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Citation Information

Lakshman Guruswamy, *Integration & Biocomplexity*, 27 *ECOLOGY L.Q.* 1191 (2001), available at <https://scholar.law.colorado.edu/faculty-articles/569>.

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Integration & Biocomplexity

Lakshman Guruswamy*

Sustainable development (SD) is premised on the inescapable and integral role played by humans in shaping and impacting the natural world and has been recognized as a foundational norm of international environmental law and policy. Ecologicalism—an outlook that embraces a comprehensive approach to interdependent natural and human systems—provides the conceptual underpinnings for a creative and integrated environmental management philosophy for implementing SD. This Article argues that the daunting task of defining and applying such an integrated approach and philosophy to the multiple interacting changes affecting planetary life support systems can benefit from the U.S. experience in addressing the need for integrated pollution control (IPC). It also contends that the relatively new discipline of Industrial Ecology (IE) that pairs industry with ecology offers a promising new system paradigm for analyzing human activity within the biophysical environment. By entwining humans and their needs with ecosystems, IE does in fact aspire to become the “science of sustainability.”

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INTRODUCTION

Our global and local life support systems consist of the major physical, chemical, biological, political, legal, and institutional systems of the world, as well as the knowledge base of humankind.¹ The interrelated nature of these complex life support systems demands an integrated approach to their management. Approaching management in an integrated manner is a means of, or a method for, achieving environmental and human goals. Goals to be achieved through management objectives should be formulated with the concept of sustainable development as their foundation.

As defined in this Article, sustainable development (SD) calls for using natural resources in a manner fulfilling human needs while also ensuring that resources continue to be available for use by future generations. SD is a political construct that has been accepted as a foundational norm of environmental law and policy by the international community. In addition, the international community has accepted SD as the *grundnorm*²

1. As defined in ENCYCLOPEDIA OF LIFE SUPPORT SYSTEMS,

A life support system is any natural or human-engineered system that furthers the life of the biosphere in a sustainable fashion. The fundamental attribute of life support systems is that together they provide all of the sustainable needs required for continuance of life. These needs go far beyond biological requirements. Thus life support systems encompass natural environmental systems as well as ancillary social systems required to foster societal harmony, safety, nutrition, medical care, economic standards, and the development of new technology. The one common thread in all of these systems is that they operate in partnership with the conservation of global natural resources.

Conceptual Framework, ENCYCLOPEDIA OF LIFE SUPPORT SYSTEMS (Feb. 10, 2000), at <http://www.eolss.co.uk> [hereinafter EOLSS].

2. A *grundnorm*, translated in the United States as the basic norm, is the foundational premise or initial hypothesis conferring validity or legitimacy on all other norms of international environmental governance. As formulated by the Austrian jurist Hans Kelsen, "[I]t is the postulated ultimate rule according to which norms . . . are established and annulled, receive or lose their validity." HANS KELSEN, *GENERAL THEORY OF LAW* 113 (1946); HANS KELSEN, *GENERAL THEORY OF LAW* 8, 194-95 (1967).

(basic norm) of international environmental law ever since it was proclaimed to be such at the Earth Summit of 1992.³ Despite its exalted status, the concept of SD maintains a chimerical character; it needs to be honed, refined, and more clearly defined. While the concept of SD continues to evolve, a recent restatement of SD conceptualized by a group including a significant number of Nobel Laureates is worthy of particular attention.⁴

This distinguished group defines SD as the wise use of resources through social, economic, technological, and ecological policies governing natural and human engineered capital.⁵ According to this restatement, such policies should promote innovations that assure a higher degree of life support for the fulfillment of human needs while ensuring intergenerational equity.

Defining SD this way creates a significant change in the national and international approaches to environmental protection. For instance, during the 1960s and 1970s, environmental activists were mainly concerned with preserving endangered species and safeguarding natural resources from human depredation. Humans were generally cast in the role of predators, parasites, and wrongdoers. SD, on the other hand, embraces *human welfare* as a central objective, while simultaneously pursuing conservation,⁶ or ecologicalism (a world view based on the principles of ecology).

This definition of SD recognizes human interaction with the natural world. Such interaction is consistent with the non-equilibrium paradigm in ecology. The non-equilibrium paradigm may be contrasted with the equilibrium model that calls for

3. The United Nations Conference on Environment and Development (UNCED) or Earth Summit was convened in Rio de Janeiro, Brazil, in 1992. The Earth Summit was the biggest and most important environmental conference in history. It sought to give expression to sustainable development and fulfill its goals of addressing the dual problems of environmental protection and socio-economic development by producing two treaties: the Convention on Biological Diversity and the Framework Convention on Climate Change; two instruments: the Rio Declaration and Agenda 21; together with a non-binding declaration on Forest Principles.

4. Inspired in part by UNCED and subsequent conferences and events, a collection of noted scientists, scholars, and policymakers determined to create a comprehensive and authoritative body of knowledge incorporating a unified, interdisciplinary understanding of the interdependence of natural and human-created systems. To this end, these visionaries initiated the ENCYCLOPEDIA OF LIFE SUPPORT SYSTEMS (EOLSS), a project currently under development. EOLSS, *supra* note 1.

5. See EOLSS, *supra* note 1.

6. Sir Shridath Ramphal, *Sustainable Development*, in ENCYCLOPEDIA OF THE ENVIRONMENT 680 (Ruth A. Eblen & William R. Eblen eds., 1994).

preservation of the natural world through the exclusion, or limited intervention, of humans. Thus, the non-equilibrium model integrates humans into the natural world and allows for appropriate human intervention into natural systems in an effort to maximize life support systems.⁷

We now know that ecological systems do not possess fixed equilibria, or static stability, but are instead characterized by change.⁸ Such a view sees nature in a constant state of flux, and stands in marked contrast to the earlier belief that ecological systems exist in a perfectly balanced, or stable, state. Not surprisingly, a significant number of environmental lawyers and policymakers have been weaned on the view, prevailing in the 1960s and 1970s, that law and policy should strive to restore, and not tamper with, the primordial balance of nature. Thus, much bedrock legislation such as the Endangered Species Act,⁹ the Wilderness Act,¹⁰ the National Environmental Policy Act of 1969 (NEPA),¹¹ Section 404 of the Clean Water Act,¹² and the broader non-degradation provisions of the Clean Air¹³ and Clean Water Acts¹⁴ are based on the premise that nature is best protected when it is left untouched. According to the equilibrium view, the absence of human intervention attempting to restore nature to a previous state free of human intrusion would enable nature to achieve a natural permanence of form and structure that would persist indefinitely.¹⁵

In contrast to the equilibrium view, the non-equilibrium paradigm recognizes that living things and the external world are not separate static entities, but are interacting components of complex, dynamic systems. Today's ecologists point out that humans and their environments are interacting components of these systems and that practically all inhabited environments

7. See Ruth A. Eblen & William R. Eblen, *Preface*, in *ENCYCLOPEDIA OF THE ENVIRONMENT*, *supra* note 6, at xv.

8. Daniel B. Botkin, *Ecological Stability*, in *ENCYCLOPEDIA OF THE ENVIRONMENT*, *supra* note 6, at 164, 166 (1994).

9. Endangered Species Act, 16 U.S.C. §§ 1531-1544 (1994).

10. National Wilderness Preservation System, 16 U.S.C. §§ 1131-1136 (1994).

11. National Environmental Policy Act of 1969, 42 U.S.C. §§ 4321-4347 (1994) ("NEPA").

12. Federal Water Pollution Control Act § 404, 33 U.S.C. § 1344 (1994).

13. Clean Air Act, 42 U.S.C. §§ 7401-7671q (1994).

14. Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (1994).

15. See A. Dan Tarlock, *The Nonequilibrium Paradigm in Ecology and the Partial Unraveling of Environmental Law*, 27 *LOJ. L.A. L. REV.* 1121 (1994); see also Jonathan Baert Wiener, *Law and the New Ecology: Evolution, Categories, and Consequences*, 22 *ECOLOGY L.Q.* 325 (1995).

have been profoundly altered by human cultures.¹⁶ Human life necessarily implies interventions into nature; however, if managed according to the knowledge available, these interventions can be ecologically sound, and can create new environmental values.¹⁷ An important element of this viewpoint is that it is not always true that "nature knows best" because nature often creates ecosystems that are inefficient, wasteful, and destructive. Thus, the non-equilibrium perspective proposes that by using reason, knowledge, imagination, and toil, people can shape ecosystems that have more efficient qualities that nature could not achieve.¹⁸

Traditionally, life support systems have been managed in a fragmented manner. These systems can be better managed if they are viewed as an integrated whole. Professor Pamela Matson offers illuminating examples of multiple interacting changes, affecting water, atmosphere, and biodiversity, among life support systems.¹⁹ These examples provide evidence in support of the view that calls for an integrated management approach that embraces not only natural life support systems (physical, chemical, and biological) but also human systems (legal and institutional).

Many experts call for life support systems to be managed through an integrated approach. Ecologists are steadfast in suggesting the need for a comprehensive, as distinct from a fragmented, approach to environmental problems. Moreover, by adopting an ecological perspective, scientists offer a better view of the enormous biocomplexity confronting an integrated approach to environmental decisionmaking.

Physical, chemical, and biological scientists, in a remarkable display of interdisciplinary cooperation, confront the interrelated character, or biocomplexity, of global problems by successfully establishing huge billion-dollar initiatives on global change, such as the International Geosphere Biosphere Program (IGBP) and the World Climate Research Program (WCRP). These institutions intend to produce a comprehensive and integrated model of the physical, chemical, and biological processes that regulate the

16. Ruth A. Eblen & William R. Eblen, *supra* note 7, at xv.

17. *Id.* at xv-xvi.

18. Rene Dubos, *Humanized Environments*, in *ENCYCLOPEDIA OF THE ENVIRONMENT*, *supra* note 6, at 344.

19. See Pamela Matson, *Environmental Challenges for the Twenty-First Century, Interacting Challenges and Integrative Solutions*, 27 *ECOLOGY L.Q.* 1179 (2001).

world.²⁰ These studies will consider the biosphere, the geosphere, and all the interactions within and between them. For example, studies include "biogeochemistry" where models track the cycles of chemical elements that flow through ecosystems, "biogeophysics" where models determine the way energy flows through ecosystems, and additional models that predict the effects of land use on ecosystems. The collection of data for undertaking such an effort has already begun.²¹

Unfortunately, many exalted interdisciplinary ventures, including the National Science Foundation's (NSF's) new biocomplexity initiative,²² while netting huge dollars from Congress, appear to be confined to physical, natural, and chemical scientists, to the substantial exclusion of social scientists and lawyers. As Professor Kai Lee argues, these hard sciences need to be integrated, not separated, from policy and law at the "design" stage.²³ The failure to do this will almost certainly result in the non-implementation of the laudable comprehensive approach being taken and will constitute an inefficient use of public money. The present article is important because it demonstrates that the most effective way to change existing law, policy, and institutions is for law and policymakers to work in tandem with scientists in an *ex ante*, instead of the traditional *ex post* fashion.

Because an integrated approach is a way to achieve both environmental and human goals, its methods of management should be crafted and molded in light of these substantive goals. The exercise of formulating specific substantive goals is an ongoing and dynamic process, informed by the knowledge base emerging out of grass roots, national, regional, and global efforts. However, these goals must be built on the foundations of sustainable development.

While recognizing that environmental objectives are an integral part of this discussion, this Article does not attempt the daunting conceptual exercise of redefining the objective of environmental protection in light of SD. Rather, this Article

20. PROTECTION OF GLOBAL BIODIVERSITY CONVERGING STRATEGIES 8-9 (Lakshman Guruswamy & Jeffrey McNeely eds., 1998).

21. *A Problem as Big as a Planet*, ECONOMIST, Nov. 5, 1994, at 83.

22. "Biocomplexity is a multi-disciplinary approach to understanding the world's environment . . . [it accounts for] the importance of scale, from micro to macro, and includes social and behavioral sciences into the ecosystem calculus." Jeffrey Mervis, *Biocomplexity Blooms in the NSF's Research Garden*, 286 SCI. 2068 (1999) (quoting Rita Colwell, Director, National Science Foundation).

23. See Kai N. Lee, *Searching for Sustainability in the New Century*, 27 ECOLOGY L.Q. 913 (2001).

focuses on integration as a method of achieving the objectives of SD and argues that attempts to understand and integrate life support systems at a global level should be informed by, and incorporated into past and ongoing integrative experiments, at a more functional, place-based or local level.

This Article identifies two aspects of ecologicalism— a world view based on the principles of ecology. The first aspect of ecologicalism, anchored in the objectives of SD, establishes a new paradigm about the nature of ecological systems that may call for a review of existing legal objectives. The second aspect of ecologicalism, based on local, regional, and global interdependency of life support systems, posits the need for developing integrated management strategies for managing life support systems in a manner that maintains their sustainability. We are currently witnessing a historic confluence of politics and science. SD and the non-equilibrium paradigm are creating conceptions of resource use that were once shunned by equilibrium ecologists, lawmakers, and policymakers. The convergence of SD and the non-equilibrium paradigm heightens the need for a reevaluation and redefinition of the objectives, substantive goals, and rationales underlying environmental protection in the United States, as well as in the international arena.

This Article is organized into four parts. Part I of this Article outlines the nature and importance of sustainable development and then delineates how it reconfigures the objectives of environmental protection. Part II examines how ecologicalism offers a scientific rationale for the political construct of sustainable development. Part III then discusses integration as a method of achieving environmental objectives. The daunting task of defining and applying an integrated approach to the multiple interacting changes affecting the entirety of planetary life support systems can benefit from the U.S. experience in controlling pollution. Based on a case study of the United States, this part explains why integrated policymaking is a dynamic, evolving process in which partial, albeit unfolding knowledge, permits only incremental progress. Part III concludes by suggesting that it is almost impossible to conceive, let alone institutionalize and implement, a grand design for planetary integration that embraces all of Earth's life support systems.

Finally, Part IV argues the case for implementing integrated strategies at a functional, place-based level. In Part IV, the

Article suggests that despite the baffling degrees of "biocomplexity"²⁴ encountered by such an approach, the scientific, economic, and socio-political arguments for an integrated approach to pollution control must now include global life support systems. The emerging field of industrial ecology (IE) complements our comprehension of the biocomplexity surrounding the global life support systems of the planet.

IE offers a promising whole-system paradigm for analyzing human activity within the biophysical environment by pairing industry with ecology. It does so by drawing together the natural world as a whole system based on principles of ecology, and the full cycle of human modifications of the environment, through the market-based and regulatory institutions that govern industry. IE examines how local, regional, and global materials and energy flows in products and processes affect and are affected by a gamut of human activities in industrial societies and economies. By entwining humans and their needs with ecosystems, it does in fact aspire to become the "science of sustainability."²⁵ For the purposes of this discussion, IE and integration are mutually reinforcing endeavors that share a common view of the natural world as a system, and attempt to understand materials and energy flows.²⁶ The concepts of mass flow analysis²⁷ and life cycle analysis are common to both endeavors.

Specifically, this section argues that an integrated approach, based on scientific constructs of the kind suggested by Professor Matson,²⁸ must be incorporated and implemented within the political parameters of SD. This symposium has recognized that one of the most daunting challenges facing the new century is to formulate laws, policies, and institutions that address SD. This paper offers some modest suggestions as to how we might begin to meet these challenges when dealing with environmental integration.

These unfolding findings should then form the basis of managerial or policy decisions that could be applied on an incremental basis to advance integrated approaches at a local

24. *Id.*

25. T. E. GRADEL & B. R. ALLENBY, *INDUSTRIAL ECOLOGY* (1995).

26. Charles W. Powers & Marion R. Chertow, *Industrial Ecology*, in *THINKING ECOLOGICALLY* 24-26 (1997).

27. Robert Ayers et al., *Human Impacts on the Carbon and Nitrogen Cycles*, in *INDUSTRIAL ECOLOGY AND GLOBAL CHANGE* 121-155 (Robert H. Socolow et al. eds., 1994).

28. See Matson, *supra* note 19.

pollution control level, as well as climate change at a global level. Doing so will, of course, necessitate the creation of law and policy frameworks that can respond to new knowledge in a dynamic as distinct from a static manner.

I

SUSTAINABLE DEVELOPMENT

In 1983, the General Assembly of the United Nations (U.N.) created the World Commission on Environment and Development (WCED or Brundtland Commission) and charged the WCED with proposing long-term environmental strategies for SD. The U.N. did not define that elusive term, and despite the efforts of the Brundtland Commission and the Earth Summit, the term SD still eludes satisfactory definition. After four years of deliberation, worldwide consultation and study, the Brundtland Report, *Our Common Future*,²⁹ articulated the paradigm on which the Earth Summit, and indeed International Environmental Law (IEL) has since been based. In essence, it rejected the pessimistic thesis that environmental problems were beyond repair, spiraling out of control, and could only be averted by *no growth* (arresting development and economic growth). Instead, the Brundtland report argued that economic growth was both desirable and possible within a context of SD.³⁰

Although SD was not clearly defined by the Brundtland Commission, some of its key attributes are identifiable. First, SD calls for developmental policies and for economic growth that work to relieve the great poverty of Less Developed Countries (LDCs) while protecting the environment. Second, SD suggests that development and growth should be based on policies that sustain and expand the environmental resource base in a manner that meets the needs of the present generation without compromising the ability of future generations to meet their own needs. Consequently, SD was envisioned as environmentally sensitive development.³¹ By rejecting economic development that destroys the resource base, along with environmentally insensitive growth, SD, as originally conceived, confers parity of status to economic growth and environmental protection.

The iteration of SD that emerged at the Earth Summit was somewhat different from that suggested by the Brundtland

29. WORLD COMM'N ON ENVTL. DEV., *OUR COMMON FUTURE* (1987).

30. See *id.* at xii.

31. *Id.* at 1-8.

Commission.³² To begin, the intended "Earth Charter" was replaced by the "Rio Declaration on Environment and Development" (Rio Declaration),³³ a title that diminished the environmental resonance and status of that document. Second, the Rio Principles, in contrast to those of the Stockholm Declaration on the Human Environment of 1972³⁴ (Stockholm Declaration),³⁵ stressed development at the expense of conservation. For example, the nascent right to a wholesome environment as embodied in the Stockholm Declaration was abandoned in the Rio Declaration in favor of a right to development (Principle 2).³⁶ In addition, the obligation not to cause trans-frontier damage contained in Principle 21 of the Stockholm Declaration³⁷ was weakened in Principle 2 of the Rio Declaration by the addition of crucial language authorizing states "to exploit their own natural resources pursuant to their own environmental and *developmental* policies."³⁸

The Rio Declaration granted states the right to *consume* or *develop*. This new right to *develop* replaced the previous obligation, as found in the Stockholm Declaration, to *conserve*. For instance, the Rio formulation refers to "developmental and

32. See *supra* note 4.

33. Rio Declaration on Environment and Development, June 13, 1992, U.N.C.E.D. Doc. A/CONF.151/1 (Rev.1), 31 I.L.M. 874 (1992) [hereinafter Rio Declaration].

34. Stockholm Declaration of the United Nations Conference on the Human Environment, June 16, 1972, *Report of the U.N. Conference on the Human Environment, Stockholm*, June 5-16, 1972. U.N. Doc. A/CONF.48/14/Rev.1 at 3 (1973), U.N. Doc. A/CONF. 48/14 at 2-65, and Corr. 1 (1972), 11 I.L.M. 1416 (1972) [hereinafter Stockholm Declaration].

35. The Stockholm Convention on the Human Environment, 1972, was the first international conference convened specifically to address global environmental problems, and was the chrysalis from which international environmental law emerged as a legal subject in its own right.

36. Rio Declaration, *supra* note 33, at Principle 2:

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

37. Stockholm Declaration, *supra* note 34, at Principle 21:

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

38. Rio Declaration, *supra* note 33, at Principle 2 (emphasis added).

environmental needs of present and future generations."³⁹ This re-formulation necessarily negates or weakens the obligation to conserve expressed in the Stockholm Declaration. Finally, the Rio Declaration frowns upon unilateral actions, such as that taken by the United States under the Marine Mammal Protection Act of 1972,⁴⁰ to prevent the killing of dolphins by prohibiting imports of tuna caught in dolphin killing nets, or the protection of endangered sea turtles.⁴¹ Principle 12 of the Rio Declaration, stating that "[u]nilateral actions to deal with environmental challenges outside the jurisdiction of the importing country should be avoided,"⁴² effectively prevents a concerned state from taking action to protect the international environment.

Not surprisingly, some commentators, including the present author,⁴³ argue that the Rio Declaration institutionalized a preeminent right to economic development that enfeebled and attenuated the imperative of SD.⁴⁴ The Convention on Biological Diversity⁴⁵ (CBD) confirms such a claim. While SD functions as a prevailing force and ultimate objective of the CBD, the treaty states both in its Preamble and in critical articles dealing with the financing of the Convention that "economic and social development and poverty eradication are the first and overriding priorities of developing countries."⁴⁶ By diminishing environmental protection, the Convention effectively tips the balance of SD toward development rather than conservation. Despite these misgivings about what it ought to mean, the hard fact remains that SD is about development.⁴⁷

39. *Id.* at Principle 3 (stating that "[t]he right to development must be fulfilled so as to equitably meet developmental and environmental needs of present and future generations").

40. 16 U.S.C. § 1361-1421h (1994).

41. Lakshman Guruswamy, *The Annihilation of Sea Turtles: WTO Intransigence and U.S. Equivocation*, 30 ENVTL. L. REP. 10,261 (2000).

42. Rio Declaration, *supra* note 33, at Principle 12.

43. Lakshman D. Guruswamy & Brent R. Hendricks, *INTERNATIONAL ENVIRONMENTAL LAW IN A NUTSHELL* 12-14 (1997).

44. See Marc Pallemmaerts, *International Environmental Law in the Age of Sustainable Development: A Critical Assessment of the UNCED Process*, 15 J.L. & COM. 623, 630-35 (1996).

45. Convention on Biological Diversity, June 5, 1992, 31 I.L.M. 818 (1992).

46. *Id.* at preamble ¶ 19; see also *id.* art. 20, § 4.

47. See *supra* text accompanying notes 5-6. While reference to sustainable development is only made once in the CBD, it is repeatedly inscribed within two common terms of the treaty: "conservation" and "sustainable use." These might be seen as the twin poles of sustainable development. On the one hand, sustainable use acknowledges the necessity of utilizing biological resources: "Sustainable use" means the use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its

Consistent with its objectives, the EOLSS Conceptual Framework defines SD as development that wisely uses human and natural resources to assure a "higher degree of human needs fulfillment, or life support."⁴⁸ The life support systems referred to are both natural and social systems that promote human welfare. Thus, "life support systems" are defined as "natural environmental systems as well as ancillary social systems required to foster societal harmony, safety, nutrition, medical care, economic standards, and the development of new technology . . . that . . . operate in partnership with the conservation of global natural resources."⁴⁹ These definitions give primacy to the pursuit of human welfare and the betterment of human quality of life through the prudential conservation of natural resources. The emphasis is clearly on the advancement of human welfare rather than on the protection of the environment or the preservation of natural resources for its own sake. In sum, it would be fair to conclude that the balance struck in the EOLSS Conceptual Framework's definition of SD favors development rather than conservation.

The manner in which SD is defined can have profound implications for law, policy, and institutions. For example, the existing paradigm of U.S. environmental laws and policies as found in the National Environmental Policy Act (NEPA),⁵⁰ Endangered Species Act (ESA),⁵¹ the Preservation Act,⁵² the Clean Air Act (CAA),⁵³ and Clean Water Act (CWA),⁵⁴ arguably institutionalizes environmental protection as a value in its own right, whether or not human needs are fulfilled or promoted. Further, the laws embody a concept different from SD as presently defined, a view based at least in part on a theory of the environment and ecology that is not scientifically supported.

potential to meet the needs and aspirations of present and future generations." Convention on Biological Diversity, *supra* note 45, art. II, ¶ 16. On the other hand, "conservation" is not defined in the treaty, but its usage clearly speaks to the preservation of biological diversity. For example, the treaty does define *in-situ* conservation as "the conservation of ecosystems and natural habitats and the maintenance and recovery of viable populations of species in their natural surroundings . . ." *Id.*, art. II, ¶ 13. Thus, in combining the development connotation of "sustainable use" with the preservation connotation of "conservation," the CBD strikes the balance of sustainable development.

48. *Conceptual Framework*, *supra* note 1, at 7.

49. *Id.* at 1.

50. 42 U.S.C. §§ 4321-4370e (1994).

51. 16 U.S.C. §§ 1531-1544 (1994).

52. 16 U.S.C. §§ 1131-1136 (1994).

53. 42 U.S.C. §§ 7401-7671q (1994).

54. 33 U.S.C. §§ 1251-1387 (1994).

II

ECOLOGICALISM

Professor Matson's approach to water resources, atmosphere, climate, biodiversity, and ecosystems may be described as "ecologicalism."⁵⁵ Such a perspective has been distinguished from conservationism and environmentalism. Conservationism centers around the wise use of resources and is generally regarded in local terms. Environmentalism primarily concerns human health and adopts a somewhat broader outlook. Ecologicalism focuses on ecological sustainability and adopts a comprehensive outlook that accounts for the local, regional, and global interdependency of life support systems. For example, the EOLSS enterprise symbolizes the global embrace of ecologicalism. Two principles of ecologicalism are crucial to our discussion. The first relates to equilibrium theory and the second deals with the interconnected nature of ecological systems.

A. Equilibrium Theory

The prevalent view up to the 1960s and 1970s was that ecological systems existed in perfect balanced stability. The absence of human intervention was believed to restore the balance of nature and enable it to achieve a natural permanence of form that would persist indefinitely.⁵⁶ Under this view, the objective of law and policy was to restore, rather than interfere with this balance of nature.

Policymakers found this scientific hypothesis, called the equilibrium theory, attractive for reasons independent of the scientific reasons for restoring a natural balance. It was premised on a romantic view of nature that values ethical and religious motivations as much or even greater than scientific reasons. Aldo Leopold, for example, called for a new land conservation ethic based on respect for the land.⁵⁷ While he did suggest scientific reasons for preserving land, based on the ecologist Frederick Clements' theory of end-state equilibrium,⁵⁸ Leopold's appeal for preservation rested primarily on ethical and

55. Riley E. Dunlap & Angela G. Mertig, *Environmental Movement*, in ENCYCLOPEDIA OF THE ENVIRONMENT, *supra* note 6, at 211, 213.

56. See Joseph M. Petulla, *Conservation Movement in the U.S.*, in ENCYCLOPEDIA OF THE ENVIRONMENT, *supra* note 6, at 114-15.

57. See ALDO LEOPOLD, *A SAND COUNTY ALMANAC AND SKETCHES HERE AND THERE* 201-26 (Oxford Univ. Press paperback ed. 1968).

58. See Frederick E. Clements, *Nature and Structure of the Climax*, 24 J. ECOLOGY 252, 255-56 (1936).

moral grounds.⁵⁹ Moreover, the "balance of nature" was a concept rooted in Christian and Enlightenment world views.⁶⁰ According to some of these views, nature is made perfect by an omniscient and omnipotent creator and is then wrongly defiled by man. An affirmation that nature should be left to have its own way thus becomes an expression of religious belief.⁶¹

This convergence of science, ethics, and religion had a profound influence on policymakers and scholars addressing resource management.⁶² Equilibrium and the balance of nature resonated strongly with policymakers in the 1960s and 1970s, who were predominantly influenced by the first-world environmentalism of the times.⁶³ These views had not yet been countervailed by the views of those from the third world. The difference in these perspectives is encapsulated by the contrast

59. See Aldo Leopold, *Some Fundamentals of Conservation in the Southwest*, 1 ENVTL. ETHICS 131 (1979).

60. DANIEL B. BOTKIN, *DISCORDANT HARMONIES: A NEW ECOLOGY FOR THE TWENTY-FIRST CENTURY* (1990).

61. Influential contemporary commentators now attribute the balance of nature views of earlier ecologists to the prescientific views of Greek and Roman philosophers, who believed that nature, undisturbed by human action, achieves a permanence of form and structure that persists indefinitely. According to the theory of ecological succession, each ecosystem, having undergone a series of changes, ends in a permanent climax that lasts indefinitely. Unfortunately, nature is destroyed by people who are outside it and impact it adversely. Modern exponents of this view continue to believe that nature forms a world apart from man, and that pristine places should be unaltered and preserved. *E.g.* BILL MCKIBBON, *THE END OF NATURE* 48, 55 (1989).

62. See Tarlock, *supra* note 15, at 1126-28. While Prof. Tarlock suggests that Leopold was echoing the thesis of the ecologist Tansley about a "relatively stable dynamic equilibrium" there is little doubt that Leopold was also clearly espousing and pressing the need for a land ethic. *Id.* at 1127; see also BRYAN G. NORTON, *TOWARD UNITY AMONG ENVIRONMENTALISTS* 39-60 (1991).

63. Environmentalism during this period was primarily the preoccupation of first-world (American and European) elites and policymakers. The themes articulated by RACHEL CARSON, *SILENT SPRING* (1962), BARRY COMMONER, *THE CLOSING CIRCLE* (1971) and Kenneth Boulding, *The Economics of the Coming Spaceship Earth*, in *ENVIRONMENTAL QUALITY IN A GROWING ECONOMY* 3 (1966) resonated from the United States into the thinking of other industrial nations. Many of these themes were melded and expressed with crusading cogency within an international context in DONELLA H. MEADOWS ET AL., *LIMITS TO GROWTH* (1972). The computer modeled Meadows study painted an apocalyptic picture of the growth of population, pollution, and exhaustion of natural resources leading to a breakdown of the carrying capacity of the Earth. The writing and ideology of global environmentalism captured the minds of first world decisionmakers. It failed to have the same impact on their third-world counterparts, who felt that environmentalists did not comprehend why development and growth were so crucial to the third world or less developed countries. Third-world policy architects saw the eradication of pollution caused by poverty, not environmental degradation, as their primary and overriding mission. To third-world decisionmakers, development and economic growth, despite the environmental damage they might cause, was the only way to eradicate the pollution of poverty.

between the tenor of the Stockholm Declaration of 1972 and Rio Declaration of 1992. The first was clearly environmentalist and the second developmental.

B. Non-Equilibrium Theory

The prevailing view today, however, is that the natural orders of organisms, populations, biotic communities, ecosystems, landscapes, biomes, biogeographic regions, and the biosphere⁶⁴ inevitably interact with the human order and undergo some kind of change. This paradigm relies upon Darwinian evolutionary theory to support the view that mutation and selection provide mechanisms that allow for adaptations that progressively become incorporated in the genetic apparatus of an evolving organism or species. Therefore, populations, biotic communities, and ecosystems can continue to exist only if they possess mechanisms that enable them to maintain their identity despite the endless pressure of external forces, and on the other hand to respond adaptively to those forces.⁶⁵

Furthermore, contemporary ecological research demonstrates that nature continually changes both in response to internal processes, such as chemical cycling, and external pressures, such as climate. Ecological systems are dynamic

64. These are the ecological levels of organization. See Eugene P. Odum, *Ecology as a Science*, in *ENCYCLOPEDIA OF THE ENVIRONMENT*, *supra* note 6, at 172.

65. See Rene Dubos, *Environment*, in *ENCYCLOPEDIA OF THE ENVIRONMENT*, *supra* note 6, at 210. The writings of Eugene Odum, one of the foremost and best-known ecologists of our age, offers us a glimpse into the changes in ecological thinking. Writing in 1959, he stated:

Homeostasis [keeping in equilibrium] at the organism level is a well known concept in physiology We find that equilibrium between organisms and environment may also be maintained by factors which resist change in the system as a whole. Much has been written about this "balance of nature" but only with the recent development of good methods for measuring rates of function of whole systems has a beginning been made in the understanding of the mechanisms involved.

Odum, *supra* note 64, at 172; EUGENE P. ODUM, *FUNDAMENTALS OF ECOLOGY* 25 (2d. ed. 1959).

By 1992, however, the first among his great overarching ideas for the 1990s was that "[a]n ecosystem is a thermodynamically open, far from equilibrium, system." Eugene P. Odum, *Great Ideas in Ecology for the 1990s*, 42 *BIOSCIENCE* 542, 542 (1992). These statements stand out in contrast to each other. Odum still believes that humans "could be considered a parasite on the biosphere for life support . . .," Odum, *supra* note 64, at 174, but mention of an open, far from equilibrium system, and the omission to mention the "balance of nature," is remarkable. Odum's 1992 conclusions apparently signal his recognition of a dramatic change in the views of many mainstream ecologists.

entities that are constantly changing.⁶⁶ Whatever its complexity, a biological system can continue to exist only if it can maintain its identity despite these pressures.⁶⁷

Others point out that we live in a state of "humanized nature," in which the stewardship of the Earth goes beyond good conservation practices:

It involves the creation of new ecosystems in which human interventions have caused some changes in . . . land . . . and living things to take advantage of . . . nature that would remain unexpressed in the state of wilderness. Throughout history . . . humans have tampered with blind ecological determinism.⁶⁸

Moreover, the distinction between "nature" and "human" is untenable from a Darwinian point of view because humans, like other species, have evolved from other organisms. They are part of the interconnected web of life.⁶⁹

A different metaphor explains how the science of ecologicalism paired with the politics of SD becomes a "dance of nature."⁷⁰ Such a progression demands creative and integrative ways of managing the environment in order to ensure that the "dance of nature" does not become the dance of death.

The extent to which nature adapts or perishes will depend to a great extent on how it is managed. The problems created by changes with regional and global impacts encompass biophysical phenomena arising from natural resource exploitation as well as pollution. The United States has had ample opportunity to confront and address the multiple interacting impacts of environmental pollution.

Unfortunately, the U.S. experience concerning the interconnected web of life demonstrates a dysfunctional relationship between institutional implementation and scientific theories. The United States has generally responded to water, air, and land pollution by passing legislation dealing with the immediately evident manifestations of pollution at the end of pipelines, smoke stacks, or in waste dumps. As a result, law,

66. See Daniel B. Botkin, *Ecological Stability*, in ENCYCLOPEDIA OF THE ENVIRONMENT, *supra* note 6, at 164-66.

67. See Dubos, *supra* note 65, at 210.

68. *Id.* at 344.

69. See RODERICK F. NASH, THE RIGHTS OF NATURE 70 (1989); Weiner, *supra* note 15, at 349.

70. Judy L. Meyer, *The Dance of Nature: New Concepts in Ecology*, 69 CHI.-KENT L. REV. 875, 875-82 (1994) (explaining that the metaphor of the dance of nature attempts to convey a sense of the dynamic, even tumultuous state of change and adaptation in nature). See generally Wiener, *supra* note 15.

policy, and administration generally do not reflect scientific realities; it is to these realities that we now turn.

III
INTEGRATION⁷¹

This section employs a United States case study to demonstrate the need for integration. It first describes the facts of the bio-physical and bio-chemical nature of pollution. The section goes on to explain why fragmented, end-of-pipeline effluent standards or end-of-stack emission controls address local problems but do not address the causes of pollution. Such regulations succeed only in cycling pollution from water to air to land. Having examined the reasons as to why Congress chose to adopt piecemeal strategies for controlling pollution, this section proceeds to argue that the present system of policy, law, and administration is both ineffectual and inefficient. The section concludes by making the case for an integrated approach to pollution control.

The experience of the United States in dealing with the need to integrate pollution control is a harbinger of the greater challenges confronting its application to global or planetary issues. The last thirty years witnessed mounting criticism of the failings of the existing fragmented approach to pollution control. Commentators argue that the present fragmented regime concentrates on moving the pollution generated by polluting activities from one place to another.⁷² Unfortunately, such pollution transfers ignore the basic law of physics: matter is indestructible and does not go away.⁷³ The initial destination of pollutants may be altered, but ultimately they re-enter the flow of material within the environment.

71. This section draws substantially, and reproduces sections from, Lakshman Guruswamy, *Integrating Thoughtways: Re-Opening of the Environmental Mind?*, 1989 Wis. L. Rev. 463 (1989).

72. This is because the laws aimed at reducing or removing pollutants from specific mediums 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. In the result, pollution controls do not restrict the production per se of goods such as, for example, cars, paper, or energy, that are the reason for the production processes causing pollution, or even the processes themselves.

73. See Allen V. KNEESE & BLAIR T. BOWER, ENVIRONMENTAL QUALITY AND RESIDUALS MANAGEMENT 1-12 (1979); Allen V. Kneese, *Pollution and a Better Environment*, 10 ARIZ. L. REV. 10 (1968); ALLEN V. KNEESE, ECONOMICS AND THE ENVIRONMENT 16-73 (1977); MAYNARD M. HUFSCHEMIDT ET AL., NATURAL SYSTEMS AND DEVELOPMENT 73-113 (1983); LEONARD ORTOLANO, ENVIRONMENTAL PLANNING AND DECISION MAKING 25-34 (1984); J. F. LOWE ET AL., TOTAL ENVIRONMENTAL CONTROL 3 (1982).

Limiting discharges in one medium, such as air, while correcting the immediate pollution problem within that medium, often does 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 that have adverse effects on other media. For example, the provisions of the Clean Air Act directed at reducing sulfur dioxide require the use of "scrubbers"⁷⁴ in smoke stacks. Huge quantities of lime, limestone solution, and water are sprayed on exhaust gases as they flow up power plant smokestacks. Sulfur dioxide in the gas reacts with the spray and forms a solution from which sulfur dioxide is later removed, strained, and disposed of in the form of sludge.⁷⁵ The Environmental Protection Agency (EPA) estimates that three to six tons of scrubber sludge may be produced for each ton of sulfur dioxide removed from the flue gas.⁷⁶ Consequently, the problem of sulfur 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 nondegradable, bioaccumulable toxic substances.⁷⁷ According to one estimate, more than 118 million metric tons of sludge were produced annually.⁷⁸ While current technologies have reduced scrubber residues, scrubbers continue to produce large masses of sludge.⁷⁹

The effects of direct transfers are compounded by indirect transfers resulting from physical, chemical, and biological

74. 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 (1994). The EPA has determined that this necessitates the use of scrubbers.

75. Bruce A. Ackerman & William T. Hassler, *Beyond the New Deal: Coal and the Clean Air Act*, 89 YALE L.J. 1466, 1481 n.56 (1980) (citing 2 EPA, FLUE GAS DESULFURIZATION SYSTEM CAPABILITIES FOR COAL-FIRED STEAM GENERATORS 3-2 to 3-8 (1978) (EPA Pub. No. 600/7-8-032b)).

76. CONSERVATION FOUND., CONTROLLING CROSS-MEDIA POLLUTANTS 8-9 (1984).

77. *See id.* at 9.

78. *See id.*

79. *See* BUSINESS HORIZONS, Mar. 1, 2000, at 9, available at 2000 WL 20177255. A recent estimate by the U.S. Department of Energy relates to the coal burning power plants used by electric utilities that are a major but not the only source of sludge pollution. According to this estimate, electric utilities generate about 40 million tons per year of toothpaste-like wet scrubber sludge. ENGINEERING NEWS RECORD, Sept. 20, 1999, available at 1999 WL 8232722. In 1992, one of the largest coal burning power plants that met CAA requirements using scrubbers required a 383 acre reservoir, covering 13 acres of wetland, and three large valleys inhabited by wildlife. *Current Developments*, ENVTL. REP. (BNA), Apr. 3, 1992, available at 22 ER 2667.

forces.⁸⁰ 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.⁸¹ Volatilization is the process of vaporization that shifts pollutants from land or water to the air.⁸² Deposition is the transfer of pollutants from the air to land and water. Acid rain is an illustration of the problems caused by depositions.⁸³ For instance, 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 transfer medium for volatilizing fertilizers and manure.⁸⁴ In 1981, estimates showed that air deposition accounted for 90% of polychlorinated biphenyls (PCBs) entering the Great Lakes.⁸⁵ Furthermore, a pollutant's chemical structure may change as it moves through the environment.⁸⁶ Biological processes in which microorganisms break down toxic compounds also present new problems.⁸⁷

In addition, 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 implementing the Federal

80. See BUSINESS HORIZONS, *supra* note 79, at 14-20.

81. See EDWARD A. KELLER, ENVIRONMENTAL GEOLOGY 54 (1976); CONSERVATION FOUND., *supra* note 76, at 15-16.

82. See COMM. TO REVIEW METHODS FOR ECOTOXICOLOGY, NAT'L RESEARCH COUNCIL, TESTING FOR EFFECTS OF CHEMICALS ON ECOSYSTEMS 16-18 (1981).

83. Acid rain, or more accurately acid deposition, results from the emissions into the atmosphere primarily of sulfur oxides, nitrogen oxides, and to a lesser extent, of hydrocarbons. 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 NAT'L ACID PRECIPITATION ASSESSMENT PROGRAM (NAPAP), INTERIM ASSESSMENT: THE CAUSES AND EFFECTS OF ACIDIC DEPOSITION, VOLUME 1: EXECUTIVE SUMMARY 3 (1987).

84. See ENVTL. DEFENSE FUND, POLLUTED COASTAL WATERS: THE ROLE OF ACID RAIN (1988).

85. See INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA 22 (Nigel Haigh & Frances Irwin eds., 1990).

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

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

Insecticide, Fungicide, and Rodenticide Act (FIFRA)⁸⁸ evaluate the risk to people who mix chemicals, spray chemicals, or 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.⁸⁹ Plants and animals are subject to similar exposure. Absorption occurs when pollutants settle on plants, or when marine animals are surrounded by polluted water. Ingestion and inhalation occur when contaminated prey or food is consumed or inhaled. Present environmental laws ignore the multimedia risk posed by even a single substance.

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, we 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 to 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 also could prevent sludge from being discharged into water or disposed of as solid waste without first receiving further treatment. Setting independent standards for each medium that ignore the assimilative capacity of the environment imposes unnecessary and unjustified costs, thereby making the manufacturing process inefficient.

88. 7 U.S.C. §§ 136-136y (1994).

89. See Elizabeth M. Rupp et al, *Composite Hazard Index for Assessing Limiting Exposures to Environmental Pollutants: Application Through a Case Study*, 12 ENVTL. SCI. & TECH. 806 (1978); CONSERVATION FOUND., *supra* note 76, at 22.

A more efficient⁹⁰ and cost-effective method of pollution control would be to distribute the wastes among 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 that would help alleviate the problems of standards that are overly stringent in some areas and unduly lax in others.⁹¹

The Yorktown experiment⁹² illustrates the flaws of single medium pollution control as well as the legal and administrative problems attending attempts to move toward integrated pollution control (IPC). This was the result of an EPA/Amoco Production Company (Amoco) pilot study at Amoco's Yorktown, Virginia refinery examining pollution prevention and alternative permitting strategies. Among the more dramatic findings was the fact that benzene emissions were controlled as part of the waste stream of the refinery, but that the same carcinogenic chemical was not controlled in dry docks that emitted far more benzene. The bizarre result was that Amoco was spending \$31 million to rebuild its wastewater treatment facility to control benzene, whereas far more benzene emission could be controlled by spending \$6 million in its drydocks. The results of the Yorktown experiment also revealed that airborne hydrocarbon emissions were being controlled at \$2,400 per ton under existing regulations, whereas more flexible regulations could enable the same volume of hydrocarbons to be reduced for \$500 per ton. Unfortunately, existing regulations prevented EPA from

90. 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. See NAT'L ACAD. OF PUB. ADMIN., *STEPS TOWARD A STABLE FUTURE* 5 (1984).

91. E.g., BRUCE A. ACKERMAN & WILLIAM T. HASSLER, *CLEAN COAL/DIRTY AIR* 10-12 (1981); ALLEN V. KNEESE & CHARLES L. SCHULTZE, *POLLUTION, PRICES, AND PUBLIC POLICY* 81 (1975); James E. Krier, *The Irrational National Air Quality Standards: Macro- and Micro-Mistakes*, 22 *UCLA L. REV.* 323, 324-30 (1974).

92. See Ronald E. Schmitt, *The AMOCO/EPA Yorktown Experience and Regulating the Right Thing*, 9 *NAT. RESOURCES & ENV'T* 11 (1994); *Pollution Prevention: Pilot Project Cut Pollution at Less Cost than Mandated Rules, Amoco Official Says*, 24 *ENV'T REP. (BNA)* 903, 903 (Sept. 24, 1993); *EPA, Amoco Launch Pollution Prevention Project*, 14 *CHEM. REG. REP. (BNA)* 70 (Apr. 20, 1990); Bradford C. Mank, *What Comes After Technology: Using an "Exception Process" to Improve Residual Risk Regulation of Hazardous Air Pollutants*, 13 *STAN. ENVTL. L.J.* 263, 293 (1994) [hereinafter Mank, *Exception Process*]; *AMOCO/EPA YORKTOWN POLLUTION PREVENTION PROJECT: PROJECT SUMMARY* (1992) [hereinafter *AMOCO*]; Bradford C. Mank, *The Environmental Protection Agency's Project XL and Other Regulatory Reform Initiatives: The Need for Legislative Authorization*, 25 *ECOLOGY L.Q.* 1, 11-12 (1998) [hereinafter Mank, *Project XL*].

exchanging the wastewater treatment facility for greater reductions of benzene in the drydocks, or adopting alternative compliance strategies for hydrocarbons.⁹³ Not surprisingly, the study recommended that EPA should change its regulatory policies to encourage IPC.⁹⁴ How then are we still operating under a fragmented system of environmental policy and law? The answer requires a short excursus into the modern history of pollution control.

A. *The Reasons for Fragmentation*

The 1960s witnessed two different currents of thinking. On the one hand, environmentalism in the late 1960s was rooted in holistic and ecological thinking, as expressed by the enactment of NEPA and the creation of the EPA. On the other hand, the cry for environmental protection in the 1960s cast serious doubts about the New Deal belief that independent and expert administrative agencies were capable of creatively regulating a complex social problem in the public interest.⁹⁵

Legislative mandates grounded upon suspicion and doubt about expertise may adversely affect the application of ecological principles based on interconnected ecosystems and a holistic world view.⁹⁶ Ecologicalism sees air, water, and land as part of one environment, and not as separate and discrete entities. Complex and interrelated environmental problems do not simply direct us to preordained solutions. Pollution control, therefore, requires a dynamic and ongoing process of balancing and management that could best be done by expert and sensitive agencies, who are vested with comprehensive power and the authority to respond to the particular circumstances of the case. An integrated approach calls for a broad delegation of power.

The early influence of these ideas motivated unsuccessful legislative attempts, beginning ten years before NEPA, to unify conservation, resource, and environmental policy.⁹⁷ Then, in 1968, an important report of the Subcommittee on Science, Research, and Development of the House Committee on Science and Astronautics, entitled *Managing the Environment*,⁹⁸

93. AMOCO, *supra* note 92, at ix, 1-16; Mank, *Exception Process*, *supra* note 92, at 325.

94. See Mank, *Project XL*, *supra* note 92, at 13.

95. See Ackerman & Hassler, *supra* note 75, at 1468.

96. See Guruswamy, *supra* note 71, at 509-10 n.222-227.

97. See FREDERICK R. ANDERSON, *NEPA IN THE COURTS* 4 (1973).

98. HOUSE SUBCOMM. ON SCI., RESEARCH, AND DEV., 90TH CONG., CONGRESSIONAL WHITE PAPER ON A NATIONAL POLICY FOR THE ENVIRONMENT (Comm. print 1968).

recommended that a national policy for the environment be adopted.⁹⁹ The need for integration was also reflected in the even more important Congressional White Paper on a National Policy for the Environment.¹⁰⁰

B. *National Environmental Policy Act*¹⁰¹

NEPA was the outcome of two bills, one introduced in the House by Congressman John Dingell,¹⁰² and the other introduced in the Senate by the architect of NEPA, Senator Henry Jackson.¹⁰³ Professor Lynton Caldwell acted as consultant for Jackson and his committee. The writings of both Jackson and Caldwell testify to their commitment to integration.¹⁰⁴ Jackson felt that the legislative responses to the environmental problems in the 1960s were sporadic and uncoordinated, and that NEPA provided "both a conceptual basis and legal sanction" for a more coordinated and systematic method of dealing with environmental problems.¹⁰⁵ He also noted that in order to produce a truly integrated and national environmental policy, bills had been introduced to establish a National Environmental Policy Institute, a Department of Natural Resources, and a national land use policy.¹⁰⁶

Unhappily, the legislative history of NEPA also points in a different direction, and requires some clarification. To begin with, although Senator Jackson was clearly impressed with the need

99. HOUSE SUBCOMM. ON SCI., RESEARCH, AND DEV., 90TH CONG., *MANAGING THE ENVIRONMENT* (Comm. print 1968).

100. SENATE COMM. ON INTERIOR AND INSULAR AFFAIRS AND THE HOUSE COMM. ON SCI. AND ASTRONAUTICS, 90TH CONG., *CONGRESSIONAL WHITE PAPER ON A NATIONAL POLICY FOR THE ENVIRONMENT* (Comm. print 1968).

101. The tortuous journey involved before a bill becomes law, together with the various procedural steps referred to in parts of this Article are succinctly discussed in WILLIAM J. KEEFE & MORRIS G. OGUL, *THE AMERICAN LEGISLATIVE PROCESS: CONGRESS AND THE STATES* 35 (6th ed. 1985).

102. H.R. 6750, 91st Cong., 45 CONG. REC. 3415 (1969).

103. S. 1075, 91st Cong., 45 CONG. REC. 19,008 (1969).

104. In his book *Environment: A Challenge for Modern Society*, Professor Caldwell argues that there had, until recently, been no perceived need for general or comprehensive policies of environmental administration and control, and that management had extended only to specific aspects of the environment. LYNTON KEITH CALDWELL, *ENVIRONMENT: A CHALLENGE FOR MODERN SOCIETY* 163-232 (1970). He notes, however, that an ecologically based environmental policy should be characterized by comprehensiveness of policy and control and operative arrangements. Indeed his whole book is premised upon the analog of a "spaceship earth" which depends for its survival upon coordinated and interrelated systems.

105. Henry M. Jackson, *Environmental Policy and the Congress*, 11 NAT. RESOURCES J. 403, 407 (1971).

106. *Id.* at 411-13.

for integration, neither his bill (S. 1075)¹⁰⁷ nor Congressman Dingell's (H.R. 6750)¹⁰⁸ mentioned integrated environmental policies or even a national environmental policy. The reason for this appears to be that both Senator Jackson and Congressman Dingell may have been trying to avert a turf battle over committee jurisdiction. Senator Jackson had to deal with Senator Edmund Muskie, chairman of the influential Subcommittee on Air and Water Pollution of the Senate Committee on Public Works that sponsored air and water pollution legislation. For his part, Congressman Dingell had to contend with Wayne Aspinall, Chairman of the House Interior and Insular Affairs Committee, who in fact emerged as one of NEPA's strongest opponents.¹⁰⁹ This explanation is borne out by the fact that important amendments were made to S. 1075 during its hearings before Jackson's Committee on Interior and Insular Affairs. Some of the most significant amendments were made because of Professor Caldwell's promptings.¹¹⁰ These amendments incorporated the concept of environmental impact assessments.¹¹¹ In the House, the Subcommittee on Fisheries and Wildlife Conservation of the House Committee on Merchant Marine and Fisheries reported a "clean bill," H.R. 12549,¹¹² which was practically identical to H.R. 6750.¹¹³

For his part, Senator Muskie also succeeded in obtaining amendments before the Senate forwarded its bill to the conference committee. The apparent thrust of Senator Muskie's amendments was to ensure that air and water standards set under legislation being drafted by his Subcommittee, or falling within its jurisdiction, would not be affected by NEPA. The new section of NEPA which sought to achieve Senator Muskie's

107. S. 1075, *supra* note 103.

108. H.R. 6750, *supra* note 102.

109. See ANDERSON, *supra* note 97, at 5; see also Barry S. Neuman, Comment, *Implementation of the Clean Air Act: Should NEPA Apply to the Environmental Protection Agency?*, 3 *ECOLOGY L.Q.* 597, 600-02 (1973) (discussing NEPA's "nebulous legislative history" in contrast to its "clear statutory directive").

110. See ANDERSON, *supra* note 97, at 6; see also JOHN E. BONINE & THOMAS O. MCGARTY, *THE LAW OF ENVIRONMENTAL PROTECTION* 6-7 (1984).

111. Caldwell's testimony led to inclusion of action-forcing provisions. The bill containing those provisions was passed on July 10, 1969. ANDERSON, *supra* note 97, at 6 (citing 115 CONG. REC. 19,008-13 (1969)).

112. *Id.*

113. See ENVIRONMENTAL QUALITY: HEARINGS ON H.R. 6750, BEFORE THE SUBCOMM. ON FISHERIES AND WILDLIFE CONSERVATION OF THE HOUSE COMM. ON MERCH. MARINE AND FISHERIES, 91st Cong. (1969).

objectives was Section 104.¹¹⁴ It was ambiguously worded and did not plainly and clearly support Senator Muskie's objective that air and water pollution legislation should be exempted from NEPA.¹¹⁵ As Judge Leventhal concluded in *Portland Cement Ass'n v. Ruckelshaus*,¹¹⁶ "[t]here is no express exemption in the language of the Act or Committee Reports."¹¹⁷ With a view to remedying this ambiguity, when the Conference Report on NEPA reached the floor of the Senate, an attempt was made at the last minute to clarify the legislative history of Section 104 so that it could be interpreted to exempt environmentally protective federal activities from NEPA obligations.¹¹⁸ This attempt took the form of a document introduced into the Congressional Record by Senator Jackson during debate over approval of the Conference Report. Jackson's document stated that Section 102¹¹⁹ was aimed primarily at "those agencies who now have little or no legislative authority to take environmental considerations into account,"¹²⁰ and that Section 103¹²¹ was "aimed at those agencies which have little or no authority to consider environmental values."¹²² While this may have lent support to Muskie's views, the same document went on to say, that Section 102 was "clearly designed to assure consideration of environmental matters by *all* agencies in their planning and decision making."¹²³ Senator

114. National Environmental Policy Act of 1969 § 104, 42 U.S.C. § 4334 (1994). "Nothing in section 4332 or 4333 of this title shall in any way affect the specific statutory obligations of any Federal agency (1) to comply with criteria or standards of environmental quality, (2) to coordinate or consult with any other Federal or State agency, or (3) to act, or refrain from acting contingent upon the recommendations or certification of any other Federal or State agency." *Id.*

115. See ANDERSON, *supra* note 97, at 8 (citing 115 CONG. REC. 29,046-063, 29,066-099, 40,923-928; 116 CONG. REC. 8984).

116. 486 F.2d 375 (D.C. Cir. 1973).

117. *Id.* at 381 (citing S. REP. NO. 91-296 (1969); H.R. REP. NO. 91-765 (1969)).

118. See Anderson, *supra* note 97, at 106; see also 115 CONG. REC. 40,417 (1969); 115 CONG. REC. 29,056, 29,058-59 (1969); Comment, *Landmark Decision on the National Environmental Policy Act: Calvert Cliff's Coordinating Comm., Inc. v. Atomic Energy Comm'n*, 1 ENVTL. L. REP. 10125 (1971).

119. NEPA § 102, 42 U.S.C. § 4332 (1994). Section 102 placed a duty on "all agencies of the Federal Government" to prepare environmental impact statements in "every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment." *Id.* (emphasis supplied).

120. See 115 CONG. REC. 40,418 (1969).

121. NEPA § 103, 42 U.S.C. § 4333 (1994). Section 103 directed *all* agencies of the Federal Government to bring their policies and procedures into full compliance with NEPA.

122. 115 CONG. REC. 40,418 (1969).

123. *Id.* On a subsequent occasion when the amendments to the Federal Water Pollution Control Act were being debated, Senator Jackson concluded that EPA should not be exempt from NEPA. See 118 CONG. REC. 10,271 (1971).

Muskie, responding to Senator Jackson's document, stated that the clear understanding between Senator Jackson and himself was that the legislative mandates of agencies having environmental protection duties were not changed in any way by Section 104 of NEPA.¹²⁴ Whatever the nature of this understanding between Senators Jackson and Muskie, it was not formalized in any statement in the Conference Report. As Senator Allott, a member of the Interior and Conference Committees said, "Only the conference report itself was signed by all the Senate conferees, and therefore, only it was agreed upon and is binding."¹²⁵ In a like vein, Judge Skelly Wright observed in *Calvert Cliffs Coordinating Commission v. United States Atomic Energy Commission*,¹²⁶

This rather meager legislative history, in our view, cannot radically transform the purport of the plain words of Section 104. Had the Senate sponsors fully intended to allow a total abdication of NEPA responsibilities in water quality matters—rather than a supplementing of them by strict obedience to the specific standards of Water Quality Improvement Act (WQIA)—the language of Section 104 could easily have been changed.¹²⁷

Citing the Supreme Court, Judge Wright stated that "the legislative history of a statute (particularly such relatively meager and vague history as we have here) cannot radically affect its interpretation if the language of the statute is clear."¹²⁸ Indeed, Section 102 states quite explicitly and unambiguously that it applies to "all agencies of the Federal Government."¹²⁹

The interventions of Senators Jackson and Muskie are perhaps best understood as an attempt to protect the "turf" of committee jurisdiction rather than as an attempt to strike at the integrative functions of NEPA.¹³⁰ In any event, this legislative history, that was concerned with, and indeed confined to the applicability of NEPA to air and water controls, could not have been directed at EPA, which was not yet born. Eventually, EPA

124. See 115 CONG. REC. 40,423 (1969).

125. *Id.* at 40,422.

126. 449 F.2d 1109 (D.C. Cir. 1971). The Atomic Energy Commission had recently passed new rules. Petitioners argued that the AEC failed to consider environmental matters to the extent required by NEPA. The AEC contended that the rules were within the broad scope of NEPA.

127. *Id.* at 1126.

128. *Id.*

129. NEPA § 102(2), 42 U.S.C. § 4332(2) (1994).

130. See Guruswamy, *supra* note 71, at 484-86.

was clearly granted an authority that extended beyond air and water at its inception.

C. *The Creation of the Environmental Protection Agency*

Six months after the enactment of NEPA, President Nixon established two new agencies by executive order: the Environmental Protection Agency (EPA)¹³¹ and the National Oceanic and Atmospheric Administration (NOAA).¹³² In establishing these two agencies, Nixon made the case for controlling cross-media pollution in an integrated manner. It would be fair to conclude that the notion of comprehensive management and integration undergirded the creation of EPA, and was based upon the ecological ideas and concepts referred to above.¹³³ Nixon observed that since environmental problems

131. For text of plan see MESSAGE FROM THE PRESIDENT OF THE UNITED STATES, REORGANIZATION PLAN NO. 3, H.R. MISC. DOC. NO. 91-364 (1970).

132. For text of plan see MESSAGE FROM THE PRESIDENT OF THE UNITED STATES, REORGANIZATION PLAN NO. 4, H.R. MISC. DOC. NO. 91-365 (1970). The five major programs moved to EPA were: water pollution, which had formerly been carried out by the Federal Water Pollution Control Administration in the Interior Department; air pollution formerly executed by the National Air Pollution Control Administration in the Department of Health, Education, and Welfare (HEW); solid waste management, drinking water quality, and radiological health also from HEW; pesticides regulation and research from the Food and Drug Administration and the Agriculture Department; and ambient standard setting for radiation from the Atomic Energy Commission. U.S. COUNCIL ON ENVTL. QUALITY, ENVIRONMENTAL QUALITY, FIRST ANNUAL REPORT 25 (1970). 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. 91-366 (1970); COMM. ON GOVERNMENTAL OPERATIONS, APPROVING REORGANIZATION PLAN 3 OF 1970, H.R. REP. NO. 91-1464 (1970); COMM. ON GOVERNMENT OPERATIONS, APPROVING REORGANIZATION PLAN NO. 4 OF 1970, 91st Cong. (1970); *Reorganization Plans Nos. 3 and 4 of 1970: Hearings Before A Subcommittee of the Committee on Government Operations*, 91st Cong. (1970).

133. While Nixon's commitment to environmental protection may be open to some doubt, it seems reasonably clear that his approach towards integration was consistent with his beliefs. He believed that government should be organized around functions (overriding existing divisions) rather than along programs (based on existing sectoral legislation). His administration made efforts to coordinate programs in a number of policy areas. See Kenneth T. Palmer, *The Evolution of Grant Policies, in THE CHANGING POLITICS OF FEDERAL GRANTS* 5, 24-25 (Lawrence D. Brown, James W. Fossett, & Kenneth T. Palmer eds., 1984); JOHN C. WHITAKER, STRIKING A BALANCE: ENVIRONMENT AND NATURAL RESOURCE POLICY IN THE NIXON-FORD YEARS 46 (1976); see also BARRY G. RABE, FRAGMENTATION AND INTEGRATION IN STATE ENVIRONMENTAL MANAGEMENT 15 (1986). Moreover, during Congressional hearings on NEPA, President Nixon had issued an executive order establishing an interagency Environmental Quality Council with broad responsibilities for coordinating federal environmental policy. See Exec. Order No. 11,472, 34 Fed. Reg. 8693 (1969), amended by, Exec. Order No. 11,514, 35 Fed. Reg. 4247 (1970), Exec. Order No. 12,007, 42 Fed. Reg. 42,839 (1977), reprinted in 42 U.S.C. § 4321, at 507 (1982). Alfred Marcus has concluded that the Nixon Administration's commitment to administrative integration

should be "perceived as a single, interrelated system," the then-existing piecemeal federal efforts were inappropriate.¹³⁴ Consolidating 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."¹³⁵ He hoped that by combining programs that were previously housed in several separate agencies, the government would be able to "mount an effectively coordinated campaign against environmental degradation in all of its many forms."¹³⁶

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.¹³⁷

President Nixon returned to this theme in his President's Message that accompanied the first report to Congress on the state of the nation's environment, by stressing that 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 it was evident that a different approach was necessary. President Nixon felt that reorganization under EPA, together with the Council on Environmental Quality (CEQ), which had been charged by the President with coordinating all

was in fact based upon ecological thinking. ALFRED A. MARCUS, PROMISE AND PERFORMANCE CHOOSING AND IMPLEMENTING AN ENVIRONMENTAL POLICY 31-32 (1980).

134. *The President's Message to the Congress upon Transmitting Reorganization Plans to Establish the Two Agencies*, 6 WEEKLY COMP. OF PRES. DOC. 908 (July 13, 1970).

135. *Id.* at 911.

136. *Id.* at 912.

137. *Message from the United States President Relative to Reorganization Plans 3 and 4 of 1970*, reprinted in U.S. COUNCIL ON ENVTL. QUALITY, *supra* note 132, at 295.

environmental quality programs,¹³⁸ would now make this possible.¹³⁹

Arguments for integration based on ecological thinking were countered by others who resisted the granting of wide discretionary power. During the New Deal, champions of the administrative process assumed that there was an objective public interest that could be ascertained and implemented by expert administrators.¹⁴⁰ Political scientists attacked these views¹⁴¹ on constitutional and political grounds. The constitutional objection to the granting of wide discretionary authority to executive agencies appears to have been resolved by the use of the "intelligible principle."¹⁴² Arguably, by doing so the courts removed any insurmountable legal roadblock preventing the granting of wide powers to specialized executive agencies. Nevertheless, the political arguments for not granting wide discretion to executive agencies appear to have prevailed. Those attacking the technocratic philosophy on political grounds

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

139. U.S. COUNCIL ON ENVTL. QUALITY, *supra* note 132, at viii.

140. Richard B. Stewart, *The Reformation of American Administrative Law*, 88 HARV. L. REV. 1669, 1682-85 (1975); Ackerman & Hassler, *supra* note 75, at 1674-75; Cass R. Sunstein, *Constitutionalism After the New Deal*, 101 HARV. L. REV. 421, 460-61 (1987).

141. Louis L. Jaffe, *The Independent Agency—A New Scapegoat*, 65 YALE L.J. 1068 (1956); *see also* Louis L. Jaffe, *The Administrative Agency and Environmental Control*, 20 BUFFALO L. REV. 231, 232 (1970) (pointing out that lawyers, as distinct from political scientists, were partial to the independent administrative agencies) [hereinafter Jaffe, *The Administrative Agency*].

142. Article 1, Section 1 of the United States Constitution provides that "[a]ll legislative powers herein granted shall be vested in a Congress of the United States." In essence, the constitutional argument raised was that Congress could not delegate these powers to executive agencies because executive agencies ought to be subject to presidential not Congressional control. Moreover, the executive agencies were hybrid institutions—a headless fourth branch of government that combined powers previously distributed among the three traditional branches of government. The courts, however, recognized the practical need for Congress to delegate their functions to executive agencies provided there was "an intelligible principle to which the person or body authorized [to exercise the delegated authority] is to conform." *J.W. Hampton & Co. v. United States*, 276 U.S. 394, 409 (1928) (upholding delegation to the President under the Tariff Act of 1922 to set flexible tariffs). To date, there are only two decisions, both occurring in 1935, that invalidate an Act of Congress by invoking the "intelligible principle" rule under the non-delegation doctrine. Despite this, the Court of Appeals in the recent case, *American Trucking Assocs. v. EPA*, 175 F.3d 1027 (D.C. Cir. 1998), *modified on rehearing by* 195 F.3d 4 (D.C. Cir. 1999), *aff'd in part, rev'd in part*, ___ S. Ct. ___, 2001 WL 182549 (Feb. 27, 2001), found that the EPA had violated the non-delegation doctrine by setting nationwide standards for clean air without articulating an "intelligible principle" to constrain its authority. *See* 175 F.3d at 1034. *See generally* STEPHEN G. BREYER & RICHARD B. STEWART, *ADMINISTRATIVE LAW AND REGULATORY POLICY* 128 (2d ed. 1985).

charged that independent agencies, having no duly constituted master, were falling under the domination of private interests, usually the very interests whose activities they were supposed to regulate.¹⁴³ Economists leveled a somewhat different criticism. They saw regulation as being inefficient because it was created and administered for the benefit of well-organized interests at the expense of the public. These critics advocated either deregulation or regulatory reform. Ironically, political and economic critics of regulation agreed that regulation benefited the regulated industries rather than the public.¹⁴⁴

By the end of the 1960s, much of the regulation in the United States was seen to be in "deep trouble."¹⁴⁵ It became necessary to face up to the problem of how agencies misused and even abused the broadly delegated power conferred upon them. Confidence in the ability of administrative agencies to implement statutes effectively and in the public interest apparently evaporated. Many influential commentators referred to the problems arising out of the unsatisfactory implementation of the legislative mandates given to administrative agencies. They suggested that one way to remedy this problem was to enact new statutes with clear mandates and definite obligations.¹⁴⁶

Marver Bernstein set up an influential model of agency obsolescence in which he traced the cycle of a regulatory agency from gestation to youth, youth to maturity, and maturity to old age. Bernstein's model suggests that in old age, the agency suffered debility and decline and "surrendered" to the regulated.¹⁴⁷ One reason for the malaise lay in the nature of the legislative mandate. According to Bernstein, statutory mandates lack clarity and rarely provide clear directions to the new

143. *E.g.*, THEODORE J. LOWI, *THE END OF LIBERALISM: IDEOLOGY, POLICY, AND THE CRISIS OF PUBLIC AUTHORITY* (1969); ROBERT C. FELLMETH, *INTERSTATE COMMERCE COMMISSION: THE PUBLIC INTEREST AND THE ICC* (1970); JAMES S. TURNER, *THE CHEMICAL FEAST* (1970).

144. See PAUL W. MACAVOY, *THE CRISIS OF THE REGULATORY COMMISSIONS* (1970); George J. Stigler, *The Theory of Economic Regulation*, 2 *BELL J. ECON. & MGMT. SCI.* 3 (1971). For a succinct survey of these criticisms, see BREYER & STEWART, *supra* note 142, at 36-38.

145. ROGER G. NOLL, *REFORMING REGULATION: AN EVALUATION OF THE ASH COUNCIL PROPOSALS 110* (1971). Whether this perception was valid is open to question. See *THE POLITICS OF REGULATION* (James Q. Wilson ed., 1980).

146. See MARVER H. BERNSTEIN, *REGULATING BUSINESS BY INDEPENDENT COMMISSION* 286 (1955); KENNETH C. DAVIS, *ADMINISTRATIVE LAW TREATISE* 9-53 (1958); HENRY J. FRIENDLY, *THE FEDERAL ADMINISTRATIVE AGENCIES: THE NEED FOR BETTER DEFINITION OF STANDARDS* (1962); LOWI, *supra* note 143.

147. BERNSTEIN, *supra* note 146, at 74-102.

agency.¹⁴⁸ The vagueness, he suggests, was deliberate and resulted from the lobbying of well-organized private groups who were the subject of the regulation. Having failed in their efforts to prevent the enactment of legislation affecting them, confident that they could capture the agency in question, the regulated interests groups concentrated on making the regulatory provisions as vague and innocuous as possible.¹⁴⁹ The unwillingness or inability of Congress to give better directives to its agencies was also criticized by Judge Friendly.¹⁵⁰

Professor K.C. Davis, in his *Administrative Law Treatise* and later in *Discretionary Justice*,¹⁵¹ demonstrated with compelling and devastating effects the injustice and dangers of unnecessarily wide delegation of discretionary power. In his book *The End of Liberalism*,¹⁵² Theodore Lowi synthesized the criticisms of Davis and other authors and suggested that one remedy for many of the troubles of agencies might lie in statutes that had clear goals and explicit means of implementation.¹⁵³ These new statutory norms would target and institutionalize the public needs that led to the statute in the first place and would make it difficult for the agency to postpone the performance of its obligations.¹⁵⁴ One of the central themes present in the climate of policy opinion, therefore, was that expertise could be an excuse for inaction and, even worse, could be captured by special interests. Believers in regulation suggested enacting legislation setting forth explicit goals, specific means by which these goals could be attained, and rigorous timetables in which to do so.

Foundational legislation enacted in the 1970s, such as the Clean Air and Clean Water Acts, reflected a deep mistrust of administrative agency expertise and decisionmaking. This resulted in agencies being directed to comply with legislatively ordained mandates and specific deadlines. One of the unfortunate outcomes of such legislation was that it prevented agencies from taking a more integrated and comprehensive approach to abating pollution.

148. *Id.* at 75-76.

149. *See id.* at 96.

150. FRIENDLY, *supra* note 146, at 168.

151. *See* DAVIS, *supra* note 146; KENNETH C. DAVIS, *DISCRETIONARY JUSTICE* (1977).

152. *See* LOWI, *supra* note 143.

153. This was not the only suggested method of relief. There were demands that the agencies should redeem their New Deal promise by generating clear standards through creative rulemaking. *See* Ackerman & Hassler, *supra* note 75, at 1479. Another solution was to look to the courts for action. *See* Jaffe, *The Administrative Agency*, *supra* note 141, at 235.

154. *See* LOWI, *supra* note 143, at 125-56.

D. *The Political Context*

A fragmented approach to legislation also arose from the way in which jurisdiction over environmental legislation was carved up between Congressional committees.¹⁵⁵ Environmental legislation is almost entirely drafted and piloted through Congress by committees. It is a rare occurrence for a committee decision to be overturned by the full House or Senate.¹⁵⁶ The committees responsible for various aspects of environmental law and policy guard their jurisdiction jealously. It has been pointed out that "jurisdictional politics is an ubiquitous feature of present day congressional policy making. To hold jurisdiction means to claim a piece of the action. Therefore, jurisdiction is as central to the life of a member or a congressional sub-unit as votes or the ability to hire staff."¹⁵⁷

In the late 1960s and the early 1970s, the Subcommittee on Air and Water Pollution Control of the Public Works Committee maintained primary responsibility for air and water pollution legislation. Senator Muskie, who had become the dominant Congressional figure in pollution control, headed this committee.¹⁵⁸ Another committee that assumed some influence and importance in formulating environmental policy was the Committee on Interior and Insular Affairs, chaired by Senator Jackson. Senator Jackson was the architect of NEPA, which sought to place environmental policy within an integrated framework.¹⁵⁹ Senator Muskie resisted attempts to extend NEPA

155. Committee jurisdiction covers three areas: (a) formulation and approval of legislation; (b) the conducting of oversight hearings and investigations; and (c) the reviewing and approval of appropriations. See J. CLARENCE DAVIES & BARBARA S. DAVIES, *THE POLITICS OF POLLUTION* 61-79 (2d ed. 1975).

156. See *id.* at 61.

157. Roger H. Davidson, *Subcommittee Government: New Channels for Policy Making*, in *THE NEW CONGRESS* 118-19 (Thomas E. Mann & Norman J. Ornstein eds., 1981).

158. See DAVIES & DAVIES, *supra* note 155, at 63-66; MARCUS, *supra* note 133, at 53-78.

159. NEPA's basic substantive policy was to ensure that the federal government "use all practicable means and measures" to protect environmental values, avoid environmental degradation, preserve historic, cultural, and natural resources, and promote the widest range of beneficial uses of the environment without undesirable or unintended consequences. 42 U.S.C. § 4331 (1994). Congress directed that to the fullest extent possible, the policies, regulations, and public laws of the United States shall be interpreted and administered in accordance with NEPA, and that all agencies of the federal government should follow the procedures set out in NEPA. *Id.* § 4332. The procedures set out that responsible officials of all agencies should prepare a detailed statement covering the impact of particular actions on the environment, the environmental costs that might be avoided, and alternative measures that might alter the cost-benefit ratio. See *id.* § 4332(2)(c).

to air and water pollution control agencies. At one level his approach to NEPA was an exercise in turf protection.¹⁶⁰ Accordingly, it has been suggested that Senator Muskie was more concerned with keeping air and water pollution control under the jurisdiction of the Subcommittee of the Senate Public Works Committee, which he chaired, than with preventing integration. He was engaged in the characteristic gambit of preventing encroachment on the agencies under his committee by Senator Jackson's Interior and Insular Affairs Committee, which drafted NEPA.¹⁶¹ Unfortunately, whatever his motives, the effect of his actions on pollution policies was to entrench fragmentation at the expense of integration.

Political writers such as James Q. Wilson have explained and substantiated the symbiotic political relationship between public interest activists and subcommittee chairmen interested in gaining national prominence.¹⁶² However, what occurred with the Clean Air Act was strikingly different. Muskie was the chief architect of the air and water pollution legislation passed by Congress in the 1960s, and his Senate Subcommittee on Air and Water Pollution began drafting amendments to the Clean Air Act in 1970. John Esposito, in *Vanishing Air*, documented the extent to which Ralph Nader's intervention led to a dramatic tightening of the provisions of the final bill presented by Muskie's committee.¹⁶³ *Vanishing Air* also reveals the extent to which Muskie's espoused presidential candidacy in 1972 made him

160. Professors Ackerman and Stewart have noted that powerful organized interests such as Congressional committees have vested interests in protecting the status quo. Bruce A. Ackerman & Richard B. Stewart, *Reforming Environmental Law*, 37 STAN. L. REV. 1333, 1333-34 (1985).

161. Neuman, *supra* note 109, at 602; Comment, Kalur v. Resor, *Water Quality and NEPA's Application to EPA*, 2 ENVTL. L. REP. (ENVTL. L. INST.) 10025, 10029 (1972) [hereinafter *Water Quality*]. For a seemingly contrary view, see Liroff, who suggests that, "While the Senators' disagreements were largely based on jurisdictional jealousies, they derived as well from a fundamental difference in outlook concerning the manner in which protection for environmental values should be provided in federal decision making." RICHARD A. LIROFF, A NATIONAL POLICY FOR THE ENVIRONMENT 11 (1976). It would seem, however, that this 'fundamental difference' related to the efficacy of policing NEPA, and not to the need for integrated environmental evaluation and action. See *id.* at 18-20.

162. See James Q. Wilson, *The Politics of Regulation*, in SOCIAL RESPONSIBILITY AND THE BUSINESS PREDICAMENT 145 (J. McKie ed., 1974).

163. See JOHN C. ESPOSITO, *VANISHING AIR* (1970); see also MARCUS, *supra* note 133, at 53-85; ADVISORY COMM'N ON INTERGOVERNMENTAL RELATIONS, PROTECTING THE ENVIRONMENT: POLITICS, POLLUTION AND FEDERAL POLICY 23-24 (1981) [hereinafter ACIR]; Donald Elliot, Bruce Ackerman & John C. Millian, *Toward a Theory of Statutory Evolution: The Federalization of Environmental Law*, 1 J.L. ECON. & ORG. 313 (1985).

especially vulnerable to political pressure of the entrepreneurial kind.

James Q. Wilson suggests four different manifestations of the politics of legislation and regulation: majoritarian, interest group, client, and entrepreneurial. Wilson argues that the Clean Air Act of 1970 was not the result of interest group politics but of the entrepreneurial politics of Ralph Nader.¹⁶⁴ Wilson's explanation is consistent with an arresting theory of the "prisoners dilemma" offered by Elliot, Ackerman, and Millian.¹⁶⁵ They argue that the Clean Air Act was enacted at a time when environmentalists were not well organized as an interest group in Washington. However, it was a time in which two presidential aspirants, President Nixon and Senator Muskie,¹⁶⁶ competed

164. WILSON, *supra* note 145, at 367-70. Traditional interest group politics see legislation as the outcome of a competitive struggle among groups with differing interests. However, Wilson's persuasive analysis limits the application of interest group politics to situations in which the public at large do not see themselves being affected by a regulation. A regulation attracting interest group politics will typically benefit a small group at the expense of a comparable small group. Each side has a strong incentive to organize and exercise political influence. *Majoritarian* politics are found where the costs and benefits of a contemplated action are widely distributed and most of society is expected to gain or pay. Interest groups have little incentive to form around such issues because no small definable segment of society such as an industry or occupation or locality can expect to capture a disproportionate share of the benefits. Where costs and benefits are narrowly concentrated, conditions are ripe for *interest group politics*. Where the benefits of a prospective policy are concentrated but the costs widely distributed, *client politics* is likely to result. Some small easily organized group will benefit and thus has a powerful incentive to organize and lobby. Since the costs of the benefit are distributed at a low per capita rate over a large number of people, there is little incentive to organize in opposition. Finally, where a policy is proposed that will confer general but small benefits at a cost to be borne chiefly by a small segment of society, we witness *entrepreneurial politics*. Where this is the case, the incentive to organize is strong for opponents of the policy but weak for the beneficiaries while the political system provides many points at which opposition can be registered. In these circumstances, it requires the efforts of a skilled entrepreneur who can mobilize latent public sentiment, associate the legislation with widely shared values and put the opponents of the plan publicly on the defensive.

165. See Elliot, Ackerman & Millian, *supra* note 163, at 313; see also Ackerman & Millian, TOWARD A THEORY OF STATUTORY EVOLUTION; THE FEDERALIZATION OF ENVIRONMENTAL LAW 2, J.L. ECON. & ORG. 313 (1985). The Prisoner's Dilemma is a classic game theory problem that has been exhaustively canvassed by the literature in game theory, economics, philosophy, biology, sociology, and political science. It is a story of two prisoners who are arrested by the police near the scene of a burglary and illustrates the conflicts between what is a rational choice for an individual member of a group, and for the group as a whole. It helps us understand how such a dilemma can be resolved. See generally, ROBERT AXELROD, THE EVOLUTION OF COOPERATION (1984).

166. Senator Muskie was chairman of the Subcommittee on Air and Water Pollution of the Senate Committee on Public Works. He had been involved in

without restraint for credit to be gained from legislation assuring the public of a cleaner world. In 1970, Muskie was vulnerable not only because he was a presidential candidate but also because the 1967 Air Quality Act that he had drafted was not working satisfactorily.¹⁶⁷ Elliot, Ackerman, and Millian's theory appears to be well substantiated by the sequence of events leading up to the enactment of the Clean Air Act. On December 10, 1969, Muskie introduced a bill that sought little more than an incremental change to the law controlling air pollution.¹⁶⁸ Two months later Nixon submitted his own proposals to Congress, calling for a far more substantial change in the law, necessitating a major structural change in existing federal air pollution statutes.¹⁶⁹ Three weeks after Nixon's proposal, Nader's task force published their report harshly criticizing Muskie and alleging that he was soft on industry.¹⁷⁰ In August, Muskie's subcommittee reported a revised bill that essentially followed the outcome of Nixon's proposals but was much tougher than Nixon's proposal. Muskie's tougher and more stringent law (the 1970 Clean Air Act) was subsequently signed into law by Nixon despite his grave reservations over the exacting demands the law made on industry. Elliot's conclusions are that Nader's report threatening Muskie with the loss of his reputation as Mr. Clean had the effect of trapping both Nixon and Muskie in a politician's dilemma. The report compounded pressure on both politicians by exploiting the difficulty the public had in identifying politicians who deserved credit for enacting legislation in response to perceived need. As a result, both were forced to support legislation more stringent than either would have preferred.

pollution control for many years and was a front runner among Democratic candidates. See generally, MARCUS, *supra* note 133, at 53-82.

167. See *id.*

168. Marcus' characterization of it as a "minor tinkering" with the 1967 law has been endorsed by Elliot et al. See Elliot, Ackerman & Millian, *supra* note 163 at 60.

169. See PRESIDENTIAL MESSAGE TO CONGRESS RECOMMENDING A 37 POINT ADMINISTRATIVE AND LEGISLATIVE PROGRAM, WEEKLY COMP. PRES. DOC. 160, 164 (Feb. 10, 1975). The proposals, though advocating a qualitative change to the existing structure of air pollution by establishing nationwide air quality standards and national emission standards, was still fragmented in its approach and dealt with air, water, and solid waste management as if they were independent and separate problems. The message, however, did recognize that federal institutions dealing with the environment and natural resources had developed piecemeal over the years, and indicated that Nixon had appointed Roy Ash to make a thorough study of the organization of federal environmental, natural resource, and oceanographic programs. *Id.* at 171. It was the work of the Ash Council reorganization study that laid the foundations for EPA. See generally, MARCUS, *supra* note 133, at 31-52.

170. See ESPOSITO, *supra* note 163, at 290-92.

Unfortunately, the Ralph Nader organization, while executing a remarkable coup, also succeeded in further entrenching the fragmented approach. Although they expressed scathing criticism of the bureaucratic inertia displayed by the National Air Pollution Control Administration (NAPCA) in the Department of Health, Education, and Welfare (HEW),¹⁷¹ Esposito and Nader displayed little awareness of the interrelated nature of the problem of air pollution. They denigrated the difficulties of pollution control caused by the need to relate emission standards to ambient air quality standards. They ridiculed NAPCA's reliance on experts. Underlying their criticisms was a deep suspicion of the view that the atmosphere should be used to its optimal capacity. This concept was seen as the basis on which corporate polluters exploited and plundered the environment in city after city.¹⁷² Overall, these criticisms reflected dissatisfaction with bureaucratic implementation and disillusionment with the New Deal ideal of expert administrators. The Nader answer, insofar as one was offered, appeared to be a visible and simple one. It lay in clear national emission standards.¹⁷³ That proposal was only partially adopted by the Clean Air Act. Instead, Muskie's committee finally set forth explicit goals accompanied by defined means, clear deadlines, and rigorous timetables in an attempt to meet Nader's criticisms. In so doing, Muskie's committee sought "handles"¹⁷⁴ on environmental degradation connected to fragmented, incremental, and credit-seeking solutions to the problems of dirty air.

E. The Environmental Protection Agency and Integration

The Nixon administration created the EPA with the specific objective of integrating the various legislative mandates entrusted to it. Nixon envisioned an EPA that would end much of the fragmentation of environmental policy. Douglas Costle, who later became 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 reorganization along

171. See *id.* at vii-ix. (R. Nader commenting in foreword to the book).

172. See *id.* at 259-98.

173. See *id.* at 307.

174. See MARCUS, *supra* note 133, at 70-71.

functional lines was the desired long term goal, an incremental strategy was preferable in the short term.¹⁷⁵

Costle recommended a three-stage plan. Initially, the five programs dealing with air, water, pesticides, solids waste and radiation, and noise would be preserved. After a period of time three new assistant administrative offices would be created along functional lines, dealing with Planning and Management, Standards and Compliance, and Research and Monitoring. The five individual programs would temporarily be allowed to retain their separate identity in the remaining administrative offices. Finally, after the passage of a reasonable amount of time, the program distinctions were to be eliminated entirely.¹⁷⁶

There were a number of reasons for Costle's caution in pushing forward with integration. First, the differing policy streams leading to the creation of EPA and the passage of the 1970 Clean Air Act proceeded along parallel paths.¹⁷⁷ 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 hand it was staffed by those committed to a programmatic administration based on fragmented policies. EPA's structure was unprecedented in terms of the number and size of disparate agencies brought under a new organizational roof.¹⁷⁸ 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.¹⁷⁹ Most bureaucrats within EPA had a program perspective. They were tied to specific legislation,

175. See *id.* at 104.

176. See *id.* at 70-71.

177. See *id.* at 54-57.

178. There were ten major administrative units in all. The Federal Water Quality Administration from the Interior Department was the largest with 2,670 personnel and a budget of over \$1,000 million. The National Air Pollution Control Administration from HEW was second with 1,100 personnel and a budget of \$110 million. Other major units included the Pesticides Regulation Division from the Agriculture Department with 425 personnel, the Bureau of Radiological Health from HEW with 350 and the Office of Pesticides Research from HEW with 275. Stephen A. Cohen, *EPA: A Qualified Success*, in *CONTROVERSIES IN ENVIRONMENTAL POLICY* 179 (Sheldon Kamieniecki et al. eds., 1986).

179. See MARCUS, *supra* note 133, at 103-04; see also DAVIES & DAVIES, *supra* note 155, at 107-12; ACIR, *supra* note 163, at 22; WILLIAM R. AHERN, *ORGANIZING FOR POLLUTION CONTROL: THE BEGINNINGS OF THE ENVIRONMENTAL PROTECTION ADMINISTRATION 1970-1971* (1973) (providing further information on Costle's role).

functions, and appropriations. They took their cues from Congress, and reflected the pragmatic, fragmented policies of that body.¹⁸⁰

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.¹⁸¹ The resulting confusion could prevent it from meeting the obligations of its legislative mandates, particularly the inflexible demands of the Clean Air Act. These concerns were compounded by the fear that managers of EPA's program sections would not go along with a fully integrated plan.

William 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 he did not implement the third phase, which was to fully integrate EPA.¹⁸² It would seem that the primary reason for this was that even the limited division of duties Costle had brought about led to conflict and restlessness. Apart from being nervous about their position and prospects in a new organization, the bureaucrats he 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 particular legislative mandates, and they feared that the concrete directives were in danger of being ignored in the move toward integration. They also had access to Senators and Representatives of Congressional committees who enacted such legislation, and who continued to supervise their implementation. Faced by the prospect of bureaucratic resistance and Congressional criticism, Ruckelshaus decided to "play it safe."¹⁸³ These initial rumblings of discontent, signifying a

180. See DAVIES & DAVIES, *supra* note 155, at 108.

181. See MARCUS, *supra* note 133, at 103.

182. See *id.* (initial history of the EPA); see also DAVIES & DAVIES, *supra* note 155, at 108-18 (creation of EPA). EPA began as a wholly program-based administration and was then modified into one which was partly programmatic and partly functional. Three Assistant Administrators were appointed with responsibility along functional lines for: (a) Planning and Management; (b) Enforcement and General Counsel; (c) Research and Monitoring. The other Assistant Administrators remained in charge of particular regulatory programs. *Id.* The Ruckelshaus design remains basically unchanged up to date and "continues to be stuck in the same half-programmatic, half functional pattern." Terry Davies, *The United States: Experiment and Fragmentation*, in INTEGRATED POLLUTION CONTROL IN EUROPE AND NORTH AMERICA, at 51-66 (Nigel Haigh & Frances Irwin eds., 1990).

183. MARCUS, *supra* note 133, at 101-06; see also Alfred Marcus, *Environmental Protection Agency*, in THE POLITICS OF REGULATION, *supra* note 145, at 275-77. It may be possible to explain his behavior on the basis that the crucial concern of any

bureaucratic preference for fragmentation, led to a special pleading that EPA be excluded from NEPA, and they set the stage for EPA's virtual rejection of an integrated approach.

In several cases in which the issue was raised,¹⁸⁴ EPA insisted that it was not bound by the provisions of NEPA and sought to justify its position on broad policy grounds. The foundation of EPA's 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, objectives, and deadlines require rapid 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.

These arguments were advanced in *Anaconda Co. v. Ruckelshaus*,¹⁸⁵ in which a plaintiff industry sought to demonstrate that the control strategy and emission standard for sulfur dioxide proposed by EPA with reference to state implementation plans would create an "enormous solid waste disposal problem."¹⁸⁶ The District Court's holding that EPA should comply with NEPA was vacated on appeal on the ground that EPA's action was not subject to judicial review because the proposed regulation had not yet been adopted.¹⁸⁷ The reasoning of the District Court in *Anaconda* was rejected as "myopic" in

agency head is how to maintain the agency as a viable, credible, steady institution rather than to make decisions that achieve the agency's prescribed goals. *E.g.* CHESTER I. BERNARD, *THE FUNCTIONS OF THE EXECUTIVE* 215, 231-34, 251-57 (1968); JAMES Q. WILSON, *POLITICAL ORGANIZATIONS* 9-10, 13 (1973); PHILLIP SELZNICK, *TVA AND GRASS ROOTS: A STUDY IN THE SOCIOLOGY OF FORMAL ORGANIZATIONS* 12-13 (1949).

184. *E.g.* *Appalachian Power Co. v. EPA*, 477 F.2d 495 (4th Cir. 1973); *Buckeye Power Inc. v. EPA*, 481 F.2d 162 (6th Cir. 1973), *cert. denied sub nom. Tenn. Valley Auth. v. EPA*, 425 U.S. 934 (1976); *Duquesne Light Co. v. EPA*, 481 F.2d 1 (3d Cir. 1973), *vacated and remanded by* 427 U.S. 902 (1976); *Essex Chem. Corp. v. Ruckelshaus*, 486 F.2d 427 (D.C. Cir. 1973), *cert. denied*, 417 U.S. 921 (1974); *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 349 (3d Cir. 1972), *cert. denied*, 409 U.S. 1125 (1973); *EDF v. EPA*, 489 F.2d 1247 (D.C. Cir. 1973); *Wyoming v. Hathaway*, 525 F.2d 66 (10th Cir. 1975), *cert. denied*, 426 U.S. 906 (1976); *Maryland v. Train*, 415 F. Supp. 116 (D. Md. 1976).

185. Neuman, *supra* note 109, at 622.

186. *Id.* [citing Brief for *Anaconda Co.* at 38, *Anaconda Co. v. Ruckelshaus*, 352 F. Supp. 697 (D.C. Cir. 1972) (No. C-4362)].

187. See 482 F.2d 1301 (10th Cir. 1973).

Portland Cement Ass'n v. Ruckelshaus,¹⁸⁸ a case dealing with new source performance standards.

In *Portland*,¹⁸⁹ 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.¹⁹⁰ 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.¹⁹¹ Judge Leventhal resolved that any determination of the "best system of emission reduction" that took "into account the cost of achieving such reduction"¹⁹² constrained the Administrator to consider counter-productive environmental effects as well as the cost to industry.¹⁹³ Together with the need for a statement of reasons, these factors constituted the "functional equivalent" of a NEPA impact statement, and they exempted EPA from the stricter requirements of NEPA.¹⁹⁴ The fact that the time involved in complying with NEPA, as interpreted by the courts, would have prevented EPA from meeting the rigorous and inflexible time schedules set out in the Clean Air Act was regarded as a "substantial," if not a decisive, consideration.¹⁹⁵

A similar decision was reached in *Essex Chemical Corp. v. Ruckelshaus*, which was consolidated with *Appalachian Power Co. v. EPA*.¹⁹⁶ The petitioner corporation maintained, *inter alia*, that in promulgating standards for sulfuric acid, EPA failed to consider the adverse impact on water caused by tail gas scrubbers that would have to be installed if the new source performance standards were to be met.¹⁹⁷ The petitioner argued that EPA should have complied with NEPA. EPA, while admitting that the setting of standards might involve other environmental impacts, cast NEPA in general terms, in contrast to the specific provisions of the Clean Air Act.¹⁹⁸ EPA further argued that the

188. 486 F.2d 375 (D.C. Cir. 1973), *cert. denied*, 417 U.S. 921 (1974).

189. *Id.*

190. See Neuman, *supra* note 109, at 617 (citing Brief for Portland Cement Ass'n as Petitioner at 35, *Portland Cement Ass'n v. Ruckelshaus*, 486 F.2d 375 (D.C. Cir. 1973)).

191. See 486 F.2d at 384.

192. *Id.* at 385.

193. *Id.*

194. *Id.* at 384.

195. *Id.* at 381.

196. 486 F.2d 427 (D.C. Cir. 1973), *cert. denied*, 416 U.S. 969 (1974).

197. See 486 F.2d at 439.

198. See EPA Brief at 21, *Appalachian Power Co. v. EPA*, 486 F.2d 427 (D.C. Cir. 1973) (No. 72-1079), *cert. denied*, 416 U.S. 969 (1974).

Clean Air Act was based on the premise that air pollution levels were at crisis levels demanding strict time limits for compliance.¹⁹⁹ The application of NEPA would be inconsistent with the time constraints central to the Clean Air Act. The court found no reason to divert or expand from the logic of the *Portland Cement* decision, and it held that NEPA impact statements were not a condition to making Section 111 determinations.²⁰⁰

The *Kalur v. Resor*²⁰¹ court went against the tide and held that, in exercising its powers under the Refuse Act Permit Program, the Army Corps of Engineers was fully subject to NEPA. The Corps of Engineers could not delegate its statutory authority under the Refuse Act to EPA.²⁰² Congress responded by exempting EPA from that responsibility. The Clean Water Act exempts 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.²⁰³ Similarly, the Energy Supply and Environmental Coordination Act of 1974 provided that no action taken by EPA under the Clean Air Act would require an EIS.²⁰⁴ Furthermore, EPA determined that regulations under the Resource Conservation and Recovery Act of 1976,²⁰⁵ the Toxic Substances Control Act of 1976,²⁰⁶ the Safe Drinking Water Act,²⁰⁷ and the Noise Control Act²⁰⁸ are exempt from NEPA.²⁰⁹

While policies and laws based on integrated perspectives did exist, they were swamped by a confluence of policies and politics. Those policies and politics, as we have seen, included dissatisfaction with New Deal administration, incrementalism, the competition for environmental credit between President Nixon and Senators Muskie and Jackson, rivalry between Congressional committees, and the preference of bureaucrats for programmatic administration.

199. See *id.* at 15; see also Neuman, *supra* note 109, at 606.

200. See 486 F.2d at 431.

201. 335 F. Supp. 1 (D.D.C. 1971).

202. See *id.* at 14-15.

203. Clean Water Act § 511(c)(1), 33 U.S.C. § 1371(c)(1) (1994).

204. Energy Supply and Environmental Coordination Act of 1974 § 7(c)(1), 15 U.S.C. § 793(c)(1) (1994).

205. Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k (1994) (Resource Conservation and Recovery Act).

206. Toxic Substances Control Act, 15 U.S.C. §§ 2601-2692 (1994).

207. Public Health Service Act, 42 U.S.C. §§ 300f-300j-26 (1994) (Safe Drinking Water Act).

208. Noise Control Act, 42 U.S.C. §§ 4901-4918 (1994).

209. 44 Fed. Reg. 64,174 (1979).

F. *The Present Predicament*

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, that in turn have created problems of air and water pollution.²¹⁰ 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."²¹¹ In a similar vein, the U.S. National Research Council notes that "multimedia transport of pollution appears to be the rule rather than the exception."²¹²

The Pollution Prevention Act (PPA)²¹³ is an important step in the direction of an integrated approach to pollution control. Congress concluded that there are significant new opportunities for reducing or avoiding the billions of dollars the United States spends on controlling pollution. Congress recognized that opportunities for source reduction are often not realized because existing regulations, and the industrial resources they require for compliance, focus on treatment and disposal rather than on source reduction. Accordingly, Congress embraced the need for cost-effective changes in production, operation, and raw material selection that would reduce or prevent pollution at the source.

The PPA realizes the need for multimedia management.²¹⁴ The Act finds that "[s]ource reduction is fundamentally different and more desirable than waste management and pollution control" and that the "Environmental Protection Agency needs to address the historical lack of attention to source reduction."²¹⁵ The PPA further crystallizes some essentials of integrated

210. Solid Waste Disposal Act, 42 U.S.C. § 6901(b)(3) (1994) ("[A]s a result of the Clean Air Act [42 U.S.C. §§ 7401 *et seq.*] the Water Pollution Control Act [33 U.S.C. §§ 1251 *et seq.*], 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 . . .").

211. ROYAL COMM'N ON ENVTL. POLLUTION, TACKLING POLLUTION—EXPERIENCES AND PROSPECTS (Rep. No. 10) (1984) (emphasis added).

212. NAT'L RESEARCH COUNCIL, SYMPOSIUM: MULTIMEDIA APPROACHES TO POLLUTION CONTROL 4 (1987).

213. Pollution Prevention Act, 42 U.S.C. §§ 13101-13109 (1994).

214. *Id.* § 13101(a)(3).

215. *Id.* § 13101(a)(4).

environmental management (IEM) by declaring that the national policy of the United States requires that pollution should be prevented or reduced at the source whenever feasible.²¹⁶ Under the PPA, the Administrator of the EPA is charged with developing and implementing a strategy promoting "source reduction."²¹⁷

The *ex ante* approach to pollution control embodied in PPA is a far cry from the *ex post* laws and policies to which we have become accustomed. While this change deserves acclaim, it is wise to guard against false hope. Although the PPA, by shifting the focus of pollution control from effects to sources, resonates with prophetic cadences,²¹⁸ the portents for a hortatory bang fizzling into an implementing whimper are disappointingly high. All that the PPA provides regarding institutional implementation is a charge to the already harassed and overburdened Administrator of EPA to develop and implement a strategy to promote source reduction.²¹⁹

This legislative prodding added to the mounting evidence and conviction, at least within the leadership of EPA in both the Bush and Clinton Administrations, that single medium regulation is both ineffective and inefficient. Responding to these pressures, the Clinton Administration unveiled Project XL (an acronym for eXcellence and Leadership) in 1995. The project consists of twenty-five initiatives intended to reinvent environmental regulation.²²⁰ Many of these programs attempt to

216. *Id.* § 13101(b).

217. *Id.* § 13103(b). Source reduction is defined as "any practice which reduces the amount of any hazardous substance, pollutant or contaminant entering the waste stream." Source reduction "includes equipment technology modifications, process or procedure modifications, reformulation or redesign of products, and substitution of raw materials." *Id.* § 13102(5)(A).

218. 42 U.S.C. § 13101(b).

219. 42 U.S.C. § 13103(b).

220. President William J. Clinton & Vice President Albert A. Gore, *Reinventing Environmental Regulation*, Mar. 16, 1995, available at <http://www.epa.gov/reinvent/notebook/19950316.pdf>. The XL initiative has been extensively discussed. *E.g.*, James Salzman, *Beyond the Smokestack: Environmental Protection in the Service Economy*, 47 UCLA L. REV. 411 (1999); Robert M. Sussman, *The Government Performance and Results Act and the Future of EPA: A Second Look*, 29 ENVTL. L. REP. 10347 (1999); Lawrence E. Susskind & Joshua Secunda, *The Risks and the Advantages of Agency Discretion: Evidence from EPA's Project XL*, 17 UCLA J. ENVTL. L. & POLY 67 (1998-1999); Pamela Hill, *Emerging Policy and Legal Directions at EPA*, 33 NEW ENG. L. REV. 625 (1999); Thomas E. Caballero, *Project XL: Making It Legal, Making It Work*, 17 STAN. ENVTL. L.J. 399 (1998); Bradford C. Mank, *The Environmental Protection Agency's Project XL and Other Regulatory Reform Initiatives: The Need for Legislative Authorization*, 25 ECOLOGY L.Q. 1 (1998); Rena I. Steinzor, *Reinventing Environmental Regulation: The Dangerous Journey from Command to Self-Control*, 22 HARV. ENVTL. L. REV. 103 (1998); Rena I. Steinzor, *Regulatory Reinvention and Project XL: Does the Emperor Have Any Clothes?*, 26 ENVTL. L. REP. 10527 (1996);

adopt a multi-media approach to regulation, amounting in effect to an integrated approach to pollution control. Unfortunately, no direct legislative authority exists for adopting IPC. Despite the fact that the National Environmental Policy Act (NEPA)²²¹ and the Toxic Substances Control Act (TSCA)²²² provide EPA with authority to move toward IPC, the EPA has not done so. The courts have effectively exempted EPA from making an EIS statement under NEPA.²²³ Moreover, EPA has chosen not to act under TSCA.²²⁴

This means that EPA must find its power and authority to carry out the Clinton Administration's XL projects using existing statutory mandates under the Clean Air Act (CAA),²²⁵ the Clean Water Act,²²⁶ the Safe Drinking Water Act,²²⁷ the Resource Conservation and Recovery Act (RCRA),²²⁸ the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA),²²⁹ and the Toxic Substances Control Act.²³⁰ While the lack of a specific IPC statute may be seen by some as providing a long-term ability to introduce IPC into the current system,²³¹ industry has been adamant that it needs legislative protections to carry out XL projects in order to defend themselves from the threat of citizen suits. Industry also feels that EPA and states require a clear mandate to provide flexibility. While there have been some efforts to draft legislation that could enjoy broad

Daniel J. Fiorino, *Essay: Toward a New System of Environmental Regulation: The Case for an Industry Sector Approach*, 26 ENVTL. L. 457 (1996).

221. 42 U.S.C. §§ 4321-4370(e) (1994).

222. 15 U.S.C. §§ 2601-2692 (1994).

223. See Guruswamy, *supra* note 71, at 477-79, 484-87, 490-92.

224. See Robert V. Percival, *Presentation at American Association of Law Schools Annual Meeting, Joint Program of Sections on Environmental Law and Torts and Compensation Systems, Three Perspectives on Risk: Common Law, Environmental Regulation and Law and Economics*, Jan. 6, 1997, 14 PACE ENVTL. L. REV. 513, 520 (1997); see also 15 U.S.C. § 2605 (a) (1994); *Corrosion Proof Fittings v. EPA*, 947 F.2d 1201 (5th Cir. 1991); Thomas O. McGarity, *The Courts and the Ossification of Rulemaking: A Response to Professor Seidenfeld*, 75 TEX. L. REV. 525, 548 (1997) (stating that, "In the six years that have passed since the Corrosion Proof Fittings opinion, EPA has not initiated a single action under section 6 of TSCA, and it is not likely to use section 6 to impose requirements that regulatees oppose until it is amended to overrule the court's opinion.").

225. 42 U.S.C. §§ 7401-7671q (1994).

226. Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1387 (1994).

227. 42 U.S.C. §§ 300f-300j (1994).

228. Solid Waste Disposal Act, 42 U.S.C. §§ 6901-6992k (1994).

229. 42 U.S.C. §§ 9601-9675 (1994).

230. 15 U.S.C. §§ 2601-2692 (1994).

231. See Lisa C. Lund, *Project XL: Good for the Environment, Good for Business, Good for Communities*, 30 ENVTL. L. REP. 10140 (2000).

support,²³² to date, Congress has not seriously considered any such legislation.²³³

Weaknesses in the vision of both the PPA and the XL program compound infirmities in their implementation. For instance, the PPA and Project XL institutionalized an operational modality of integrated environmental management (IEM) that concentrates on preventive technology, modifications of plant, and industrial processes and procedure redesigns. However, an operational version of IEM largely assumes the need for activities and products that lead to pollution and seeks to neutralize the deleterious effects of such activities and demands. Therefore, operational IEM does not provide for a truly comprehensive approach to pollution control and ecology that could radically and strategically change the sources and demands that lead to pollution.

While the operational versions of preventive IEM, represented by PPA and Project XL, represent a significant step forward, they are based on environmentalism rather than ecologicalism and are unable to address the fundamental restructuring demanded by the management of life support systems. Industrial ecology may provide a two-way bridge from environmentalism to ecologicalism.

IV

THE WAY FORWARD

A comprehensive ecological approach confronts a substantial difficulty that needs to be addressed at the outset. If everything is related to everything else in increasing degrees of complexity, then nothing can be done unless everything is understood. An integrated approach seeks to further such understanding by synthesizing the myriad areas of knowledge about these ecologically inter-connected issues. But as we have seen, fully understanding the daunting biocomplexity of the physical, biological, and chemical life support systems in order to undertake SD is an intimidating, if not an impossible, task. An integrated approach seems first to demand an almost superhuman feat of comprehending all these earth support

232. See *Baucus Soon to Introduce Bill to Set Up Pilot MultiMedia Programs*, 17 CHEM. REG. REP. (BNA) 1709 (Jan. 7, 1994).

233. S. 1348, 105th Cong. (1997). There was a new effort in 1999 to build a bipartisan consensus in both the House and Senate to legislate an "XL-like" program. Second Generation of Environmental Improvement Act of 1999, H.R. 3448, 106th Cong. (1999).

systems. This is followed by the need for legal and institutional implementation, although the legal and administrative structures required for such an endeavor are non-existent today.

The eminent economist/political scientist Charles Lindblom articulated the significant deficiencies of an integrated approach; he cogently argued that precisely because everything is interconnected, environmental problems are beyond our capacity to control in one unified policy.²³⁴ Lindblom asserted that the very enormity of the interconnected environment makes it impossible to treat as a whole. Tactically defensible or strategically defensive points of intervention must be found,²³⁵ suggesting that a step-by-step approach will help to solve a problem better than a grand solution based upon the necessarily incomplete analysis offered by comprehensive rationality.

Lindblom also contended that a "rational-comprehensive" decisionmaking process that adopts a synoptic perception of a problem, collects all relevant information, and explores all relevant solutions after considering all relevant answers, is impossible to develop when dealing with the environment as a whole. Such an approach, which is admirably marked by clarity of objective, explicitness of evaluation, a high degree of comprehensiveness of overview, and quantification of values for mathematical analysis, is only possible when dealing with small-scale problems with a very limited number of variables. Lindblom suggested, that poor as it is, incremental politics ordinarily offers the best chance of producing beneficial political changes.

To the extent that an integrated approach must take account of political reality, it seems undeniable that most people simply find it too overwhelming to think concurrently of whole litanies of problems without succumbing to agitated confusion or passive despair. Instead, building a series of "small wins" creates a sense of control, reduces frustration and anxiety, and fosters continued enthusiasm on the part of the public, scientists, and politicians.²³⁶ These "small wins," however, can be real victories only if they contribute to an overarching integrated strategy.

Industrial ecology may provide the bridge between fragmentation and integration and allow for such "small wins." At its core, industrial ecology focuses on the materials, energy,

234. Charles E. Lindblom, *The Science of Muddling Through*, 19 PUB. ADMIN. REV. 79, 79-82 (1959).

235. See Charles E. Lindblom, *Incrementalism and Environmentalism*, in MANAGING THE ENVIRONMENT 83 (U.S. Gov't. Printing Office, 1973).

236. J. T. Heinen & R. S. Low, *Human Behavioral Ecology and Environmental Conservation*, 19 ENVTL. CONSERVATION(2) 105-116 (1991).

and product flows that characterize technological society.²³⁷ To the extent that a firm or industrial unit is the analog of a living organism, many of the insights gained from the study of these flows through the natural environment, and the lessons learned from the applications of models to natural systems can help in the development of good practice for systems models in industry.²³⁸ At the same time, those engaged in the laudable enterprise of collecting data and understanding the interactions of various physical, chemical, and biological processes and cycles that regulate the world could learn about the vicissitudes of the political and legal processes encountered by industrial ecology and IPC.

Industries and ecosystems are examples of self-organizing systems that process materials into useful forms using external sources of free energy.²³⁹ The utility of IE lies in the fact that it is a practical expression of the principles of ecology at the level of industry that offers pragmatic criteria on how to better manage large-scale ecosystems. Industrial activities may provide valuable "bottom up" experience because of the compelling analogy between biological processes and industrial metabolisms.

Lindblom notwithstanding, ecologicalism calls for the adoption of a comprehensive approach to the entire planetary ecosystem, and to its management. This is a gargantuan scientific task. The need to better understand water, the atmosphere, and biodiversity demands rigorous scientific research not only into whole systems, but also into how the details fit into the overall scheme.²⁴⁰ This involves not only large-scale control experimentation on whole catchments and ecosystems, but also the modeling of whole systems in order to study the likely consequences of management actions.²⁴¹

However, management relating to ecosystems²⁴² or risk,²⁴³ whether on a national or international level, is a largely political activity in which the decisions taken may not be based on the best scientific evidence. That is why it is important for at least some scientists to be conscious of the political dimension to their

237. See Reid Lifset, *Why Industrial Ecology?*, 1 J. INDUS. ECOLOGY 1 (1998).

238. See Mitchell J. Small, *Show Me the Data*, 1 J. INDUS. ECOLOGY 9 (1998).

239. R. U. Ayres, *Industrial Metabolism*, in ENCYCLOPEDIA OF THE ENVIRONMENT, *supra* note 6, at 366.

240. See STEPHEN TRUDGILL, *SOIL AND VEGETATION SYSTEMS* 4 (2d ed. 1988).

241. See *id.* at 19.

242. See *id.*

243. See William D. Ruckelshaus, *Risk, Science and Democracy*, in FOUNDATIONS OF ENVIRONMENTAL LAW AND POLICY 48-52 (Richard L. Revesz ed., 1997).

research, so that it might be presented in the most politically palatable fashion, and in a manner that lends itself to legal and administrative adoption.

CONCLUSION

Human and natural forces have created multiple interacting changes influencing the physical, chemical, biological, political, legal, and institutional life support systems at national, regional, and global levels. These changes and impacts call for responses that will continue to support and enrich life. In the first place, there is a need to formulate, or re-conceptualize the objectives or goals of environmental management. This is a dynamic, ongoing process as distinct from an inflexible commitment to static and predetermined outcomes, and it involves recognizing not only the natural, but also the political life support systems of the world. While recognizing the need for revised goals, this Article has not embarked upon this undertaking, but has focused instead on determining how these objectives can be realized. Ultimately, this Article argues that the realization of environmental objectives calls for an integrated approach.

A historiographical view of the United States' approach to pollution control reveals a serious disjunction between "ought" and "is." The need for an integrated approach based on our understanding of the natural, physical, and chemical life support systems stands in bleak contrast to the compartmentalized response of policy, law, and administration based on political and social realities. Such an experience can be disillusioning. The deep psychological need for "small wins" and a sense of accomplishment in the face of a daunting problem might be provided by industrial ecology. The holistic approach to materials and their flows that industrial ecology offers opens up a promising segue into the difficult task of confronting the baffling biocomplexity presented by climate change, biodiversity, and resource management. Industrial ecology could become symbiotically connected to the enterprise of understanding global systems, and it could enrich as well as become enriched by the larger undertakings addressing planetary life support systems in the twenty-first century.

We are offered the opportunity to learn from our mistakes and to respond politically, administratively, and legally in a manner that reflects the undeniably integrated and complex nature of the problems being addressed. The twenty-first century beckons us to do so.