chemicals for potential "significant risk of serious and widespread harm" by creating a list of chemicals that should be tested further.²¹¹

The objectives of TSCA advance IPC in substantial ways. TSCA helps to overcome the lack of knowledge about the journey of a pollutant by establishing a formidable range of information collecting mechanisms. EPA recently has begun to utilize its authority under TSCA to fulfill data needs that originate outside the TSCA program. For example, under its Section 4 powers, it has implemented a test rule to ascertain the environmental transport and fate data of chemical substances regulated by the Office of Solid Waste (OSW) of EPA. One commentator reports that program offices are excited about the prospects of using TSCA to generate data for air toxic standards and effluent guidelines under the Clean Water Act.²¹² Moreover, the courts have granted EPA broad discretion in exercising authority to require testing under Section 4.²¹³

EPA is also utilizing Section 8(d) of TSCA to require "health and safety studies" from manufacturers, processors and distributors of chemicals in cases governed by other statutory provisions. It has done so with regard to chemical substances sought to be controlled under the 1984 Resource Con-

and some action has been taken on 500 of them. INTEGRATED POLLUTION CONTROL, *supra* note 8, at 22.

It could be argued that the requirements of unreasonable risk coupled with that of restraint in regulating such chemicals in order not to stifle innovation, emasculated the Act and rendered it ineffective. Even if this be true, the import of the Act in establishing an integrated approach to pollution control is very substantial.

210. TSCA § 4, 15 U.S.C. § 2604 (1982).

211. The establishment of an Interagency Testing Committee fulfilled the third objective. TSCA § 4(e), 15 U.S.C. § 2604(e)(1982). Members of the committee were drawn from the principal federal agencies having statutory obligations with respect to chemical health risks. The principal federal agencies were the National Institute of Health, National Cancer Institute, and the National Science Foundation.

212. Hayes, *TSCA: The Sleeping Giant Is Stirring*, 4 NAT. RES. & ENV'T 3-4 (1990).

213. In *Ausimont U.S.A., Inc. v. EPA*, 838 F.2d 93 (3d Cir. 1988) the Third Circuit concluded that testing can be required by EPA when an "existing possibility of harm raises reasonable and legitimate cause for concern." A similar finding was reached by the District of Columbia Circuit in *Chemical Mfrs. Assoc. v. EPA*, 859 F.2d 977 (D.C. Cir. 1988).

servation and Recovery Act (Solid Waste Disposal Act), the Safe Drinking Water Act, the Clean Water Act, and the Federal Insecticide, Fungicide and Rodenticide Act.²¹⁴ Given its extensive data gathering power TSCA may indeed be a sleeping giant that can be stirred into the service of IPC.

Section 9 of TSCA, which deals with its relationship to other laws, further promotes IPC. When available information leads to the conclusion that there is an unreasonable risk of injury to health or environment, from an activity not controlled by other federal laws, the TSCA Administrator may require other agencies to help abate the activity in question.²¹⁵ What is more significant is the provision²¹⁶ dealing with laws administered by the Administrator. It provides:

The Administrator shall coordinate actions taken under this chapter with actions taken under other Federal laws. . . .

If the Administrator determines that a risk to health or the environment . . . could be eliminated or reduced to a sufficient extent by actions taken under the authorities contained in such other Federal laws, the Administrator shall use such authorities to protect against such risk unless the Administrator determines, in the Administrator's discretion, that it is in the public interest to protect against such risk by actions under this chapter . . .²¹⁷

It is arguable that this section commands the Administrator to coordinate an integrated approach to pollution control established by TSCA, with the segmented approaches of the other legislation. The Administrator is instructed to consider whether the powers granted under those other Acts could be used to control the risks defined in TSCA. If they can, the existing body of pollution control legislation, insofar as it concerns chemicals, would need to be interpreted in the light of the integrating and holistic policies embodied in TSCA. Further stipulating that the Administrator shall use the powers under those Acts rather than TSCA, considerably strengthens the case for such a re-interpretation of existing legislation.

In sum, it seems that TSCA has established a powerful integrating norm capable of countervailing the fragmented orientation of law and policy administered by EPA. There can be no doubt that the sheer number of toxic chemicals and their interactions with other chemicals present formidable problems. Nonetheless, a positive start has been taken on the long road to toxics control, and many of the provisions of apparently single medium statutes can now be interpreted from an integrative perspective. In the light of TSCA's provisions, the relevance and applicability of IPC in the im-

214. Hayes, *supra* note 212, at 5.

215. TSCA § 9(a)(1), 15 U.S.C. § 2608(a)(1) (1982).

216. *Id.* § 9(b), 15 U.S.C. § 2608(b).

217. *Id.*

plementation of other legislation can no longer be ignored. Even skeptics concede that focusing on the substance (in the way that TSCA does) undoubtedly has begun to contribute to an integrated approach.²¹⁸

2. IPC Through Control of Source

We have noted how IPC has been implemented through source controls in the U.K. and Sweden. At individual facilities (or sources) IPC has been achieved through the adoption of technological measures. In the U.K., legislation currently being enacted will make decisions based on the best available technology not entailing excessive costs. Sweden employs the best available technology. Two case studies undertaken by the Pollution Inspectorate in the U.K. demonstrate the importance of plant design. The case studies indicate that it is possible to implement IPC through a more comprehensive understanding of the technologies, their waste generating characteristics and possible environmental impacts.²¹⁹

We have already noted how it has been demonstrated, in the U.S., that designing a facility as a system has proven to be more efficient and effective in reducing pollution.²²⁰ There is no reason why the EPA, like the HMIP in the U.K., should not become involved in the design and building of plants and the implementation of IPC at source.²²¹

3. IPC and Existing Standards

The experience of the U.K. and Sweden emphasize that IPC does not entail a lowering or adjustment downwards of existing pollution standards. During the Reagan Administration there was a fear that integration may be a euphemism for lowered pollution standards. The arguments of the deregulators and regulatory reformers, about the defects of the present system, were remarkably similar to those heard in favor of IPC.²²² It is true that the remedies favored by the regulatory reformers were diametrically opposed to those advanced by IPC. Nonetheless, the apparent confluence of thinking between the regulatory reformers and the proponents of IPC, revealed by their common criticisms of the existing system, succeeded in scaring some away from IPC.

218. INTEGRATED POLLUTION CONTROL, *supra* note 8, at 22-23.

219. Owens, *The Unified Pollution Inspectorate and Best Practicable Environmental Options in the United Kingdom*, in INTEGRATED POLLUTION CONTROL, *supra* note 8, at 262.

220. Carr, *supra* note 44.

221. The U.K. RCEP has proposed an instructive procedure for the practical implementation of IPC at source. RCEP, No. 12, *supra* note 8, ¶ 3(8). The applicability of this procedure is discussed in Guruswamy, *supra* note 5, at 498-501.

222. Guruswamy, *supra* note 5, at 501-09.

That fear should now be put to rest. While the lowering of standards will always remain a danger, the proposed U.K. legislation specifically provides that IPC will not lower existing standards. A similar approach is necessary within the U.S. to ensure that IPC results in the improvement and not the deterioration of environmental quality. A "republican" theory of government²²³ and a Weberian model of administration²²⁴ offers strong theoretical foundations for the view that Congress can and does mandate and empower the EPA to interpret and execute the goals, norms, and standards embodied in legislation in furtherance of what it considers to be the public interest.

Such theories do not, however, empower the EPA to rewrite or emasculate the fixed, clear, and definite standards embodied in legislation. EPA may feel that some aspects of existing law are ill advised. For example, the "cost oblivious" legislative provisions²²⁵ that demand the protection of health with no reference to costs; the national ambient air standards of the Clean Air Act;²²⁶ the fishable/swimmable criteria of the Clean Water Act;²²⁷ the "greatest protection" standards of the Occupational Safety and Health Act (OSHA);²²⁸ and the "absolutist" themes of the Solid Waste Disposal Act²²⁹ may be seen by the EPA as obstructing IPC. The repeal or amendment of such legislation, however, cannot be undertaken by EPA. That is a task for Congress. It is important, therefore, that the possible erosion of existing environmental standards be safeguarded.

E. New Legislation

It took new legislation to establish IPC in the U.K. and Sweden. The U.K. pollution regime, similar to that of the U.S., is a fragmented system based upon the discrete treatment of air, water and land. Based on the experience of the U.K. and Sweden, it is tempting to argue that IPC can only be implemented by comprehensive new legislation.

223. D. EPSTEIN, *THE POLITICAL THEORY OF THE FEDERALIST* 93-99 (1984); Bessette, *Deliberative Democracy: The Majority Principle in Republican Government*, in *HOW DEMOCRATIC IS THE CONSTITUTION?* 102 (R. Goldwin & W. Schabba eds. 1980).

224. Michaelman, *Political Markets and Community Self-Determination: Competing Judicial Models of Local Government Legitimacy*, 53 *IND. L. J.* 145, 149 (1977-78); Mashaw, *Mirrored Ambivalence: A Sometimes Curmudgeonly Comment on the Relationship Between Organization Theory and Administrative Law*, 33 *J. LEGAL EDUC.* 24, 49 (1983).

225. Rodgers, *Benefits, Costs and Risks: Oversight of Health and Environmental Decision-making*, 4 *HAR. ENVTL. L. REV.* 191, 210 (1980).

226. 42 U.S.C. § 7409(b)(1)(1982).

227. 33 U.S.C. § 1251(a)(2)(1982).

228. 29 U.S.C.A. § 655(a)(1982).

229. 42 U.S.C.A. §§ 6902(b), 6903(5)(B), 6924(e), 6924(j), 6924(l), 6939(b), 6991(b)-(g), 6945(a). See also W.M. RODGERS, *ENVIRONMENTAL LAW PESTICIDES AND TOXIC SUBSTANCES* 515 (1988).

The Conservation Foundation has indeed drafted "The Environmental Protection Act" that will establish IPC.²³⁰ Yet, it is extremely unlikely that comprehensive new legislation, which wipes the slate clean of existing law, and wrests jurisdiction from prevailing legislative committees, will be enacted in one swoop. The arguments for so contending have already been made.²³¹ The difficulties in enacting new legislation are truly formidable.²³² Interest groups seeking legislation need to have access either to the executive branch or to legislative subcommittees. While law and policy making may no longer be confined to closed networks or "iron triangles" between congressional subcommittees, executive agencies and outside clientele groups, the difficulties of breaking into the system are overwhelming. A bill needs a sponsor, and getting sponsorship for the draft act could be problematical. Congressmen and Senators hear a bewildering array of lobbyists and face a confusion of voices. Even where a sponsor is found, the conservatism and caution of the legislature makes progress very problematic. Congress is "... devoted inordinately to the prevention of action ..." and is "... so well equipped to stop legislation ..." ²³³ And what it does not stop, it alters. Compromise is the order of the day. Any proposal for legislation requires major and marginal compromise in caucus, in committee, on the floor and in negotiations with the executive.²³⁴

We have nonetheless seen that legislation establishing a commission to review the working of EPA is now progressing through Congress and stands a good chance of becoming law in the present session.²³⁵ This development may be seen as one that augers well for the speedy introduction of comprehensive new legislation of the kind mooted by the Conservation Foundation. To so hope is to believe in vain. In Congress today, there are eleven full House and nine full Senate committees and up to one hundred subcommittees that share environmental jurisdiction.²³⁶ New legislation will entail a shake up of such fragmented responsibilities. In the absence of further administrative and policy developments that establish a strong case for IPC, it is extremely unlikely that members of Congress will consent to a move that wrests power away from them, or interferes with their ability to influence environmental policy. To try and introduce new legislation at this stage, without first laying the necessary foundations, will be premature.

230. CONSERVATION FOUNDATION, *THE ENVIRONMENTAL PROTECTION ACT, SECOND DRAFT* (1988).

231. Guruswamy, *supra* note 5, at 519-20.

232. W. KEEFE & M. OGUL, *THE AMERICAN LEGISLATIVE PROCESS* 1-36 (6th ed. 1985); D. LOCKARD, *THE PERVERSED PRIORITIES OF AMERICAN POLITICS* (1971); W. ESKRIDGE & P. FRICKEY, *LEGISLATION* 1-36 (1987).

233. D. LOCKARD, *supra* note 232, at 123.

234. W. KEEFE & M. OGUL, *supra* note 232, at 15-16.

235. *See supra* note 9.

236. Reilly, *supra* note 7, at 9.

Consequently it is wiser to move administratively through existing legislation to lay the groundwork for future legislative moves. Through a robust implementation of TSCA, NEPA, and coordinated permitting, EPA may well be able to demonstrate the effectiveness and efficiency of IPC.²³⁷ In doing so EPA could be laying the foundations for new legislation.

IV. CONCLUSIONS

"Muddling through" and incrementalism were understandable and necessary steps in the evolution of environmental policy. Muddling through for twenty years has brought home the shortcomings of such an approach. The winds of change are blowing strongly in the direction of integration. It would be a mistake, however, to attempt IPC through one revolutionary act of legislation. Such an endeavor overlooks the political obstacles confronting new legislation, and neglects the accumulated wisdom of nearly twenty years of pollution control.

This article espouses an interim stage that will build upon past experience, and act as a precursor to a more radical implementation of IPC. Such a stage envisions an administrative initiative that institutionalizes IPC in those areas

237. EPA's authority to interpret and implement existing statutes to advance IPC may be challenged in court. The success of such a challenge is rendered very unlikely by *Chevron U.S.A. v. National Resources Defense Council*, 467 U.S. 837 (1984). *Chevron* is described as "the leading case on the subject of deference to administrative agencies on issues of statutory interpretation." Levin, *Judicial Review of Administrative Action in a Conservative Era* 39 ADMIN. L. REV. 353, 356 (1987). In *Chevron*, the Supreme Court crafted a paradigm to govern the federal judiciary's review of administrative interpretation. According to *Chevron*, a court reviewing an agency's interpretation of a statute is required to undertake a two stage analysis. First, the court is to determine "whether Congress has directly spoken to the precise question at issue." *Chevron*, 467 U.S. at 842. If the answer to that question is clear that is the end of the matter. If, however, the court finds that the statute is silent or ambiguous with respect to the specific issue the reviewing court shall proceed to the second step. In taking this second step "a court may not substitute its own construction of a statutory provision for a reasonable interpretation made by the administrator of an agency." *Id.* at 844.

K.C. Davis opines that by denying the court power to intervene where there has been an erroneous construction of a statute by an agency, the Supreme Court is contradicting Section 706 of the Administrative Procedure Act which states that "the reviewing court shall decide all relevant questions of law." 5 U.S.C. §706 (1988); K.C. DAVIS, ADMINISTRATIVE LAW OF THE EIGHTIES: 1989 SUPPLEMENT TO ADMINISTRATIVE LAW TREATISE 508 (1989). Despite this and other criticisms, *Chevron* remains the leading case on the subject and was cited more than 600 times in the first three and a half years since it was decided. See Bye, *Judicial Review of Administrative Interpretation of Statutes: An Analysis of Chevron's Step Two*, 2 ADMIN. L. J. 255 (1988); Breyer, *Judicial Review of Questions of Law and Policy*, 38 ADMIN. L. REV. 363, 372-382 (1986); Sunstein, *Constitutionalism After the New Deal*, 101 HARV. L. REV. 421, 465-469 (1987); Schwartz, *Recent Administrative Law Issues and Trends*, 3 ADMIN. L. J. 543, 560-568 (1989/90).

It is clear from our discussion of TSCA, NEPA and other statutes that an interpretation directed at IPC is eminently reasonable. If so, there is good reason to believe the courts will defer to EPA's judgment.

where it is mandated by existing laws and policies. The use of comparisons enlightens the way forward, and reveals a curious irony. It is evident from the experience of the U.K., Sweden and the EC that they rely on instruments, institutions and models analogous to EPA and environmental assessments under NEPA and TSCA. Although they originated in the U.S., these legal designs have lost their integrative impact and thrust in the U.S. We need, therefore, to re-discover their integrative potential, and re-baptize them into the service of IPC. In so doing we will be paving the way for comprehensive integrated pollution control.

