Chapter 7

Guiding Principles for Policy Development

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As discussed in the preceding chapter, the flow of materials and products through the economy gives rise to environmental impacts that are not adequately accounted for under current environmental policies. Table 6-6 lists a variety of regulatory and market-based options that have been proposed to address these impacts. These involve government intervention at various stages of the product life cycle, ranging from taxes on production of virgin materials to waste disposal fees. All of these options could have an impact on the product design process.

What criteria can policymakers use to evaluate these options? The Office of Technology Assessment (OTA) suggests three guiding principles that can help to shape environmental policies that encourage, rather than inhibit, green design:

. Identify the root problem and define it clearly.
. Give designers the maximum flexibility that is consistent with solving the problem.
. Encourage a systems approach to green design.

These principles are developed further below. The chapter concludes with a broader perspective on the significance of green design for U.S. competitiveness and environmental quality.

GENERAL PRINCIPLES

Principle 1: Identify the Root Problem and Define It Clearly

One of the biggest challenges in developing a policy is clearly defining the environmental problem to be addressed. Often, products and waste streams have multiple environmental impacts that cannot be easily disentangled. For example, policymakers may be concerned with the quantity of a particular waste stream, its toxicity, or its persistence in the environment. Policies aimed at solving a problem at one stage of the life cycle may have unintended negative effects at another stage: for example, requiring automobiles to be made from currently recyclable materials could adversely affect their fuel efficiency. Inevitably, tradeoffs and value judgments must be made to determine which environmental impacts are the most important.

Despite the difficulty, the discipline of defining the problem clearly is critical to defining an appropriate policy response. In the absence of a clearly defined problem, it becomes easy to confuse means and ends. In the Resource Conservation and Recovery Act (RCRA) reauthorization debate, for example, the problem is often framed in terms of the large quantity of municipal solid waste being generated. But a solution often put forward is to mandate higher recycling rates—as if the problem was that recycling rates are too low. The figure of merit for measuring progress then becomes higher recycling rates, instead of less waste generated.

This approach misses the point that recycling is only one of several means to reduce the quantity of solid waste destined for disposal. Perversely, an exclusive emphasis on recycling could even lead to more waste being generated, especially if such emphasis discourages designs featuring waste prevention. If the objective is to reduce the amount of solid waste generated, municipal solid waste policies and government procurement programs should make allowances for product designs that feature waste prevention.

Without a clearly defined problem, there is a tendency to focus on the most visible environmental issues, rather than those that are the most important. Recent examples include proposals to ban heavy metals from packagingl (despite the fact that packaging is a minor source of heavy metals in landfills and incinerators) and proposals to regulate municipal trash (while the much larger problem of industrial solid waste has not been addressed).[2]

A clearly defined problem can also help to set priorities. For example, although the dissipation of toxic materials in the global environment is a growing problem, not all toxic chemicals and products are of equal concern. Treating them as equal can divert attention and resources from truly

1 Model legislation developed by the Coalition of Northeastern Governors' Source Reduction Task Force has been passed in 10 States,

2 U.S. Congress, Office of Technology Assessment, *Managing Industrial Solid Wastes From Manufacturing, Mining, Oil and Gas Production, and Utility Coal Combustion, OTA-BP-O-82* (Washington, DC: U.S. Government Printing Office, February 1992).

high-risk chemicals and waste streams.[3] Similarly, comprehensive reporting requirements on industrial use of all toxic materials are not necessarily cost effective. Proposals to require companies to report on their use of hundreds of additional chemicals, without distinguishing those chemicals that are of greatest concern, could generate a massive paperwork burden without significant environment benefits.[4]

In reauthorizing RCRA and other environmental legislation, Congress has an opportunity to refocus attention and resources on the key problems associated with current materials flows. If it frames the objective in terms of reducing the generation of wastes, especially those that pose the greatest risks, it will encourage the design of products that use resources efficiently and waste management programs that are cost-effective. If, on the other hand, it frames the objective in terms of increased recycling rates, and if it fails to distinguish high-risk waste streams from low-risk waste streams, it may encourage less efficient product designs and less efficient waste management programs.

Principle 2: Give Designers the Maximum Flexibility That Is Consistent With Solving the Problem

Materials technology options are proliferating rapidly, and product impacts on the environment are multidimensional. This suggests that policies should be crafted to give designers as much flexibility as possible, within a framework that protects human health and the environment. This can be accomplished by several means, as discussed below.

Voluntary Agreements With Industry

Perhaps the greatest flexibility can be achieved through negotiated voluntary agreements between government and industry. Such agreements tend to be easier and faster to implement than legislation and regulations, and may be attractive to industry because it has more control over the targets and timetables. Several countries in Europe are relying more heavily on voluntary negotiations with industry to achieve waste reduction goals, especially the Netherlands, Germany, Sweden, and Denmark (see chapter 5). In the case of the German proposals requiring manufacturers to take back packaging and automobiles, industry has been given the opportunity to develop its own system for collecting and recycling the products before more heavy-handed regulations or mandatory deposit-refund systems go into effect.

In the United States, the Environmental Protection Agency (EPA) is also moving in the direction of voluntary programs; examples include the 33/50 Program and the Green Lights Program.[5] An example at the State level is Massachusetts' Toxics Use Reduction Act, which emerged from negotiations involving government, industry, and public interest groups. Under this law, companies are required to develop facility plans with self-set goals to reduce the use-not just the release-f toxic chemicals.[6]

It must be said that in most cases, such voluntary agreements are driven by public and political pressure, the threat of tough new laws and regulations, or imminent enforcement actions. In general, credible mechanisms for monitoring and enforcement of voluntary agreements are still being developed.

Flexible Regulations

Regulations affecting product design can be crafted with built-in flexibility. For instance, an important policy objective is to find ways to credit waste prevention in recycling legislation and in government procurement programs for recycled goods. One option is to provide alternative criteria for acceptable products; instead of imposing mandatory recycled content requirements for packaging, acceptable packaging could contain a certain percentage recycled content *or* a certain percentage weight reduction, etc.[7] This more flexible approach takes into account the inherently multidimensional

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[3] Michael M. Segal, "Spilled Some Salt? Call OSHA," *Wall Street Journal,* July 9, 1991, p. A16.

[4] See, e.g., testimony of the American Petroleum Institute, before the Subcommittee on Transportation and Hazardous Materials, House Committee on Energy and Commerce, Mar. 10, 1992.

[5] U.S. Environmental Protection Agency, "Pollution Prevention Resources and Training Opportunities in 1992, "EPA/560/8-92-002, January 1992, p. 84; John S. Hoffman, "Pollution Prevention as a Market-Enhancing Strategy: A Storehouse of Economical and Environmental Opportunities," *Proceedings of the National Academy of Sciences, vol. 89,* February 1992, p. 832.

[6] Ken Geiser, "The Greening of Industry," *Technology Review,* August/September 1991, p. 64.

[7] This approach, Originall, developed by the Massachusetts Public Interest Research Group (MASSPIRG), has become part of the RCRA reauthorization debate.

nature of green design, and helps to avoid forcing suboptimal design solutions to the solid waste problem.

One difficulty with this approach is that a more flexible regulation may be more expensive to monitor and enforce. For example, waste reduction is difficult to measure. It is likely to be easier to verify that a package contains a certain percentage of recycled content than to verify that it uses a certain percentage less material than a comparable package did 5 years ago. It seems likely that industry will have to bear the burden of demonstrating compliance with flexible regulations if this approach is going to work.

Economic Instruments

Market-based policy instruments such as emissions taxes, tradable emissions permits, or deposit-refund systems will generally provide a more flexible environment for product design than regulations, because designers are free to make choices based on minimizing overall costs. Economic instruments may be used in place of regulations or as a supplement to make their implementation more flexible and cost effective. For example, a regulation requiring recycled content in products may be implemented more cost effectively by establishing a tradable recycling credit scheme to encourage those manufacturers who can incorporate secondary materials most cheaply to do so.[8]

A potential disadvantage of market-based instruments such as tradable recycling credits is the cost of monitoring and enforcement. For example, verifying that a manufacturer has purchased sufficient credits to cover the virgin material content of his or her product may be difficult. Such market-based instruments may work best for a limited number of products of special concern.[9]

Principle 3: Encourage a Systems Approach to Green Design

Designers can control many of the environmental attributes of products, but they have only a limited ability to influence the systems by which products are manufactured, used, and disposed (see chapter 4). For example, a designer can make a product more recyclable by making it easier to disassemble into component parts, but if there is no infrastructure in place to recover and recycle the product, the benefits of the design changes are nullified. Coupling product design with recycling implies the formation of new relationships among materials suppliers, manufacturers, and waste management providers. Often, however, the incentives for changing these interfirm linkages are lacking; companies may also have large capital investments in existing production and distribution networks. Therefore, policy incentives are needed to provide the impetus for change.

Incentives for a Systems Approach

A system-oriented design approach can be encouraged by improving the linkages between design decisions and their environmental consequences. This can be accomplished either directly by regulation, or indirectly through taxes or other economic instruments that internalize environmental costs.

Recycled content regulations or manufacturer take-back requirements are examples of regulatory coupling between two stages of the product life cycle: manufacturing and waste management. These regulations can help make solid waste concerns a key design consideration. For example, the proposal of the German Government to require auto manufacturers to take back and recycle their cars has stimulated designers to rethink the entire 'ecology' of auto production and disposal (box 4-F). Perhaps to head off similar regulation in the United States, Ford, General Motors, Chrysler, their suppliers, and the auto recycling industry have formed a consortium called the Vehicle Recycling Partnership to address the recycling issue.[10] However, as discussed in chapter 6, such take-back regulations may be more efficient for some products (especially high-value durable goods or products that pose special waste management problems) than others.

Economists have long argued that it is not necessary to close materials cycles through recycling regulations if the prices of goods and services reflect their full social costs .11 If the economic circle

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8 Michael H. Levin, "Implementing Pollution Prevention: Incentives and Irrationalities," *Journal of Air and Waste Management Association,* vol. *40, No. 9,* September 1990, p. 1227.

9 Organisation for Economic Opportunity and Development, *Environmental Policy: How To Apply Economic Instruments,* Paris, 1991, p. 107.

10 On March 16, 1992, organizers held the First Vehicle Recycling Partnership Forum in Dearborn, MI.

11 William D. Nordhaus, *"The Ecology* of Markets," *Proceedings of the National Academy of Sciences, vol. 89,* February 1992, p. 843.

is closed, they say, the market will sort out the most efficient systems of production and materials management. Notwithstanding these advantages, however, environmental policies in all countries are primarily based on regulations. In part, this is due to the fact that no mechanism exists to establish the "true" value of environmental services. Another reason is that environmental taxes tend to be politically unpopular.

However, there is now renewed interest in the use of economic instruments in environmental policy, if not to replace regulations, at least to supplement them and help make them work more efficiently.[12] There is also interest in the idea of shifting the tax burden from socially desirable activities such as savings and work to undesirable activities such as pollution.[13]

Such a shift could have a dramatic impact on the systems by which products are manufactured, distributed, used, and disposed. For example, a phased-in $100 per ton carbon tax on fuels could not only encourage more efficient use of materials and energy in production systems, but could also transform consumption patterns and raise over $100 billion in government revenues.[14]

GREEN DESIGN IN PERSPECTIVE

How should one view the significance of green design as a competitive and environmental strategy? As a competitive strategy, green design can help manufacturers generate less waste and reduce production costs at the same time.[15] As waste disposal costs and regulatory compliance costs go up, the environmental attributes of products will necessarily become more important to consumers and investors. Europe and Japan are already moving aggressively to integrate ''clean' technology and products into their industrial strategies for future competitiveness,[16] and international trade will increasingly be influenced by environmental concerns.[17] All of these trends suggest that having an environmental dimension to one's design capabilities will be an important competitive asset in the future.

As an environmental strategy, green product design offers a new way of addressing environmental problems. By recasting pollution concerns as product design challenges, and particularly by encouraging designers to think more broadly about production and consumption systems, policymakers can address environmental problems in ways that would not have been apparent from a narrow focus on waste streams alone.

However, the significance of green design for overall environmental quality is harder to assess. Individual designers will no doubt find many opportunities to reduce wastes and increase production efficiencies. But designers operate within the constraints of available manufacturing process technologies, waste management infrastructure, and government policies on resource use and economic development. For instance, a housing development built on an environmentally sensitive wetland can hardly be considered green, even if the units are energy efficient and made with recycled materials. The potential of green design to address environmental problems is therefore contingent on broader environmental policies.

As discussed in Chapter 3, U.S. environmental policies are currently based on the environmental protection paradigm, being concerned mainly with ameliorating the effects of human activities on the environment.[18] Generally, this has meant end-of-pipe pollution controls and after-the-fact cleanups where allowable pollution limits have been exceeded. Recently, however, the emphasis has begun to shift toward waste prevention strategies.

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12 Robert W. Hahn and Robert N. Stavins, "Incentive-BasedE nvironmental Regulations: A New Era From an Old Idea?" Energy and Environmental Policy Center, John F. Kennedy School of Government, Harvard University, E-90-13, Cambridge, MA, August 1990.

13 See, e.g., George Heaton et al., *Transforming Technology: An Agenda for Environmentally Sustainable Growth in the 21st Century* (Washington, DC: World Resources Institute, April 1991).

14 U.S. Congress, Congressional Budget Office, *Carbon Charges as a Response to Global Warming: The Effects of Taxing Fossil Fuels* (Washington, DC: U.S. Government Printing Office, August 1990).

15 Bruce Smart (cd.), *Beyond compliance: A New Industry View of the Environment* (Washington DC: World Resources Institute, April 1992).

16 See, e.g., Jacob M. Schlesinger, "Thinking Green: In Japan, Environment Means an Opportunity for New Technologies,' *Wall StreetJournal,* June *3, 1992,* p. Al.

17 U.S. Congress, Office of Technology Assessment, *Trade andEnvirontnent: Conflicts and Opportunities, OTA-BP-ITE-94* (Washington, DC: U.S. Government Printing Office, May 1992).

18 Michael E. Colby, *Environmental Management in Development: TheEvolution of Paradigms* (Washington, DC: The World Bank, December 1990).

In the context of the environmental protection paradigm, green design can be a useful tool to increase industrial efficiency and to complement waste prevention strategies. But critics of this paradigm argue that simply increasing the efficiency of materials and energy use and reducing pollution rates may not be enough to ensure the future survival of the ecological systems upon which the economy and human life depend. It is quite possible to destroy the environment while continuing to become more efficient. Progress must be measured, these critics say, not by marginal reductions in pollution based on last year's levels, but by cumulative damage to ecological systems and their general sustainability.

Over the years, several national commissions and studies have examined the appropriate Federal role in managing resource use and materials flows.[19] The focus of these studies has gradually shifted from a concern with ensuring the availability of future resources for industry to a concern with managing materials use under an increasing number of constraints, including environmental constraints .20 Nevertheless, current U.S. environmental policies are not explicitly concerned with managing the physical flows of energy and materials through the economy in ways that are ecologically ''sustainable. " The Federal Government has been reluctant to address issues of materials management directly, preferring to leave these decisions to the States and private industry.[21] Despite its title, for instance, the Resource Conservation and Recovery Act is primarily concerned with regulating the disposal of hazardous wastes, not conserving or recovering resources.

Both the resource management and the eco-development paradigms are explicitly concerned with conservation and sustainability of materials use. In the case of the resource management paradigm, this is accomplished through closing the economic loop by internalization of environmental costs; in the eco-development paradigm, the emphasis is on substituting renewable for nonrenewable resources, reducing use of toxic chemicals, and closing materials loops through recycling of nonrenewable resources.[22] Under either of these paradigms, green design is not simply a useful tool, but an essential strategy for resource conservation and sustainable materials management.

In a world where population growth and economic growth put increasing pressures on natural resources and ecosystems, the dominant paradigm upon which environmental policies are based can be expected to evolve from environmental protection toward resource management and eco-development.[23] Policies in several countries, especially Germany and the Netherlands, are already beginning to reflect this shift (see chapter 5). As this evolution occurs, the importance of green design can be expected to grow. Therefore, policymakers should strive to make green product design an integral part of strategies to improve competitiveness and environmental quality.

OTA'S investigations suggest that simply providing better information to designers and consumers about the environmental impacts of products and waste streams will not be enough. To move ahead, policies must provide a closer coupling between design decisions and their environmental consequences. The challenge to policymakers is to choose a mix of regulatory and economic instruments that target the right problems and give designers the flexibility to find innovative, environmentally elegant solutions.

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19 For a review, see Resource Conservation Committee, "Choices s for Conservation,'' *Final Report to the President and Congress, SW-779,* July 1979, p. 33.

20 Ibid.

21 OTA has previously discussed the value of a national materials management policy in the context of municipal solid waste. See U.S. Congress, Office of Technology Assessment, *Facing America's Trash: What Next for Municipal Solid Waste?* (Washington, DC: U.S. Government Printing Office, October 1989), p. 6.

22 Michael E. Colby, op. cit., footnote 18.

23 Ibid.