

Improved Policy Instruments for Management of Enclosed Coastal Seas and Estuaries: The Chesapeake Bay, USA

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The most coherent and systematic critique of current environmental policy instruments has come from the discipline of economics, which has provided detailed technical recommendations for policies utilizing economic incentives, such as pollution taxes and marketable permits, to pursue efficiency objectives. However, the limited acceptance of economic incentive based environmental policy instruments in the U.S. suggests that economics efficiency alone is too narrow a criterion upon which to base improved regulatory policy.

The purpose of this paper is to explore a broader based public choice approach to environmental management, under which policy instruments, in addition to meeting the criterion of economic efficiency, would also meet acceptable standards for distributional equity, scientific validity (especially ecological sustainability), and acceptability by the major interest groups involved. The discussion of current policy instruments, their limitations, and suggestions for improvement can be summarized in a policy matrix, as shown in Figure 1.

The major focus of environmental economics has been the design of ever more refined policy instruments for the efficient reduction of pollution externalities. In this literature, there is a general agreement that in many cases economic incentives such as pollution taxes, or an equivalent set of transferable, marketable emission permits can provide economic methods for improving water quality, usually at lower total social costs than can traditional regulatory methods. Efficiency in the use of emissions charges results from the fact that profit-seeking firms, given the option of paying a charge per unit of emission, or of controlling emissions will find it profitable to control emissions up to the point where the marginal abatement cost equals the pollution charge. The equalization of marginal abatement costs across firms provides incentives for firms with the lower abatement cost to undertake the major share of pollution control. Similarly, pollution charges and emission permits provide incentives for managers to seek technological advances and cost reduction in pollution technology, and to minimize the information needed by regulators.

In view of the strong case to be made for economic incentive-based methods of pollution control and the potential cost savings, it is important to inquire into the reasons why federal and state governments in the U.S. have consistently rejected these methods and have adopted the less efficient, more expensive command and control regulatory approach. A brief summary of the complex reasons lying behind the apparent preferences for the regulatory approach would include issues such as equity, redistribution of income and wealth, and the obvious role played by interest groups.

Just as economic theory can be enriched by concepts from thermodynamics and ecology, its explanatory power can be greatly enhanced by extending the discipline to incorporate

insights from the field of public choice, which emphasizes the importance of interest groups, rent and profit seeking, institutional response, bureaucratic behavior, distribution and compensation. Given a choice between present regulatory approaches and a tax on pollution, polluters have strong incentives to support a continuation of the regulatory approach which permits them to emit up to the statutory limits without any charge, while an emission tax system, would require them to incur a cost for every unit of pollution emitted. Investigators have concluded that the present system of emitting without pollution charge has generated large rents for emitters. It is thus not surprising that pollution emitters, who form a very large and powerful interest group, prefer the present regulatory system which is both less onerous and much less costly to them than would be incentive based systems.

Given the role of interest groups and the economic and political power of the emitters versus the general public, it would require a high degree of optimism to expect that the massive transfers of income and wealth that would result from a switch to the emissions charge system, could be accepted in the neat future. Perhaps the best that could be expected would be an alternative approach which would forego the massive income redistribution involved in a charge system, but to seek instead the efficiency gains which could result from adopting a variation of the transferable emission permit system. Based upon interdisciplinary research by economists and biologists, the optimal number of emission permits to achieve a target level of water quality could be determined. These permits could then be auctioned off to the highest bidder, or awarded by a regulatory authority or even given without charge under a grandfathering process to current emitters.

In order to save the Chesapeake fisheries from further depletion, it may be necessary to move towards more curtailment of open access. From the viewpoint of public choice, the problem is how to gain the support or at least the acquiescence of the major interest group involved, the watermen. A first principle should be to seek a Pareto improvement, i. e., a reorganization which would generate large enough efficiency gains in the system that any losers could and actually would be compensated sufficiently for their losses to gain their support for the more efficient arrangement. One possible way to address both the equity and efficiency issue involved would be to grant oyster leases and fishery quotas to current watermen without charge. Watermen would then be offered numerous options. Efficient operators and all those wishing to remain in the industry could exercise their harvesting rights and even purchase additional rights as they became available. Marginal operators or those wishing to retire, or otherwise exit, could convert their rights into cash and gain assets and compensation for leaving the industry. Those whose children wished to "follow the water" would have the option of transferring their own or purchased quotas to family members.

The major problem with current private market decisions dealing with land use is that real estate markets encourage excessive population densities in ecologically sensitive areas because the private costs of waterfront land fail to include the full cost of housing and populations. In addition to pollution, waterfront residential development often results in the loss of wetlands and fish habitat from dredging and filling. Federal and state programs which subsidize residential development and second homes create perverse incentives which add to excessive housing density in the

waterfront areas.

Zoning can be an efficient means of controlling land use, but it suffers some disadvantages from a public choice point of view. Zoning is perceived by land owners as a means of transferring wealth and of restricting the exercise of property rights. In order to make zoning more acceptable, and in order to convert potential Pareto improvements from reducing population densities into actual Pareto improvements, it may be necessary to permit paying compensation to land owners whose profit seeking or rent seeking expectations would otherwise be overturned by protective zoning. Compensating owners for land takings may lead to more efficient resource allocation. Another approach for protecting sensitive areas which is politically more acceptable than zoning, is public acquisition of land areas. This policy, although more costly, has been successful when applied in the advance of development and before major increases in land values. A major need in protecting the Bay from damaging types of land use is a revolving fund for acquiring key land parcels, permanently funded from a secure base, such as a land transfer tax.

Another remedy bearing upon land use and the problem of excessive population growth in sensitive areas is the marginal cost pricing of public services. Typically the fees and taxes collected in waterfront areas are set at average cost levels, whereas marginal population growth in waterfront areas imposes steeply rising real costs on the environment because of detrimental externalities. Recognition of this gap between private costs and social costs has resulted in impact fees or hook-up fees in some areas. In addition to these initial charges, continuing monthly user fees should be high enough to cover the full social costs of maintaining environmental protection in watershed areas. Marginal cost pricing on waterfront development could provide more accurate signals about the full social costs of waterfront development and provide incentives for reducing density of population in sensitive areas.

Private land markets and local zoning practices do not necessarily result in the optimal location of economic activity from an environmental point of view. Because prices in private land markets do not reflect the full social costs of economic development, profit seeking economic development activities can cause major environmental damage and social losses in waterfront areas. Economic externalities from commercial and industrial activity include all of those associated with residential development, plus additional pollution from heavy metals, toxic chemicals, aesthetic encroachment, congestion, and loss of recreational resources. Laws of thermodynamics and mass balance assure that all material and energy inputs into production and consumption activities will eventually be discharged into the environment as wastes and pollutants. In waterfront areas, economic gains and positive externalities would often be greater and environmental losses and negative externalities smaller if industrial and commercial development were shifted to inland areas, protecting sensitive waterfront areas for recreational and low-density uses.

The failure to adopt efficient policies for protecting waterfront areas can be partially explained by public choice literature. Informally organized citizens' groups seldom have the expertise or resources needed to protect low density areas as compared with the resources of sharply focused, well-financed development interests. Rent seeking and profit seeking provide strong incentives for development interests to

dominate local planning and zoning activities. Development forces can also point to economic gains readily measured in the market place as compared with environmental losses which are less easily computed. The concentration of economic and political power in local zoning and governmental authorities is a major obstacle in managing land use for environmental protection.

The economic gains from poorly planned regional development projects may be greatly exceeded by the resulting environmental losses, but these losses are spread over many individuals whose opportunity costs and transaction costs prevent their exerting as much influence in decision processes as do the better organized development establishments. Reducing welfare losses from inappropriate land use will require major institutional changes such as the implementation of the Critical Areas legislation in Maryland.

Although economic theory has concentrated on industrial and commercial polluters, and to a lesser extent upon residential and municipal polluters as the source of detrimental externalities, surprisingly little attention has been given to the federal government as a major source of damage to the Chesapeake Bay. The environmental damage imposed upon the Bay by governmental programs is a further reflection of the economic and political power embodied in military, energy, and development programs. Primary sources of public sector damage are military operations carried out by the armed forces on the thousands of acres of waterfront land which are insulated from protection by state and local authorities.

In addition to nuclear and LNG facilities governmental decision making has permitted the location of large fossil fuel energy facilities which impose problems of aesthetics, noise, thermal pollution, air pollution, and acid rain on the Bay. Efficiency based economic theory, despite the insights that it provides with respect to detrimental externalities, has offered few if any guidelines for the protection of the nation's estuaries against the environmental impact of federal energy policies. More efficient protection of estuarine resources would suggest the exclusion of large scale, high entropy energy projects with their extensive negative externalities from environmentally sensitive areas.

Government construction of infrastructure, such as highways, bridges, water supply, sewage plants and port facilities impose detrimental externalities directly upon the Bay from storm water run-off. Examples of governmental infrastructure programs which cause damage to the Bay include the dredging and deepening of channels in ports and canals which create pollution and which encourage excessive development of waterfront land. Spending public funds in order to dredge channels and expand ports for purpose of increasing waterborne traffic of oil tankers and other large vessels also increases the statistical probability of spilling oil and other pollutants which could be disastrous in the slow-flushing Chesapeake estuary.

Special interest lobbies have both large economic interests at stake and strong incentives to participate in public hearings and decision processes, despite the environmental consequences of their activities, which often are far more costly to society than any economic gains. By contrast, individual members of the public bear only a small fraction of even very large total environmental damages, which may be less

than their opportunity costs of participating in the decision process, with its uncertain outcome. In such cases, conservation lobbying groups can make a vital contribution to the public interest by charging low dues to large memberships, and by using the proceeds to retain experts well qualified to participate in and to influence decision process in environmental management.

Economic theory to date has made only marginal contributions in assisting the development of effective policies for managing inland seas, estuaries and other environmental resources. Even in the case of point-source pollution externalities, which is the major environmental issue receiving extensive treatment in economic theory, incentive based policies have had limited acceptance in the U.S. The body politic has not recognized efficiency as a primary criterion for environmental management. Economic efficiency is an important, but not sole, component of acceptable environmental policy.

Other elements which are also essential are equity, distribution, recognition of interest group positions, and scientific validity. Because of the importance of efficiency, economists potentially have much to contribute to the improvement of environmental management; but, in order to achieve this, they will have to continue efforts to incorporate into their analyses scientific concepts, such as sustainability from ecology and entropy from thermodynamics. In addition to scientific validity, economics also must incorporate a broader view of the social sciences, especially with insights from the field of public choice, and recognition that environmental management reflects the exercise of economic and political power by special interest groups in society. In summary, present management policies can not save marine resources from the immutable laws of thermodynamics and entropy, but environmental economics strengthened by insights from physical sciences, biological sciences, and from the study of public choice can assist in the search for more effective management policies.

Figure 1
Policy Matrix -- Chesapeake Bay Management

Policy Elements	POLICY PROBLEMS					Federal Programs: Intervention Failures
	Pollution	Fisheries	Population	Economic Development		
Basic issues	External Diseconomies	Common Property Resources	Land Use	Growth Policy Tax Base		Military Programs Energy Programs Infrastructure Programs
Current Policy Instruments	Regulation of Emissions Command and Control	Regulation of Gear and Seasons	Planning and Zoning	Growth Promotion Planning and Zoning Subdivision Regulations		Political Logrolling
Flows and Limitations	Inefficiency Lack of Incentives Obsolescence	Legislated Inefficiency	Social Costs Exceed Private Costs Suboptimisation	Social Costs Exceed Private Costs Interregional Competition		Power Group Politics Exclusion of State and Local Considerations
Needed Science Input	Dose-Response Analysis Sustainability Damage Estimates	Stock-Growth Models Sustainability	Land Classification Hydrology Habitat Scientific Designation of Critical Areas	Mass Balance Models Thermodynamics Regional Economic Models Sustainability		Environmental Modeling Sustainability Environmental Impact Analysis
Interest Groups	Industrial Commercial Municipal	Watermen Processers	Construction Industry Real Estate Interests	Economic Development Establishment Local Governments		Military-Industrial Coalitions PAC's
Fairness Equity and Issues	Private vs. Social Cost	Independence Open Access	Property Right Limitations	Investors' and Farmers' Expectations		Federal vs. State and Local Interests
Alternative Policy Approaches	Pollution Taxes, Permits	Quotas Property Rights Aquaculture	Growth Management Critical Areas Impact Fees Marginal Cost Pricing State and Federal Intervention Compensation No Net Loss	Growth Management Critical Areas Impact Fees Marginal Cost Pricing State and Federal Intervention Compensation No Net Loss		Non-Governmental Organizations Public Input State and Local Input