ECOLOGICAL AND ENVIRONMENTAL CHANGE

Mohamed A. Serageldin
Office of Air Quality Planning and Standards, US Environmental Protection Agency, Research Triangle Park, North Carolina, USA

Disclaimer - The views expressed in this chapter are those of the author, and do not necessarily reflect those of his affiliation
.
Keywords: Air quality standards, ecological indicators, economic incentives, emission standards, emissions trading, environmental controls, environmental pollutants, environmental regulations, public participation, risk assessment,

Contents

Summary

Environmental pollution is on the rise across the world, especially in urban growth centers, and there is much evidence that human and nonhuman resources are being inefficiently utilized in the process of creating wealth. This is a problem that both the developed and developing nations are responsible for, one that could cause irreversible harm to the environment, both locally and globally. Hence there is a need for a balanced outlook in creating wealth; one that will not diminish the opportunities of future generations and that will consider the rights of the disadvantaged. In that context, it should be recognized that environmental damage might be caused by factors other than local development activities: certain pollutants are transboundary (can travel from one region or state to another). These pollutants include oxides of nitrogen, sulfur dioxide, and VOCs, which can negatively impact human health and the ecology. Another group of pollutants is called greenhouse gases; these include carbon dioxide. They are believed to be responsible for an unpredictable climatic change, which can cause losses in assets and life. This article provides an overview of the programs of the United States and the European Union, aimed at protecting human health and the ecology and mitigating environmental changes. These two economic blocks have produced gains in many areas, and are also responsible for a disproportionate amount of pollution on a per capita basis. They have progressively reassessed their environmental protection strategies to include new approaches for encouraging technological innovations that lower costs. Some of these strategies and some of the programs and policies in support of implementation and enforcement of regulations are discussed. The role of risk assessment and economic valuation in decision making is acknowledged.

1. Introduction

Anthropogenic (i.e., human) activities due to industrialization, urbanization, and growth result in formation and release of pollutants (stressors), which have the potential to impact the physical environment (e.g., affecting a temperature change), biological environment (e.g., altering habitat consumption), and chemical environment (e.g., resulting in increased risk of cancer). The effect of such changes will impact both human and ecological health and welfare, as illustrated in the Environmental Protection Agency (EPA) report to the US Congress that describes the benefits and costs of the Clean Air Act for the period 1990 to 2010. The richer nations, which are a significant contributor to anthropogenic pollution, are more able to deal with the economic impacts than the poorer nations, which have low per capita wealth.

Governments in many countries have set up environmental agencies whose declared mission is to protect human health and to safeguard the natural environment—air, water, and land, upon which life depends. How this is achieved will be influenced by the country's environmental history, the values of its citizens, its political system, and available financial resources. Two progressive systems of regulations are discussed—those of the United States of America (the US), and of the European Union Nation States (the EU). They have a different history of legislative development, which explains why differences exist in the principles adopted, and in the types of decision-making tools used by these two economic blocs, for controlling and preventing human-made pollution. These differences are reflected in the extent to which risk assessment is used, the tools for cost and economic valuation, and the manner in which societal considerations play a role in the management of the environment. These industrialized

(or developed) countries represent regulatory systems that have evolved over more than two decades. Also, the success of their combined programs will have great impact on the health and welfare of the world.

2. Legislative History

This section provides information on some essential legislative and regulatory aspects that invariably influence the environmental planning process and the actions taken by the US and the EU.

2.1 The United States

The US National Environmental Policy Act (NEPA) of 1969 has been the primary guidance document in that country since it was enacted by the legislators. It called for the establishment of a Council of Environmental Quality. The Council, which is part of the Executive Office of the President of the United States, was assigned the task of implementing the newly declared national policy. The broad objectives of NEPA were: "[to] encourage productive and enjoyable harmony between man and his environment; to promote efforts which will eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the nation..."

The US Environmental Protection Agency (US EPA) was established in 1970, and is headed by the Administrator, who reports to the US President. A number of functions related to the environment and human health carried out by other government departments were transferred to the US EPA, which was given the task of overseeing the implementation of the newly enacted Clean Air Act (CAA) in the 50 US states. The US CAA has been amended twice since it was enacted by the US Congress in 1970, the last time being in 1990. It is divided for convenience into several broad sections referred to as Titles, and includes titles dealing with the following topics: National ambient air quality standards; Mobile sources; Air toxics; Acid deposition controls; Operating permits; Stratospheric Ozone protection (this includes provisions from the Montreal Protocol); and Enforcement.

2.2 The European Union

Unlike the US, which is a Federation made up of 50 states, the EU represents an economic bloc, presently made up of 25 Nation-States, which are bound by treaties (this total does not include the countries short listed to join the EU). The main focus of the EU, for many years, was setting up a framework for economic cooperation, often at the expense of the environment. However, this began to change with the enactment of the Single European Act in 1987. This treaty which established the European Community provided a legal framework for measures that relate to the environment. The EU treaty of November 1993 was an important milestone as it upgraded the environment to a Community policy, and not just an action of the Community. It also amended several articles that let to inconsistent interpretation of the regulations of the 1987 Single European Act. For example, Article 1 30s that relates to environmental procedures and decision was replaced with Article 175. Also, Article 95, which dealt with an

approximation of laws for the internal market replaced Article l00a. The EU treaty of 1993 promoted the concept of sustainable growth and the need to respect the environment within the EU Community. Also, the precautionary principle became one of the pillars of the EU environmental policy. The treaty of Amsterdam, which was signed by the member states in October 1997, dealt with some more of the inconsistencies related to previous environmental policies, and streamlined some of the procedures. It also required that the EU Commission prepare an impact assessment for any project that may have significant environmental impacts.

2.3 A Comparison of the US and the EU

Both the US and the EU have adopted what is referred to as traditional regulations. As in most other industrialized nations, a regulation may specify emission limits, equipment standards, and work practice standards—thus defining how much pollution is allowed. The regulations also specify the criteria for determining compliance with the standards to streamline the enforcement phase. In their efforts to deal with the most obvious threats, the focus for many years has been on large emitting facilities or sources. First, the facilities (plants or factories) that produced highly visible pollution—those with smoking stacks, were targeted. This was later followed by industrial categories that produced emissions above a certain minimum threshold, or based on some other criterion. The decision to target a certain industry, or manufacturing process, involved prioritizing specific threats. This exercise was often influenced by the input of those persons (individuals and communities) that were effective in lobbying the political and legal system. To deal with environmental priorities the US and EU set short-term objectives, and plans to achieve those objectives, and scheduled periodic evaluations for measuring and quantifying accomplishment.

The US CAA Amendments of 1990 (US CAA 1990) supplemented these traditional tools with provisions for economic incentives, emission caps to reduce SO_2 emissions, and several provisions aimed at promoting flexibility and streamlining requirements. At about the same time, the EU introduced its own brand of economic incentive tool, which relied more on taxes for modifying consumer behavior.

The EU employs different terms for their laws. They have directives, regulations, and decisions. It is important to recognize the differences when aligning (transposing) national laws, regulations, or procedures of a Member State with those of the EU. The EU regulations are written with fixed requirements that apply directly to all Member States. They are not transposed into national law. On the other hand, the EU directives are means of harmonizing compliance with environmental legislation of the individual countries in the Union. Hence, they may be transposed into national law. An EU directive provides information such as emission limits, extent of emission reduction, and general cost information. However, a directive contains less guidance than, for example, a US Control Techniques Guidelines (CTG) document); hence, a Member State appears to have more discretion in how it meets the limits and other requirements specified in a directive.

Directives are published in the EU *Official Journal.* The *Official Journal* is used to present updates, opinions, and written questions. It can be seen to serve both the

function in the US of the *Federal Register* (where regulations and other actions are published for public comment and review and the *Code of Federal Regulations,* which is published annually and includes any changes made to a US regulation. However, the structure and the type of information presented in EU and US regulatory documents are quite different.

2.4 Dissemination of Information

The US has a legal system that is different from that of the EU in respect of information dissemination. Through citizen suits, lobbying the US Congress, and the ability to obtain data and other information using the authority of the Freedom of Information Act, US organized interest groups have the ability to create pressure on the US Environmental Protection Agency.

Citizen suits are also used by nongovernmental organizations (NGO5) to change industrial practices. This kind of empowerment is not available in the EU countries through legislation. However, EU directives promote citizen participation and the sharing of information. Nongovernmental organizations are active in EU countries, and have to work within the local Member State laws. Regulators in the EU have greater discretion in deciding whom to involve during the regulation development process. Also, citizen suits are often restricted to those persons that are likely to be affected by the problems resulting from the pollution. This should be seen as a reflection of existing policies in many Member States.

-
-
-

Bibliography

Cohen-Rosenthal M., McGallierd T., and Bell M. (2000). *Designing Eco-Industrial Parks: The North American Experience,* IPTS Report 27, 1—10. Ithaca, New York: Eco-Industrial Development Program, Cornell University. URL: http://www.jrc.es/iptsreportlvol27/englishICOHl E276.htm. [The document provides an overview of eco-industrial parks, and identifies demonstration sites, emerging projects, and design principles.]

Commission of the European Communities (COM) (1999). *The Commission's Proposal for a Directive of the European Parliament and of the Council on National Emission Ceilings for Certain Atmospheric Pollutants and Proposal for a Directive of the European Parliament and of the Council relating to Ozone in Ambient Air,* 114 pp. COM (1999)125 final—COD 99/0067— COD 99/0068. [The document proposes short-term and long-term environmental ceilings for acidifying and ozone forming pollutants and lists the cost for each EU Nation State.]

Douben P. E. T. and Serageldin M. A. (1998). The basis for industrial process regulation. *Pollution Risk*

Assessment and Management, ed. P. E. T. Douben, Chapter 3, 49 - 91. Chichester: John Wiley and Sons. [The document provides an overview of policies that define environmental standards and compares their implementation and enforcement from the Canadian, US and European perspectives. It also highlights factors that can limit the effectiveness of environmental standards.]

European Union (2000). *The Amsterdam Treaty: a Comprehensive Guide.* Brussels: The European Union, 5 pp. URL: http://europa.eu.int/scadplus/leg/enllvb/al 5000.htm. [The document includes a summary of the main environmental changes brought about by the Treaty of Amsterdam.]

Heinz Center (1999). *Designing a Report on the State of the Nation's Ecosystems,* Report Brief, The H. John Heinz III Center for Science, Economics, and The Environment, October 1999. Washington, DC: Heinz Center. 119 pp. URL: http://www.us-ecosystems.org. [The document provides a prototype system for reporting on the state of America's ecosystems.]

Hirschhorn J. S. (1997). Why the pollution prevention revolution failed—and why it will ultimately succeed. *Pollution Prevention Review,* Winter, 11 - 31. [The document discusses the broad vision behind the pollution prevention concept and the reasons why there was much resistance to the adoption of this concept for pollution control.]

Serageldin M. A. (1996). *Pollution Prevention. An Informal Discussion (with Supporting Examples),* NTIS PB98-124381INZ. Springfield, Virginia: National Technical Information Services. 26 pp. [The document compares the usage of the term pollution prevention in the US, EU, and by ISO 14000, and emphasizes the problems that can occur when the source is not consistently defined. It calls for consistency in the method of collecting similar data and for communicating data.]

Serageldin M. A., Almodovar P., and Miller S. (2000). Evaporative loss sources, organic solvent cleaning operations. *Air Pollution Engineering Manual,* Second Edition, ed. W. T. Davis, pp. 311—321. Pittsburgh, Pennsylvania: Air and Waste Management Association. [The document emphasizes the importance of tracking and accounting solvents usage at the operational level as part of a management system, and stresses the importance of illustrations in describing the source, so that emissions and risk may be accurately and consistently estimated. Illustrations are provided.]

US Clean Air Act (CAA) (1993). *House Committee on Energy and Commerce. Compilation of Selected Acts within the Jurisdiction of the Committee of Energy and Commerce. (As amended through 31 December, 1990, Com. Prt. 102-A.),* 1040 pp. Washington, DC: Government Printing Office. [This document includes US CAA, classified by Titles, the Pollution Prevention Act, and other environmental laws.]

US Environmental Protective Agency (1999). *The Benefit and Costs of the Clean Air Act 1990 to 2010,* 654 pp. EPA-410-R-99-00l, November 1999. Washington, DC: EPA, Office of Air and Radiation, Office of Policy. [This document discusses both the human and ecological benefits of the US CAA Amendments of 1990.]

US Environmental Protective Agency (2000). *National Air Pollutant Emission Trends, 1900 1998,* 238 pp. EPA-45-00-002, March 2000. Research Triangle Park, North Carolina: EPA Office of Air Quality Planning and Standards. [This document presents a recent estimate of the anthropogenic criteria air pollutants from all 50 US states.]

US Environmental Protective Agency (2001). *Teaching Resources - Ecosystems.* 11 pp. URL: http://www.epa.gov/teachers/ecosystems.htm. [This Web page provides links to information about ecosystems such as that in Chesapeake Bay.]

World Health Organization (2000). *Framework for the Integration of Health and Ecological Risk Assessment,* 40 pp. Draft - April, 2000. Research Triangle Park, North Carolina: World Health Organization (International Program on Chemical Safety). [This document explains why there is need to consider together human health and ecological risk. It provides a host of definitions.]

Biographical Sketch

Mohamed A. Serageldin has a degree in Chemical Engineering and acquired his Ph.D, in 1976. During his academic career, he has taught chemical engineering at undergraduate and graduate levels. He has also supervised a research team, which included graduates studying for their M.S. and Ph.D. degrees, and undergraduates involved in special projects. He spent a few years in industry where he helped to design and develop instrumentation for product evaluation and characterization. Presently, he is involved in the development of environmental standards, at the federal level. Serageldin has published articles on coal combustion, supercritical extraction, and reviews dealing with soot formation. His recent articles deal with environmental performance indicators, and national and international rule making. Several of the papers highlight inconsistencies in the use of pollution-related terms, and try to promote consensus on the adoption of a standardized methodology for communicating environmental information.