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**POLLUTION PREVENTION AND INTEGRATED ENVIRONMENTAL
MANAGEMENT: GUIDELINES FOR LEGISLATION ***

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* This document has not been edited.

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Abstract

POLLUTION PREVENTION AND INTEGRATED ENVIRONMENTAL MANAGEMENT: GUIDELINES FOR LEGISLATION

This paper proposes guidelines for legislation in the area of pollution prevention. First, pollution prevention in various sectors (industry, agriculture, etc.) is discussed. Next an integrated approach to the management of environmental problems is outlined. Then environmental laws from various countries are examined. Finally, a draft pollution prevention and integrated environmental management law is proposed.

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Pollution Prevention and
Integrated Environmental Management:
Guidelines for Legislation

I. Introduction

Almost every human activity results in some waste, i.e., some matter that the person conducting the activity does not want or does not have an immediate need for. Farming causes soil erosion. Eating produces garbage and sewage. Smelting results in slag. Some wastes are harmful because they are more or less toxic and would poison the land, air, or water where they are deposited if they were not properly treated; other wastes are merely unsightly or inconvenient to dispose of. And, to the extent wastes are not re-used, they are a waste of the natural resources they contain as well as the energy consumed in producing them.

A law enacted by a society can be amended, but there is a law of nature that cannot be: the second law of thermodynamics. Matter does not disappear, it only changes form and place.

Although most wastes can be treated to make them less harmful, treatment often only transfers wastes from one part of the environment to another (e.g., organic compounds volatilize into the air from wastewater settling ponds) and often creates other wastes that must be dealt with in turn (e.g., sewage treatment plants produce sludge). Wastes can also be disposed of; but disposal merely relocates and postpones the effects of wastes rather than eliminating them. And treatment and disposal are both costly.

It is therefore desirable -- indeed, it is increasingly imperative -- to plan and to carry out activities that affect human health and environmental integrity in ways that will both conserve natural resources and prevent the creation of avoidable wastes, i.e. unwanted matter. For such an effort to be effective, all human activities that affect health or the environment --including agriculture, exploitation and processing of renewable and non-renewable natural resources, manufacturing, energy production and consumption, transportation, use and disposal of products -- must be planned and regulated on a coordinated basis.

A society may enact a law as a statement of its policies. But policies do not implement themselves. There must be institutions and procedures to carry them out, and people must be trained to do so. To achieve comprehensive pollution prevention, a law must provide not only definitions and objectives but also

the processes for integrated planning of human activities so that they are conducted to prevent as much pollution as possible and to generate the least possible amount of waste for treatment or disposal. This general approach is suggested by Professor Jaro Mayda:

Environmental law should not be understood as just another new system of rules and agencies. Rather, it must be viewed as part of ecomanagement -- a comprehensive process of resource management, informed by ecosystemic knowledge, and progressively integrated with economic development planning. * * * Many LDCs [less developed countries] need to modernize their environmental laws, but to be effective, the new legislation will need to be accompanied by additional institutional developments. Specifically, environmental legislation must be accompanied by a substantial increase in each nation's capability for policy development, institutional structures, administrative competence, and ability to train management, monitoring, and enforcement personnel. 1/

"In the field of environmental law," Mayda continues, "this functional analysis [i.e., one that perceives law "as a process -- a means to achieve recognized policy goals -- rather than a set

of rules"] indicates the need to distinguish between two aspects of environmental legislation. On the one hand, the variety of human ecosystems requires that each lawmaking act be performed individually, rather than adopting prefabricated models. On the other hand, it is possible to identify the elements and methods common to all well-designed systems of environmental law." 2/

Generalizations about developing nations are dangerous. Acknowledging that danger, it is useful to observe that most developing nations have some laws directed toward their resources; those prohibiting pollution of waters, regulating the hunting of wildlife, or protecting forests were commonly enacted relatively early. Laws related to agriculture and health may also be of use in managing some environmental situations. Some nations have enacted quite elaborate pollution control laws modelled on specific statutes in place in developed nations, some have recently enacted comprehensive framework legislation. It is not unusual in developing nations, however, to find gaps in the coverage of laws relating to the environment, outdated provisions, contradictions between statutory laws and customary law or between statutory laws relating to the environment and those relating to other areas of concern, an absence of implementing regulations, and lack of enforcement. (These problems are of course not unheard of in developed nations.)

There is a need not only to develop laws and institutions to

conserve resources and prevent pollution within every nation's borders but also to coordinate the goals of those laws and the activities of those institutions with regional and global efforts directed to the same purposes. It is important for each nation to avoid causing damage to its neighboring nations, to husband its resources for the sake of the future of its own people as well as of all mankind, and to participate in bilateral and international efforts. This entails becoming a party to international treaties whose obligations benefit the nation directly, or indirectly as a member of the family of nations, or both, and enacting and implementing legislation at home that is necessary for complying with those obligations. For example, Article 6 of the Convention on Long Range Transboundary Air Pollution obligates parties to "develop the policies and strategies including air quality management systems and . . . control measures compatible with balanced development, in particular by using the best available technology which is economically feasible and low and non-waste technology."

The following report begins with a discussion of pollution prevention in several sectors of human activity -- industry, energy, transportation, agriculture, and products.

This discussion is followed by an explanation of what is meant by integrated environmental management; this explanation includes a survey of techniques or tools for achieving integrated

environmental management.

The third section describes existing and proposed legislation in various nations and states that are designed to achieve pollution prevention or integrated environmental management or both.

The final section is a draft comprehensive pollution prevention act that suggests several pollution prevention measures, prepared in the form of draft legislative provisions designed to be appropriate for consideration by nations in various stages of development and adaptable to their various circumstances. A variety of measures is offered, including planning, regulation, economic incentives, information exchange, and regular evaluation. A brief commentary accompanies each section of the draft legislation in order to explain its origins, rationale and implications.

II. Pollution Prevention in Industry, Energy, Transportation, Agriculture, and Products 3/

To prevent pollution means to avoid the generation of waste in the first place, or at least to reduce the amount or toxicity of wastes that cannot be avoided. Rather than being treated or "controlled" after they are created, wastes are eliminated at

their source. Pollution is prevented -- wastes are reduced -- because energy and materials are used efficiently; efficient use of resources plus avoiding the costs of treating wastes usually results in lower overall production costs. although some processes or stages of pollution prevention may have higher costs. Preventing pollution entails net reductions of pollutants in all media -- water, air, and land -- rather than less water pollution but more sludge from wastewater treatment plants that must be disposed of on land, for example.

One important concept in preventing pollution is striving to include all the costs of a product in its price, from the extraction or harvesting of the raw materials that go into its production (and the energy and pollution associated with obtaining those raw materials) through the production, use, and disposal of the product (and the energy and pollution associated with each of these stages of its life cycle). Although the costs of the first two stages are more familiar, too often the pollution associated with the use and disposal of a product are discounted.

Unlike the treatment of pollution, which focuses chiefly on manufacturing and other production processes and depends heavily on technology, pollution can be prevented in all sectors of human activity (thus encompassing, for example, pollutants contained in surface water run-off from lands used for agriculture) and by

means ranging from providing adequate information about quite simple ways to avoid or re-use wastes to regulation or prohibition of products or their packaging.

As in the care of the human body, so in the care of the resources that are the support of all the biosphere: "an ounce of prevention is worth a pound of cure." Had we developed pollution prevention approaches earlier, we might have avoided -- or at least mitigated -- the damage and risks associated with acid rain, ozone depletion, and global warming.

A. Pollution Prevention in Industry

Because resources -- raw materials and energy -- are becoming more expensive; because the costs of treating or disposing of wastes -- and the potential liability for failure to properly treat or dispose of them -- are increasing; and because popular, and therefore governmental, concern about the effects of pollution are increasing, it makes both economic and political sense to give more attention to preventing pollution.

In industry, pollution may be prevented by 1) in-process recycling, i.e., returning potential wastes generated on-site for re-use within existing operations; 2) modifying the production process, e.g., by modernizing technology or equipment used in production so that it uses or recovers raw materials more

efficiently, for example; 3) improving plant operations, e.g., by examining (or "auditing") a plant for opportunities to avoid generating wastes, by establishing regular schedules for checking and maintaining equipment, by specifying how to handle materials to avoid loss by spilling, and by requiring that wastes be kept separate; 4) substituting the materials used, i.e., using different materials or requiring lower levels of contaminants in the materials used; and 5) reformulating the products themselves, e.g., by changing their design, composition, or specifications so that different materials or production processes may be used in making them and so that they will cause less pollution when used and disposed of.

Pollution prevention in industry -- as indeed in all sectors -- requires that information be readily available about techniques that are effective and economical. Changes in the engineering concepts for designing and producing products, and the research and education that will enable those changes, will also be required. Leadership -- from chief executive officers through plant managers -- to encourage new attitudes dedicated to achieving profits by avoiding wastes rather than disposing of them at low cost to the plant (and high cost to society) and to implement new management approaches, such as accounting methods that specify the wastes generated by each process and product and the costs of treating or disposing of them, will be needed.

B. Pollution Prevention in Energy

There are several ways to use energy more efficiently, i.e., to get the same effect with less energy, that both save money and reduce pollution. Inefficient lighting in buildings, both governmental and commercial, and in manufacturing plants can be redesigned and replaced. Utilities that produce energy can plan to meet future demands by promoting energy conservation (and hence reducing increases in the demands) as well as by building facilities to produce more power. Guidelines for the design and insulation of residences and buildings can significantly affect the amounts of energy needed to heat and cool them.

Industries, buildings, and households can all be more energy efficient. For example, industries that use electric motors can make them more efficient by introducing speed controls. Buildings can substitute fluorescent for incandescent lights. Households can replace old, less efficient appliances e.g., refrigerators, toasters. Utilities can offer their customers services to inform them how to conserve energy use, provide reduced rates or rebates to customers who install energy conservation devices, and provide loans for investment in energy-saving equipment to developers of industrial, commercial, or residential buildings.

Energy efficiency can be promoted by pricing energy to all

users to include the costs of all stages of its production and use. It can also be encouraged by allowing utilities to include investments in energy conservation measures, as well as added production capacity, in the costs on which they may base their rates.

C. Pollution Prevention in Transportation

Pollution from motor vehicles has been significantly reduced by requirements for changes in fuels (e.g., elimination of lead in gasoline) and in engines (e.g., addition of catalytic converters). Because the number of vehicles and the average number of miles traveled by each vehicle have both increased, however, preventing pollution from transportation will depend on increased use of mass transit systems and the development and utilization of alternative fuels for vehicles.

Compressed natural gas is used as a fuel in buses, delivery vehicles, and fleets owned by governments in several nations. Methanol, made from natural gas, is also in use in vehicle fleets, usually in a 6:1 mixture with gasoline. Alternative fuels have some limitations; compressed natural gas vehicles tend to cost more than gasoline-powered vehicles, for example, though their fuel and maintenance costs may be lower. Methanol is toxic to humans and destructive of some materials used in vehicles and service stations. Ethanol, liquid propane gas, hydrogen, and

electricity are other alternative fuels.

Use of alternative fuels can be encouraged by government support of research and development and by government acquisition and use of vehicles powered with alternative fuels. Vehicle manufacturers can be required to produce specified numbers of vehicles using alternative fuels for sale in specified markets, and service stations in those areas can be required to provide the necessary fuels.

D. Pollution Prevention in Agriculture

The growth of intensive agriculture practices that feature the increased use of fertilizers, pesticides, herbicides, hormones, antibiotics, and irrigation and the decreased use of labor and machinery have resulted in contamination of both surface and ground waters. Concern about this contamination plus increasing indications of insect resistance to pesticides have led to interest in agricultural methods that may vary with the place or crop involved but result in reduced pollution. These methods include diversifying and rotating crops; using natural enemies for pests rather than pesticides (integrated pest management); fertilizing with animal manure; planting legumes; cultivating mechanically; and planting cover crops that reduce soil erosion and prevent the growth of weeds and obviate the need for herbicides. Even if these methods may result in lower crop

yields in some cases, the net costs of producing those crops may be lower. Some increase in loss of fruit due to pests, for example, may be offset by reduced expenses for pesticides.

Barriers to increased use of such alternative agriculture practices may be lowered by changing the basis for financial support given to certain crops from amount of acreage of particular crops to amount of acres of all crops. Grading of certain crops based on their appearance tends to promote use of chemicals that promote that appearance. Tax policies and crop insurance rate structures may also discourage alternative practices.

Not all trade-offs between intensive and alternative agricultural practices are yet clear. Increased use of manure may contaminate water with nitrates rather than fertilizer chemicals. Even so, several countries have already made plans to reduce pesticide use by 50% over differing periods because crop losses due to insects continue to rise despite increased use of pesticides with demonstrated or suspected detrimental effects on the environment.

E. Pollution Prevention in Products

Individual choices and behavior have an important role in determining how much waste results from consumption and

disposal of goods. These choices include what products people buy, how much energy they consume, what transportation they use, and how they dispose of wastes from their homes. The availability of information about alternatives, the design of products to choose from, and, ultimately, prices that correctly reflect the costs of the life cycle of the products, from winning their raw materials through their disposal, are all essential to informed choices that result in preventing pollution.

Vehicles using less fuel, or alternative fuels, may be purchased, or mass transportation may be preferred more frequently, for example. Used oil from vehicles can be returned to service stations. Appliances for the home may be rated as to their energy efficiency and labelled so consumers may choose those that use less energy. Labels may also inform customers of the relative amounts of wastes caused by different products. Many foodstuffs and other commodities are available in bulk, thus reducing wastes from packaging them in smaller quantities. People may buy fruit, vegetables, and wine raised without pesticides. Putrescible household waste can be composted; newspapers, glass, and some plastics are recyclable, and can either be collected separately by municipalities or taken to central collection facilities. Deposits may be imposed on some containers and collection facilities established for their return. Lawns and gardens do grow without repeated application of fertilizers.

III. Integrated Management of Man's Impacts on the Environment
-- Rationale and Techniques for Achievement 4/

A. Introduction

Because all components of the environment -- land, water, air, and living organisms -- are inter-related, management of man's impacts on the environment should be integrated. That is, programs and laws whose purpose is to conserve resources and protect the environment, and the institutions that implement these programs and laws, should not endeavor to control pollution of surface and ground waters separately from pollution of air and land pollution and from the effects of pollution of these environmental media on living organisms. Nor should these programs and laws segregate management of pollution from the products -- and the processes for producing the products -- that cause it. Dealing with any specific source of man's impacts on the environment independently cannot be as effective as integrated management of all these impacts because all parts of the environment are interdependent.

The deficiencies of dis-integrated management have been demonstrated. Controlling water quality of surface waters by regulating direct discharges of pollution ignores pollutants

deposited from the air, contributed by contaminated ground water, carried in from run-off from fields and streets, and released from sediments. Limiting discharges of pollutants to waters indirectly encourages managers of facilities to consider releasing process wastes into the air; regulating discharges to both water and air causes them to collect the residues from both wastewaters and waste gases in order to deposit them on the land. Focussing on emissions to air from facilities and vehicles does not encourage consideration of impacts of air pollutants elsewhere, for example, on the ozone layer or on surface waters distant from the point of emission. And separate programs and laws focussed on air, water, land, and living organisms are inevitably complicated for governmental agencies to coordinate and confusing for enterprises to comply with; different kinds of information must be provided and managed; different permits issued, and different procedures employed to assure compliance.

The advantages of integrated management have also become clearer. Resources for the conservation of resources and environmental integrity are not unlimited; if one weighs the relative risk to human and environmental health among the possible alternative impacts and means of preventing or controlling them, it is easier to set priorities for the allocation of limited resources. Further, it usually is less expensive to design and operate the prevention and control of all releases to the environment from a facility together than to

introduce systems for capturing air pollutants, water pollutants, and solid wastes separately. Finally, a comprehensive approach to preventing and controlling pollution facilitates communication and cooperation among people responsible for planning and managing all sectors of human activity that affect the environment, including agriculture, natural resource exploitation, energy, transportation, and manufacturing.

B. Integrated Pollution Prevention and Control -- Goals, Alternative Focuses, and Techniques and Institutional Measures

1. Goals

Programs and laws, and the institutions established to carry them out, can achieve integrated management of man's impacts on the environment by taking the environment as a whole as their focus and by taking as their goal the reduction of the net detrimental effects on the environment as a whole by preventing pollution to the extent feasible and by controlling pollution to the extent prevention is not possible. Using risk, i.e., the likelihood that a certain kind of damage to human or environmental health will occur at certain levels of exposure to particular impacts, as a common measurement, facilitates achieving the goal of integrated management.

2. Focuses

One may focus on a chemical, a source, or a region -
- or a combination of them -- as ways of making policies and
decisions on an integrated basis.

A chemical can be traced through the stages of its
commercial life -- manufacture, storage, use, disposal. Its
movement through the environment can also be followed. By doing
so, exposures to it can be determined, as well as risks that
result from those exposures.

Pollution by a new chemical, i.e., one that has not yet been
introduced into commerce, can be prevented if there is a
requirement that information about its properties be submitted
before it is manufactured and marketed and authority to limit or
prohibit its manufacture or use if the information indicates that
it poses unwanted risks. Tracing an existing chemical, one
already on the market, in the environment gives information about
where it tends to occur and collect and how it may be transferred
from one environmental medium to another or transformed by
contact with the environment or other chemicals in it. This
information can assist in formulating standards for the total
amount of the chemical that can be tolerated in the environment
without causing unreasonable risks to human or environmental
health or limits on when or how it may be used.

There are perhaps as many as 100,000 chemicals in commercial use. It is therefore necessary -- and it is also possible -- to set priorities for preventing or controlling the use of chemicals by evaluating the risks they pose. The approximate risks of a chemical can be categorized by comparing its properties to chemicals with known risks and similar uses and by determining how much of it is produced and how many people (or what parts of the environment) are exposed to it.

Approaching integration by focussing on sources can be achieved by considering either a product, a process, or an economic sector as a source. Examining a source allows one to identify the total amounts of wastes it generates and when and where they are generated. Prevention can be accomplished by substituting materials that pose comparatively fewer risks, by altering the production process, or by changing the product itself.

The effects of a product may be assessed as it is produced, used, and disposed of; this assessment can be coordinated with an assessment of the effects of the chemicals associated with it.

An industrial process, or an activity such as timber harvesting or mining, can be appraised for its total releases, and the relatively least expensive and most effective ways of

reducing those releases can be determined, before the process or activity is undertaken, by conducting an environmental assessment or similar systematic evaluation.

Focussing on a sector of the economy such as agriculture, energy, transportation, or heavy manufacturing, particularly when planning the development of such sectors, allows explicit articulation and reconciliation of the goals of development and environmental quality. The impacts of a sector on achieving environmental quality goals can be defined, and plans can be made to guide development in order to prevent and control those impacts sufficiently to meet the goals.

Regional concepts such as water supply watersheds, habitats of threatened or endangered species, river basins, regional seas, or national parks and their buffer areas are familiar focuses for integrated environmental management, and enable the exploitation of natural resources and the planning of development and uses of land to be coordinated with particular established goals of conservation or protection. An integrated focus on water quality in a watershed, for example, assists attainment of environmental quality goals by taking in account pollution from land, air and water.

3. Techniques and Institutional Measures for Integrated Environmental Management

Whatever focus -- or focuses -- are employed that enable taking a comprehensive approach to making policies that considers the environment as a whole, it is necessary to choose from among several techniques and institutional measures available for implementing those policies. These techniques and institutional measures are complementary and therefore reinforce each other in achieving integrated pollution prevention and control.

a. Techniques

Research reveals more efficient uses of energy, less toxic component materials, and more durable products. It also adds to the knowledge needed about the fates of pollutants in the environment, including how they are transferred and transformed, how they degrade, and where they accumulate, and about their effects on ecological processes.

Policy planning may be undertaken by assaying the comparative risks of various problems and the technical and economic feasibility of addressing those problems. (Research into the methodologies for assessing risks, as well as research into the functioning of ecological systems and the effects of pollutants on human and environmental health will contribute to the utility of risk as a common denominator against which to

measure policies in setting priorities.) It is also possible to make an integrated survey of trends affecting the environment as a whole, rather than separate projections for air, water, and land, and to devise specific environmental quality goals and plans for achieving those goals by coordinated planning among the economic sectors that affect the environment, e.g., agriculture, transportation, energy production, manufacturing, and consumer products.

Auditing manufacturing processes (as well as waste management facilities and even households) to determine the amounts of materials purchased or received and the amounts consumed, discharged as waste, and unaccounted for is an effective means of discerning opportunities to prevent pollution. Such "mass balances" indicate the fates of materials to plant managers and the anticipated flows of kinds of wastes to waste management facilities.

Environmental monitoring provides analogous tracking of pollutants or chemicals in the environment -- how they move through the environment from where they are introduced, and in what media they accumulate and at what levels. This information is useful in assessing exposure to particular pollutants and therefore the risks they pose.

Assessment of the environmental impacts of a project

identifies the resources affected and indicates alternatives courses of action and opportunities for mitigating the impacts on those resources. The opportunities may be converted to requirements in the form of conditions included in a permit to carry out the proposed project.

Economic incentives and disincentives provide market-related signals to encourage or discourage behavior that affects the environment. Unwanted pollutants may be assessed to discourage their discharge, and the return of empty containers may be encouraged by providing refunds, for example.

A requirement for notification of the proposed manufacture or use of a particular chemical provides an opportunity to assess its potential risks and to limit or prohibit the manufacture or use, thus encouraging the develop of safer substitutes.

Standards that limit the release of a pollutant to a particular medium of the environment, e.g., water, may be established so as to take into account discharges to other media and the cumulative exposure of human or environmental receptors to that pollutant. Alternatively, a single standard for environmental decisions may be adopted, e.g., one that allows an activity only if it can avoid unreasonable risk to human and environmental health using the best available technology.

Requiring a single permit for a facility, rather than one each for discharges to air, water, or waste treatment plant, facilitates examination of total releases, evaluation of trade-offs among the effects of different releases, and identification of ways to reduce the net impact on the environment.

Similarly, compliance can also be carried out by teams of inspectors, or an inspector trained to check a facility for its impacts on the environment as a whole, whose mandate is to review total discharges to the environment, rather than conformance only to the limits established for any one medium, and to propose means for reducing wastes as much as possible and for managing those that cannot be prevented so as to cause the least impact.

b. Institutional Measures

Coordinating mechanisms facilitate implementation of integrated approaches to preventing and controlling pollution. Coordination is important both within and among government agencies and between government agencies and those affected by their programs, including other levels of government, the private sector, and the public at large. Coordination may be carried out on an ad hoc or regular basis. Task forces may be appointed to deal with a discrete assignment, e.g., evaluating the impacts of a proposed major facility, or standing committees consisting of representatives of different interests may be established, with

either a single agency responsible for taking the lead in arranging the activities of the committee or a formal agreement allocating these responsibilities. It is also of course possible to assign coordinating responsibilities to an individual.

Regular training and development of personnel promote awareness of the differences and connections among environmental programs. Such development may include rotating managers through several programs or seconding people from one agency, or part of an agency, to another, and from private enterprises to government and the reverse.

In order to manage on an integrated basis it is often necessary to reorganize or consolidate different governmental agencies in order to combine their functions and perspectives, and the disciplines of their personnel. Public health, natural resource management, and pollution control agencies have been combined to form departments or ministries, for example, and air, water, and waste programs have been reorganized into divisions that focus on protecting resources, preventing pollution, and assuring proper clean-up. In addition to facilitating integrated management of the environment, such reorganization or consolidation often contributes to improved communication and cooperation among several agencies whose missions affect the environment.

IV. Pollution Prevention and Integrated Environmental Management Provisions in the Laws of Selected Nations and States

Several of the techniques and institutional measures suggested above have been enacted -- or proposed for enactment -- as laws in various nations or their subdivisions. This section describes some representative provisions designed to achieve pollution prevention or integrated environmental management or both.

A. Sweden

The Swedish Environment Protection Act of 1969, which was amended in 1981 and is implemented by the Environment Protection Ordinance of June 4, 1981, requires a permit for "polluting activities" from specified facilities. Section 1 of the Act provides that it applies to as discharges of "waste water, solid matter, or gas from land, buildings, or installations . . . [and the] use of land, buildings, or installations in a manner that otherwise may lead to pollution of a watercourse . . . [or] to interference with the environment by air pollution, noise, vibration, light, or other such means." Thus, the Swedish act provides for a single permit for discharges to or effects on all environmental media.

Sweden also has had in force since July 1, 1973, an Act on Products Hazardous to Man and the Environment that requires anyone handling or importing a product hazardous to health and to the environment to take such precautions and measures necessary to prevent or minimize harm to human beings or the environment. The law imposes a duty on anyone manufacturing or importing such a product to "inquire carefully into its composition and other properties with a bearing on public health or environmental protection." Products are to be clearly marked with information of importance from a public health or environmental protection standpoint.

B. Switzerland

The purpose of the Federal Law Relating to the Protection of the Environment enacted in Switzerland on October 7, 1983, is to "protect persons, animals, and plants, their biological communities and habitats against harmful effects or nuisances and to maintain the fertility of the soil." Article 1 of the Act also provides that "early preventive measures shall be taken in order to limit effects which could become harmful or a nuisance." Article 4 of the act requires that regulations promulgated under other laws, for example governing air pollution and environmentally hazardous substances, "shall correspond to" the provisions of the act. Stricter provisions of other federal

laws are left undisturbed.

The Swiss law also requires an environmental impact assessment "[b]efore taking any decision regarding the planning, construction or alteration of installations which may appreciably affect the environment." Article 9 (1). "Effects shall be assessed singly, collectively, and according to their combined action." Article 8. The assessment shall be based on a report that the applicant, whether private individual or public agency, prepares or commissions that includes information on 1) the initial state, 2) the proposed project, including proposed measures for protection of the environment and in the case of disasters, 3) the foreseeable residual environmental pollution, and 4) the measures that would further reduce environmental pollution and their cost. Article 9 (2), (3).

C. The Federal Republic of Germany

1. The Abfallgesetz

The Federal Republic of Germany amended its Waste Act in 1986. Section 1a(1) of the Abfallgesetz declares that "wastes shall be avoided in accordance with regulations based on section 14(1), No.'s 3 and 4 and [section 14](2), Sentence 3, No.'s 2 through 5." Section 1a(2) of the Act also provides that wastes "are to be utilized" in accordance with section 3(2),

Sentence 3 of the Act or to the extent prescribed in regulations promulgated under section 14(1), No.'s 2 and 3 and 14(2), Sentence 3, No.'s 2 through 4. These provisions authorizing regulations for waste avoidance and utilization are set forth below.

a. Waste Avoidance

Section 14(1) authorizes the Federal Government, for "the avoidance or reduction of harmful substances in wastes or for their environmentally compatible management," to provide in regulations that

"3. distributors of certain products are only allowed to put them on the market in connection with the offering of the possibility of returning them or the charging of a deposit on them," and

"4. certain products may only be put on the market in a certain condition or for a certain purpose that ensures the proper management of their wastes or may not be put on the market if the management of their wastes cannot prevent the release of harmful substances or can only do so with unreasonably high costs."

Section 14(2) provides that the Federal Government is to establish "goals to be met within appropriate time limits for the

avoidance, reduction, or utilization of wastes from particular products" and to publish these goals. To the extent necessary for the avoidance or reduction of waste quantities or their management in an environmentally compatible manner, especially to the extent this cannot be achieved by the goals established in accordance with Sentence 1 of section 14(2), Sentence 3 of that section authorizes the Federal Government to provide in regulations that particular products, especially packages and containers

"2. may only be brought onto the market in particular ways that contribute noticeably to waste management, especially in a form that can be used more than once or that facilitates utilization,

"3. must be taken back by the manufacturer, distributor or third parties determined by them after use and that the return be ensured by suitable receiving and deposit systems,

"4. must be transferred after use in a particular way, especially separated from other wastes, in order to enable or facilitate their utilization or other environmentally compatible management, and

"5. may only be brought on the market for particular purposes."

b. Waste Utilization

As indicated above, section 1a(2) provides wastes are to be utilized in accordance with Section 3(2), Sentence 3. That sentence provides that waste utilization has priority over other waste management if it is technically possible, its higher costs in comparison to other forms of waste management are not unreasonable, and a market for exists for the recovered materials or energy or can be created by hiring third parties. Section 14(1) No. 2, referred to in section 1a(2) concerning regulations authorized for waste utilization but not in section 1a(1) concerning those for waste avoidance, provides that regulations may provide that "wastes with particular contaminant contents whose proper utilization or other management requires special handling must be kept, collected, transported, or treated separately from other wastes," and that appropriate records of these efforts be kept. Section 1a(2) also authorizes regulations for waste utilization under section 14(1), No. 3, and 14(2), No.'s 2 - 4, set forth above under those authorized for waste avoidance.

2. The Bundesimmissionsschutzgesetz

Section 1a(1) of the Abfallgesetz also states that that section leaves undisturbed the duty of operators

of facilities that must obtain a Bundesimmissionsschutzgesetz permit to avoid wastes by employing low-waste processes or by utilizing residues.

Section 4 of the Bundesimmissionsschutzgesetz requires a permit for the construction and operation of a facility that, because of its characteristics or its operation, is likely to cause detrimental environmental effects or otherwise endanger or significantly disadvantage or burden the general public or the neighborhood. The Fourth Regulation Implementing the Bundesimmissionsschutzgesetz specifies the facilities that must obtain permits if they may be expected to operate for more than six months at the same location.

Section 5(1) of the Bundesimmissionsschutzgesetz, last amended on October 4, 1985, requires such facilities to be constructed and operated so that 1) detrimental environmental effects cannot be caused, 2) precautions are taken against such effects, and 3) "residues are avoided unless they are regularly and harmlessly utilized or, if their avoidance or utilization is not technically possible or is unreasonable, can be disposed of as wastes without impairment of the common good." (Facilities that do not require a permit are to be operated so that the wastes they generate "can be properly disposed of." Section 22(1), No. 3.) Although "residues" is not defined in the Bundesimmissionsschutzgesetz, it includes all substances whose production by the facility was not intended. In October 1988

draft administrative rules interpreting and implementing Section 5(1), No. 3 were approved by the Laenderausschuss fuer Immissionsschutz.

D. The Commonwealth of Massachusetts Toxics Use Reduction Act

In 1989 the Commonwealth of Massachusetts enacted the Toxics Use Reduction Act; its goal is to achieve a fifty percent reduction of toxic or hazardous byproducts by 1997, compared to the amounts generated in 1987, by means of "toxics use reduction."

The Massachusetts act defines "toxics" as "toxic or hazardous substances," and that term, in turn, initially means (i.e., after January 1, 1990) any chemical substance in a gaseous, liquid or solid state that is included on the list of substances prepared by the U.S. Environmental Protection Agency in accordance with section 313 of the federal Emergency Planning and Community Right-to-Know Act (42 U.S.C. 11001 et seq.). After January 1, 1991, the Massachusetts Administrative Council on Toxics Use Reduction (created by section 4 of the Act) is to adopt regulations that add to this list, over a three-year period, all of the chemicals listed pursuant to sections 101(14) and 102 of the federal Comprehensive Environmental Response, Compensation and Liability Act (42 U.S.C. 9601 et seq.). The

Massachusetts list is to be conformed to the federal lists annually; after 1994 the Council may add up to ten chemicals a year to the list.

Toxic or hazardous substances do not include a chemical substance when it is present in an article; used as a structural component of a facility; present in a product used for janitorial or grounds maintenance purposes; present in foods, drugs, cosmetics, or other personal items used by employees at a facility; present in a product used to maintain motor vehicles at a facility; present in process water or air used for compression or combustion; present in a pesticide or herbicide when used for agriculture; or present in crude, lube, or fuel oils or other petroleum products to be sold.

Under the Massachusetts Act, toxics use reduction means in-plant changes in production processes or raw materials that reduce, avoid, or eliminate the use of toxic or hazardous substances or generation of hazardous byproducts per unit of product, so as to reduce risks to the health of workers, consumers, or the environment, without shifting risks between workers, consumers, or the environment.

Toxics use reduction does not include incineration, transfer from one medium of release or discharge to another, offsite (i.e., outside the production unit) recycling of wastes, or

methods of "end-of-pipe" treatment of toxics. Rather, it is to be accomplished by 1) input substitution, i.e., replacing a toxic or hazardous substance or raw material used in production with a non-toxic or less toxic substance; 2) product reformulation, i.e., substituting for a current end-product an end-product which is non-toxic or less toxic when used, released, or disposed of; 3) redesigning production units; 4) modernization of production units, i.e., replacing or upgrading existing equipment or methods; 5) improving operation and maintenance of production equipment and methods, i.e., modifying or supplementing them by improved housekeeping practices, system adjustments, product and process inspections, or control equipment or methods; and 6) recycling, re-use, or extended use of toxics by equipment or methods that are an integral part of the production unit, e.g., filtration and other closed-loop methods.

The Act provides that the Department distribute a toxics use survey to employers in specified kinds of commercial enterprises that is to be completed by July 1990 and establishes a progressive toxics use fee based on the number of employees.

The Massachusetts act requires large quantity users of toxic or hazardous substances to file annual reports, beginning in July 1991, for each facility that manufactures, processes, or uses more than the established threshold amounts of such a substance. For manufacturing or processing the threshold amount is 25,000

pounds of a substance per year at any one facility. (Manufacture and process are defined, respectively, as producing, preparing, importing, or compounding a substance, and preparing a substance for distribution in commerce after its manufacture.) The threshold amount is 10,000 pounds/year for users that use a substance other than by manufacturing or processing. These amounts are to be reduced for a substance if the U.S. Environmental Protection Agency lowers the threshold for the substance that a facility must report under section 313 of the Emergency Planning and Community Right-to-Know Act.

The reports to the Massachusetts Department of Environmental Quality Engineering are to include the information that a facility must report under section 313 to the U.S. Environmental Protection Agency. The Massachusetts act requires quite detailed reporting requirements in addition to the information that must be submitted to federal authorities, including statements of the amounts of the substance that are manufactured; processed; otherwise used; generated as a byproduct; and shipped from the facility as -- or in -- a product. (A byproduct is defined as all nonproduct outputs of a substance generated by a production unit prior to handling, transfer, treatment or release.) Facilities with less than ten employees, laboratory activities, pilot plants, and production units that are starting up are exempted from some or all of the reporting requirements under the act.

Beginning in July 1994, each user of large quantities of toxic or hazardous substances must prepare a "toxics use reduction plan" for each facility that must file a report. The plan must include a statement of the facility management policy concerning toxics use reduction and a statement of the objectives of the plan, including the amounts of planned reduction of the substances used and generated as byproducts in two years and five years. For each production unit in which a substance is manufactured, processed or otherwise used, the plan shall contain 1) an economic and technical evaluation of the appropriate technologies, procedures and training programs that would potentially reduce the use of each substance; 2) an analysis of current and projected use, generation as byproduct and emission of the substance (emission is defined as release to the environment or transfer offsite as waste); 3) an evaluation of the types and amounts of substances used; 4) an identification of the economic impacts of the use of each substance, including costs of storing and handling the raw materials and byproducts, potential liability costs, and costs of compliance with regulations; and 5) an identification of each technology, procedure, or training program that will be implemented to reduce the use of the substances, as well as the costs of -- and savings from -- implementing each.

Each toxics use reduction plan must be certified by a toxics use reduction planner as meeting the criteria for such plans. To

be a certified toxics use reduction planner an individual must have completed a program and passed an examination that the Massachusetts Department will prepare before January 1992 in consultation with the Toxics Use Reduction Institute at the University of Lowell, or have at least two years work experience in toxics use reduction activities.

The Massachusetts Department is to use the annual reports filed by facilities and the summaries of the facilities' toxics use reduction plans to prepare an annual report of its findings on progress in and expected progress in toxics use reduction and emissions reduction in Massachusetts to the Administrative Council on Toxics Use Reduction, created by the Act.

The Council is a separate agency, with its own staff, and is made up of representatives from the executive offices for environmental affairs, economic affairs, labor, science and technology, and public health. It is responsible for promoting state programs in order to achieve reductions in the use of toxic substances, and for recommending standardization in the reporting requirements of various federal and state laws related to chemical or hazardous substance production, use, release, and disposal and worker exposure. The Council is to make an annual report to the governor on the implementation of the act. Also, in order to promote toxics use reduction, the Council may comment on proposed rules relating to toxics production and use,

hazardous waste, industrial hygiene, worker safety, public exposure to toxics, or releases of toxics into the environment.

The Act establishes a fifteen-member Advisory Board that is to provide a forum for discussion of matters relating to the implementation of the law. The Advisory Board will also establish an annual governor's toxic use reduction award program to recognize outstanding individual and organizational public and private achievement in toxics use reduction.

The Act also establishes an Office of Toxics Use Reduction Assistance and Technology to provide technical assistance to toxics users, including users of less than the threshold amounts that define users of large quantities, to assist them in achieving toxics use reduction and in complying with the law. The Office may establish criteria that set priorities for providing such assistance.

The Act also contains a provision that requires the Department to develop, by January 1992, regulations which will ensure that inspections are "multi-media in approach," i.e., having to do with all environmental media, including water, land, air, and workplaces within facilities. The regulations are also to ensure, where appropriate, that the inspections are performed by teams of inspectors from existing programs and to minimize duplication of inspection and enforcement by other agencies.

The Act contains comprehensive trade secret protection provisions as well as provisions for protection of employee rights, improved enforcement of toxics laws, and penalties for violations.

E. The State of Missouri Solid Waste Law

In 1989 the State of Missouri amended its solid waste law to exempt the collection of recyclable paper fibers, plastic, glass or metals to be used in the manufacturing of a product or otherwise re-used from city or county solid waste collection or disposal fees levied to pay for the design, construction, operation or maintenance of an incinerator or resource recovery facility. Section 260.202 also exempts such waste from being subject to the authority of a city or county to require that all waste generated within its boundaries be managed or disposed of at particular incinerators or resource recovery facilities.

F. The State of Oregon Solid Waste Control Law

In the 1983 Opportunity to Recycle Act, the Legislative Assembly of the State of Oregon declared a policy that established reduction in the amount of solid waste generated as the first priority in methods of managing solid waste. Re-using materials for the purpose for which they were originally

intended and recycling materials that cannot be re-used are the second and third priorities, respectively; energy recovery and disposal are fourth and fifth. The legislature reaffirmed that primary responsibility for solid waste management rests with local governments but declared that "the opportunity to recycle should be provided to every person in Oregon."

Opportunity to recycle was defined by the legislature as consisting at least of a place for collecting source separated recyclable material located either at a disposal site or another location more convenient to the population being served and, if a city has a population of 4,000 or more, collection at least once a month of source separated, recyclable material from collection service customers. The "opportunity" also includes a public education program that gives notice to each person of the opportunity to recycle and encourages source separation of recyclable material.

The Oregon legislature defined "recyclable material" as any material or group of materials that can be collected and sold for recycling at a net cost equal to or less than the cost of collection and disposal of the same material. It directed the state's Environmental Quality Commission to adopt regulations defining acceptable alternative methods for providing the opportunity to recycle and for carrying out the education program. It also mandated the identification of "wastesheds" in

the state, and the principal recyclable material for each wasteshed.

The Commission adopted rules in December 1984; concurrently, it adopted a policy guidance statement for implementation. It iterated the definition of a "wasteshed" as an area of the state having a common solid waste disposal system or designated by the commission as an appropriate area of the state in which to develop a common recycling program, and listed them. Newspaper, ferrous scrap metal, non-ferrous scrap metal, used motor oil, corrugated cardboard and kraft paper, container glass, aluminum, high-grade office paper and tin cans were designated as the potential recyclable materials and for each wasteshed the regulations specified which of these were included. The education and promotion programs, to be designed and implemented by affected persons in each wasteshed, were to provide written -- or more effective -- notice designed to reach each person who generates recyclable materials in the wasteshed and that clearly explains why people should recycle, what recycling opportunities are available, the materials that can be recycled and the proper preparation of those materials. In cities with more than 4,000 people, the notice must include, in addition, the name, address and phone number of the person who provides collection services and a list of the depots for recyclable materials and their hours of operation.

G. Proposed Federal Legislation in the United States

Several bills are currently under consideration by the Congress of the United States that provide different approaches to waste reduction, pollution prevention, and integrated environmental management. An example is H. R. 1457, introduced by Representative Wolpe of Michigan, with many co-sponsors. Hearings were held on this bill in August 1989.

H.R. 1457 would be cited as the Waste Reduction Act. It would create an office within the U.S. Environmental Protection Agency, independent of the Agency's media-specific program offices but with "authority to review and advise such offices on their activities to promote a multimedia approach to source reduction," to carry out the purposes of the act. Source reduction is defined as any practice that reduces the amount of any hazardous substance that enters the waste stream or the environment before being recycled, treated, or disposed of; "the term includes equipment or technology modifications, process or procedure modifications, reformulation or redesign of products, substitution of raw materials, and improvements in housekeeping, maintenance, training or inventory control."

The bill provides for a program of matching financial grants to states for programs that would promote the use of source reduction techniques by businesses by providing technical

assistance and training. The bill also provides for a clearinghouse to compile information from states on management, technical, and operational approaches to source reduction, and creates a national data base to track progress on waste reduction and recycling across all media.

The bill gives several assignments to the Administrator of the Environmental Protection Agency as part of a mandate to "develop and implement a strategy to promote source reduction." The assignments include reviewing proposed regulations for their effect on source reduction; coordinating source reduction activities in each media-specific program office; developing an inventory of data collected under existing environmental laws; determining needed changes in collecting data from measuring environmental pollution and its control; fostering the exchange of information about source reduction techniques; establishing measurable goals for the strategy and timetables for meeting them; establishing a training program on source reduction opportunities; establishing an annual award program to recognize and publicize the success of one or more companies that operate outstanding multimedia source reduction programs; and establishing both a liaison group with industry, public interest groups and state source reduction program officials and an advisory panel of technical experts.

The bill also requires the Administrator to provide bi-

annual reports to the Congress on the actions taken to implement the Agency's source reduction strategy and the results of those actions.

V. A Draft Pollution Prevention and Integrated Environmental Management Act

The following provisions, some of them based on the concepts and laws described above, are offered as guidelines for the consideration of nations interested in implementing policies that emphasize pollution prevention and integrated environmental management.

Section 1. Purposes

The [legislative body] finds that scarce resources are being wasted and human health and environmental integrity are being impaired by practices that generate wastes unnecessarily. This law is enacted to prescribe required measures that will prevent pollution to the maximum extent technically feasible and economically reasonable in all sectors of the economy, and incentives for continual improvement in

Commentary. Statements of purpose are in part hortatory, but are

nevertheless useful in providing guidance to administrators who implement their provisions and to courts who must construe the meaning of provisions that become the subject of controversy.

Section 2. Council on Pollution Prevention

(a) There is established in the Office of the [President, Prime Minister, or Chief of State] a Council on Pollution Prevention which shall be responsible for the faithful execution of this law. The Council shall be chaired by the [President, Prime Minister, or Chief of State] or a person appointed by him or her, and shall have as its members the heads of the governmental agencies primarily responsible for agriculture, planning, production of energy, transportation, manufacturing and trade, management of renewable and non-renewable natural resources, and conservation of the environment or their delegates.

(b) The Council is authorized to promulgate regulations for the implementation of this law after consultation with interests that would be affected by the regulations.

Commentary. The proposed council is located in the office of chief of state both to give it maximum political influence and to facilitate its role in coordinating and integrating the planning and pollution prevention policies applicable to the activities

governed by the various named agencies. The kinds of agencies represented on the council could be expanded; the list is intended to suggest the activities that usually have the greatest potential for pollution prevention efforts. It is possible that there are existing institutions that could be given the assignment of overseeing the implementation of this law, in which case the council would not need to be created.

Rulemaking authority is provided to the Council to tailor the provisions of the law to different and changing circumstances. The provision for consultation could be fulfilled either by conducting hearings or by publishing draft regulations and requesting written comments or both.

Section 3. Regular Appraisal of Sources of Pollution and Pollution Prevention Measures

Within one year following enactment of this law, and every two years thereafter, the Council shall prepare a report, which shall cover at least the ten most important sources of pollution in the nation, on the nature, causes, and effects of the pollution from these sources, the measures that have been taken to prevent pollution from these sources, the effectiveness of these measures, and recommendations for improved and additional measures for preventing pollution in ways that will achieve the maximum protection of human health and environmental integrity.

Commentary. This provision is intended to provide a procedure for regular appraisal and reporting on the state of human health and environmental integrity, on the principal causes of pollution that impairs them, and on the existing and proposed means of prevention. The figure "ten" in "ten most important sources of pollution" is, of course, arbitrary, and could be adapted to national circumstances. It was intended to suggest a comprehensive effort. It might be preferable to begin with a survey report, followed by in-depth reports on two sectors or kinds of sources each year.

Section 4. Definitions

(a) "Pollution prevention" means any effort that has the effect of reducing the amount or harmfulness of wastes resulting from an activity, process, or product, including, but not limited to 1) recycling or re-use, 2) source reduction, 3) materials substitution, and (4) process changes.

(b) "Recycling or re-use [distinguish?]" means the use of wastes, either within the facility in which they were generated or elsewhere, rather than the treatment or disposal of those wastes.

(c) "Source reduction" means a reduction in the amount of wastes generated that is accomplished by materials substitution or process changes or changes in how an activity other than manufacturing, e.g., farming, is conducted.

(d) "Materials substitution" means any change in raw materials or other substances used in a manufacturing process or other activity.

(e) "Process changes" means any alteration in the physical or chemical engineering of a manufacturing process.

(f) "Waste" means any matter resulting from an activity or product that is not recycled or re-used.

Commentary. Definitions are frequently controversial portions of a law because they set out the scope of what it covers and does not cover. These definitions are intended to be comprehensive and flexible. Pollution prevention means waste is not generated. It emphasizes efficient use of materials and energy. It includes all wastes and all environmental media. It applies to all sources and seeks to reduce the total amount of wastes.

Section 5. Economic Incentives for Pollution Prevention

The Council is authorized to establish the following kinds of economic incentives and disincentives to encourage the development and use of pollution prevention practices in all sectors of the economy:

- (a) grants or loans to enable the adoption of or conversion to pollution prevention practices;
- (b) grants or loans to support research and development of pollution prevention practices;
- (c) tax credits or accelerated depreciation for investments in pollution prevention;
- (d) reduced duties on goods imported for pollution prevention purposes;
- (e) charges on wastes that are not recycled or re-used.

In establishing incentives and disincentives, the Council shall endeavor to assure that the process, product, or activity affected is priced to take into account the full costs of production, use, and disposal.

Commentary. Subsidies encourage socially preferred behavior and

charges discourage unwanted behavior by changing the costs of the behavior and therefore the prices of the products resulting from it. Goods whose prices include a surcharge paid for the pollution associated with producing them cost more than goods without such a charge and, assuming they are of equal quality and equally available, will be purchased less frequently, thus leading to reduced pollution of the environment. Such charges are a means of assuring that prices reflect the total social costs of production.

Section 6. Awards for Pollution Prevention

The Council is authorized to establish a program of awards for practices, projects, and products that it judges demonstrate exceptional advances in pollution prevention.

Commentary. Awards programs are a means of providing an incentive to the development of innovative processes and products and an effective means of publicizing both the goals of pollution prevention and particular means for achieving it in different activities.

Section 7. Prohibitions on the Import, Manufacture, Sale, or Use of Harmful Substances or Products

The Council is authorized to prohibit the import, manufacture, sale, or use of substances or products it determines pose an unreasonable risk to human health or environmental integrity.

Commentary. Although provisions such as this are not frequently invoked, it is useful to have explicit authority to prohibit a product, in order to be able to exclude importation of unwanted pesticides, for example.

Section 8. Responsibility for Wastes

To the maximum extent technically and economically feasible, measures shall be employed that prevent the generation of wastes. Wastes that cannot be prevented must either be recycled or re-used by the person who created them, transferred to a person licensed by the Council to recycle or re-use such wastes, or treated or disposed of by a person licensed by the Council to treat or dispose of such wastes. The Council may issue a license for the treatment or disposal of wastes to the person who creates those wastes.

Commentary. This provision establishes the priority of prevention of wastes, followed by recycling or re-use. It also

creates a system of licenses or permits for those who recycle or re-use wastes and those who treat or dispose of them, thus enabling a comprehensive system of control over the permitted means for these activities and the persons who are authorized to carry them out.

Section 9. Requirement for Mass Balances

Each license issued for a manufacturing process or for the treatment or disposal of wastes shall require that the holder of the license conduct regular mass balance appraisals of the manufacturing or waste treatment or disposal process, i.e., an accounting of all materials that enter into and result from the process.

Commentary. [explain the concept of mass balances and provide the New Jersey form as a good example of how to conduct mass balance appraisals.]

Section 10. Participation in International Agreements

The Council shall investigate existing and proposed international agreements that are designed to conserve natural resources and prevent or reduce pollution and recommend [to the

head of state] participation in those agreements it deems will further the nation's interests in these goals at home, among its neighbors, and in the world. The Council shall prepare and recommend to [the head of state] legislation designed to implement the agreements to which the nation is a party.

Commentary. This provision is designed to encourage cooperation among neighboring nations and participation in global international agreements. It is also designed to draw attention to the need for national legislation to implement such agreements.

Section 11. Pollution Prevention Objectives and Plans

The Council shall prepare national objectives for reducing pollution from manufacturing, transportation, energy, agriculture, and products, as well as such other sectors and activities as in its judgment contribute significantly to national pollution loads, and shall adopt schedules and specific plans for achieving the objectives. The objectives, schedules and plans shall be reviewed and revised at least every twenty years.

Commentary. This provision is designed to initiate a continuing process for integrating environmental quality goals with plans

for reducing pollution from each of the most important sectors of economic activity that affect the environment in order to meet those goals.

Section 12. Environmental Assessment

The Council shall adopt regulations requiring that privately and publicly funded projects that will significantly affect the environment be evaluated, before they are approved, for the resources that would be consumed, the damages that would be caused to the environment by pollution and otherwise, and the possibilities for reducing the resources to be used and preventing or mitigating the damages to be caused.

Commentary. This section provides for environmental impact analysis of major projects and programs, as is currently practiced, for example, in the European Communities, Switzerland, and the United States.

Section 13. Advisory Committees

The Council is authorized to appoint committees to advise it in the implementation of this act. Members shall receive reasonable expenses for their participation in the work of such

committees unless they are employees of the government.

Commentary. The Council may need technical, economic, or other advice in implementing these provisions. This section enables it to draw on the knowledge of people to assist it in its work.

References

- 1/ Mayda, "Environmental Legislation in Developing Countries: Some Parameters and Constraints," 12 Ecology Law Quarterly 997, 997-99 (1985). "External assistance to LDCs must be reoriented and coordinated to promote this broad, integrated, and sustainable approach to ecomanagement," Mayda suggests.
- 2/ Id. at 999.
- 3/ The following discussion relies extensively on "Pollution Prevention: Getting At The Source," draft prepared for the U.S. Council on Environmental Quality 1990, Annual Report by Christine Ervin, The Conservation Foundation, Washington, D.C., January 1990.

4/ The following discussion is based on research done at The Conservation Foundation, Washington, D.C., and the Institute for European Environmental Policy, London, England. See, e.g., Haigh and Irwin, Integrated Pollution Control in Europe and North America, The Conservation Foundation, Washington, D.C., 1990.