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Institutional Guidelines for Designing Successful Transferable Rights Programs

James T.B. Tripp†
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Traditional regulatory programs impose uniform requirements on all of the persons or firms within designated categories subject to the program. For example, in the context of land use, communities generally issue zoning regulations that rigidly divide land into categories such as residential and commercial, and they impose a set of restrictions on all of the land within each category. Similarly, many air and water pollution control laws require all sources within particular categories to comply with identical schedules that designate limits on discharges or emissions of specified pollutants. Because all sources face a rigid ceiling, firms have no incentive to reduce discharges below the prescribed limits. The result is a great deal of waste because policymakers ignore the varying potential for sources to reduce their discharges of pollution. Moreover, firms regulated by programs embodying this approach have little or no economic incentive to reduce their discharges below the permitted level.

A number of economists have argued for incorporating market incentive systems with tradeable rights into regulatory programs. In such systems, the regulatory body issues a finite number of use rights (credits or permits) authorizing the holder to use a...

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3. See, e.g., J. Dales, Pollution, Property and Prices (1968); Stewart, Economics, Environment, and the Limits of Legal Control, 9 Harv. Envtl. L. Rev. 1 (1985); Ackerman & Stewart, supra note 2. For a comprehensive discussion of the use of economic incentive systems within a regulatory context to address a wide range of resource protection and pollution abatement problems, see Law and Economics Symposium: New Directions in Environmental Policy, 13 Colum. J. Envtl. L. 153 (1988).
particular resource or to discharge a particular pollutant. Any exploitation of the resource or discharge of the pollutant must be accompanied by a corresponding use right. After the original distribution of the transferable use rights, each potential resource user or polluter can evaluate its needs and determine how much of the resource it will use or how much of the pollutant it will discharge. Those who want to use or to pollute more must purchase use rights to do so from others. Those who are willing to use or discharge less than their use right allotment allows can sell their excess use rights. Use rights are traded in an open market, in which firms can obtain the quantity of rights they determine will allow them to operate in the most cost-efficient manner. Such a trading program provides flexibility for those who are regulated and increases the efficiency with which environmental goals can be attained.

Despite the potential of trading programs to reach environmental goals while minimizing the costs imposed upon society, they often meet considerable opposition. Many environmentalists oppose transferable rights programs because of their concern about the consequences of putting a value on socially desirable health and conservation goals. Some oppose credit exchange mechanisms, which implicitly recognize rights to release pollutants into the environment, based on a belief that harming the natural environment is wrong under any circumstances, and that putting a price on environmental issues cheapens them by making them matters of private interest and not matters of public-spirited societal consensus. A less extreme variation on this theme is the view that polluters should be stigmatized and should not be given permits or licenses to discharge emissions.4

Some observers are also concerned that the programs are ineffective and can be abused easily. They fear that market-based regulatory programs will slow the pace of efforts to solve environmental problems by allowing polluters to find loopholes in the programs. Designing and implementing these programs is technically complex, and monitoring and enforcement can be particular-

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ly difficult obstacles. Much of this resistance arises from the difficulty in making these rights or credit exchange programs work effectively to accomplish specific goals. This Comment suggests fundamental guidelines for establishing practical and effective rights exchange programs.

Part I of this Comment provides a general description of the background, development, and advantages of transferable develop-

Part II sets out essential guidelines for the successful implementation of a rights transfer program. Part III explains how these guidelines were derived from the experiences with existing rights transfer programs. It describes two successful programs, the New Jersey Pinelands plan and the Environmental Protection Agency's (EPA) policy on allocating limited rights to produce chlorofluorocarbons. It also describes two relatively unsuccessful programs, the Los Angeles air pollution bubble and the water pollution control program at Fox River, Wisconsin. Part IV applies these guidelines to a proposed program developed to combat acid rain and suggests the possibility of designing transferable rights programs in other environmental contexts.

I. Transferable Regulatory Rights

This Part describes regulatory programs that enable the exchange of rights to use resources and how such programs function in two contexts. First, it discusses land use control programs that use transferable development rights (TDRs). Second, it describes waste reduction credit exchange programs. Both types of programs enable firms to buy and sell use rights to a resource use that is constrained by regulation: limited, tradeable rights to develop land are closely analogous to limited, tradeable rights to emit pollutants.

5. See R. LIROFF, supra note 4, at 15. In the land use context, there are concerns about increasing the density of already densely populated areas. See Richards, Transferable Development Rights: Corrective, Catastrophe, or Curiosity?, 12 REAL EST. L.J. 26 (1983). Other sources of opposition are from people with stakes in the current approach, including policymakers accustomed to traditional inflexible regulation who resist trying new approaches.

6. Recently, Senators Timothy E. Wirth and John Heinz published a report for President Bush advocating market-based regulatory systems. This has stimulated renewed interest in solving certain environmental problems through regulatory programs based on the exchange of rights. PROJECT 88, HARNESSING MARKET FORCES TO PROTECT OUR ENVIRONMENT: INITIATIVES FOR THE NEW PRESIDENT, REPORT TO THE PRESIDENT (1988) [hereinafter PROJECT 88] (investigating and supporting use of market forces and incentives to achieve environmental goals).
A. Transferable Development Rights in Land Use Control Programs

Transferable rights programs have been analyzed extensively in the land use context. TDR programs generally are implemented to channel development away from environmentally sensitive land areas and toward designated growth areas. The programs allocate permits for development efficiently when communities desire to limit the total amount of development. Land use programs incorporating TDRs generally designate some land as preservation areas, where little or no development is allowed, and other land as growth areas, suitable for high density residential or commercial development. The local land use regulatory authority grants TDRs to property owners in the preservation area, which they can sell or transfer to other tracts. Once property owners in the preservation area sell their TDRs, they must register a conservation easement on their property deeds permanently.


The literature promised the achievement of various preservation goals at a low cost: communities could achieve these goals without purchasing the land to be preserved or removing it from their tax rolls. In Penn Cent. Transp. Co. v. City of New York, 438 U.S. 104 (1978), the Supreme Court concluded that TDR programs could be implemented without violating the takings clause of the Fifth Amendment. In response, approximately two dozen communities adopted TDR programs. They were mostly ad hoc, and did not result in many trades. Until 1983, the number of articles about TDRs vastly exceeded the number of rights traded. Pizor, Making TDR Work: A Study of Program Implementation, 1986 AM. PLAN. ASSN. J. 203, 203-204.


8. See, e.g., Penn Cent. Transp. Co., 438 U.S. at 104 (upholding New York City's TDR program, which channelled development from historically or architecturally significant properties to other properties).
restricting the development of their land. The only other means to obtain a high degree of permanence for land conservation plans—acquiring the land—is much more expensive, and therefore much less attractive to communities than TDR programs.

Within the designated growth areas, the local government establishes a two-tier zoning structure: (1) a base zoning density delineating the maximum density to which a property owner can ordinarily build, and (2) a higher level of zoning density that property owners may enjoy if they obtain TDRs. TDRs have significant economic value if the overall growth pressure in a region exceeds the number of development rights available. As land is set aside in preservation areas, land available for development becomes more scarce, thereby increasing the land values in the growth (or TDR receiving) areas. The value of TDRs will increase concomitantly, because they enable developers to build at a greater density in growth areas, thereby reducing land costs per residential or commercial unit.

TDR programs can be a powerful tool to channel the process of development.9 Owners of land in the preservation zone, whose land would be of low value because of the development restrictions, benefit financially from TDRs. Finally, by introducing market signals and incentives into the land use regulatory framework, TDRs enable communities to achieve their resource preservation goals more efficiently.

B. Waste Reduction Credit Exchanges

Waste reduction credit exchanges in the pollution control context are analogous to TDR programs in the land use context. In such programs, the environmental agency establishes cumulative limits on the amounts of each regulated pollutant that may be emitted in a region. It then allocates permits to emit limited

9. TDR programs can encourage a process of cooperation and agreement between environmentalists and developers. In communities with undeveloped land on the fringes of growing metropolitan areas, TDR programs encourage both conservationists and developers to define their primary resource objectives and to recognize that land preservation and development goals can be accomplished simultaneously. Conservationists are given the opportunity to identify critical land resources to be preserved with little or no development, but they must also be willing to designate growth areas where high density development may be allowed. Similarly, developers must be prepared to support the designation of preservation areas in exchange for the delineation of areas where high density development is allowed.
amounts of pollution among potential pollution sources. Because costs for controlling emissions vary among plants, some sources will install pollution control devices, reduce their emissions, and sell their excess emissions use rights. Others can purchase these credits if the cost of implementing pollution control devices exceeds that of the credits. Because the number of permits remains limited, economic growth should increase demand for the permits and, consequently, raise their price. Over time, polluting becomes more expensive, and polluters have a greater incentive to reduce their emissions.

Theoretically, the ability to trade emissions credits should provide sources with flexibility in scheduling compliance with emissions limit requirements. The sources would then have greater control over investment options than they would under a program requiring all sources in a category to meet the same emissions limits on a fixed reduction schedule. Sources with low control costs would choose to control their emissions to a much larger degree than would sources with relatively expensive clean-up costs.

II. Essential Institutional Guidelines of Effective Programs

The overall concept of a transferable rights program is simple, but to make such a program accomplish its objectives, attention to technical, legal, and institutional details is required. Based on our experience with several such programs, we can distill eight basic design guidelines governing the effectiveness of any such program. The first three guidelines concern the institution responsible for administering the program. The fourth, fifth, and sixth relate to the nature of the resource problem that the program addresses. The final two involve the design and imple-
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mentation of the program. These design guidelines are necessary for the rights or credits to have value and to be freely transferable, for the program to be effectively enforceable, and for the designated resources to be preserved at a minimum social cost.

First, the administering agency must have clear legal authority to generate the transferable rights and to implement and enforce the program. Explicit authority helps minimize the reluctance of governmental agencies that have the option of implementing a rights transfer program. If a program's legal basis is ambiguous, opponents can delay or impede its implementation by raising challenges in the courts. While express legal authority may not be absolutely necessary, its absence is likely both to make any regulatory agency more hesitant about implementing a trading program, and to make regulated entities reluctant to participate.

Second, the agency responsible for the program must have the technical capability to design and implement it. The staff of the agency must be able to deal effectively with the planning, economic, scientific, and legal intricacies of the program. This includes the capacity to establish baseline conditions, to certify the proper issuance and use of rights, and to monitor transactions in rights. The agency also must be able to ensure that the use of pollution restrictions are enforced, by monitoring compliance with the limits and imposing penalties for noncompliance.

Third, the program must be evasion proof. A single body should have exclusive control over all use of the resource in the region, and use of the transferable rights should be the only way to exceed the resource use limits that otherwise apply. For example, in the land use area, acquisition of TDRs should be the only means of increasing density in the growth areas. If a property owner were able to increase density by applying for a zoning variance or waiver, or by appealing to a different agency with concurrent jurisdiction, the TDR program's preservation goals would be frustrated. Similarly, if sources can use loopholes or waivers to discharge more pollutants and thereby avoid having to acquire rights, there will be no need for a market in rights and no incentive for sources to reduce their emissions to obtain saleable rights.

Fourth, the program should have clearly specified objectives. A strong scientific footing for the resource objectives and clear identification of regional goals is necessary to convince affected companies and communities that the designated resources are
worth protecting. This, in turn, assures political support for the
program.

Fifth, rights exchange programs work best when applied to
resource or pollution problems with \textit{regional significance}. For
example, rights exchange programs can address pollution problems
caused by the cumulative mixing of pollutants from numerous
sources in a region, but they cannot address problems caused by
specific sources with localized impact.\textsuperscript{12} Insofar as smog in urban
air or depressed dissolved oxygen in waters is caused by regional
mixing of pollutants, the cumulative reduction in regional loadings
of a pollutant is more important than the reduction of releases
by individual sources.

Sixth, the resource problem must be defined so that the
tradeable rights have \textit{economic value} and that incentives to buy and
sell them exist. They will have value when the demand for the
rights to develop or to pollute significantly exceeds the supply
of rights that society chooses to permit. In the land use context,
TDRs work well when there is pressure for development and the
program sets aside a growth area large enough to receive more
TDRs than are generated. To have a successful rights transfer
program for pollution reduction, there should be sufficient
variation among regulated firms to produce a large pool of buyers
and sellers of rights.

Seventh, the program should provide an \textit{equitable and administratively simple method for allocating} the tradeable rights. In the land
use context, rights can be allocated to owners of land in the
preservation zone based either on a simple formula of a number
of rights per acre, or on a more complex method that accounts
for variations in land values based on the type of land or its
location. There may be a trade-off between fairness and adminis-
trative simplicity. Similarly, the government can allocate the rights
to discharge pollutants either by distributing them on a cost-free
basis or by selling them at auction or for a fee. An auction is
more complex administratively, but could provide better economic

\textsuperscript{12} See Stewart, \textit{supra} note 3, at 15-16. Administrative restrictions on trading within
a nonattainment metropolitan area may be necessary to prevent local pollutant concen-
trations, or "hot spots." If attractive sites for new sources often correlate with local hot spots,
strict restrictions on trades must be imposed. If there must be severe geographic restric-
tions on credit sending and receiving areas, a relatively open market cannot be used to
distribute the use rights and the particular pollution problem is not amenable to this
regulatory approach. The same problem arises with toxic wastes, for due to the localized
danger of the waste, regulatory agencies have great interest in overseeing the location of
toxic waste producers.
Incentives for firms to pursue environmentally preferable alternatives.\textsuperscript{13} Eighth, to ensure that the rights have economic value, buying and selling the use rights must entail only minimal transaction costs. The greater the administrative or public hassle confronting a prospective buyer or seller of rights, the less economic value the rights have and the less effective the program will be. Restrictions on the use of rights by buyers or uncertainty about the ability of sellers to sell rights inhibit participation in a rights transfer program. Conversely, the administrative agency could reduce transaction costs if it has the authority to establish an initial market in rights, to help buyers and sellers of rights identify one another, and to help broker transactions. Programs can be especially effective by providing for “credit banks” to serve these functions and to serve as the rights buyer and seller of last resort.

These guidelines provide a basis for designing rights transfer programs that will produce active markets for the rights, receive political support, and most important, achieve their environmental goals. With careful planning and monitoring, and an amenable environmental issue, the design guidelines can be used to implement successful programs. Given the generality of the guidelines, this regulatory approach can be applied in a number of different contexts.

III. Experience with Existing Programs

The utility of the institutional guidelines described in Part II can be demonstrated by assessing the experience with several existing programs. This Part discusses two regulatory programs that use rights transfer mechanisms successfully: the land use TDR program in the New Jersey Pinelands, and EPA's policy on allocating limited rights to produce the chlorofluorocarbons (CFCs) that threaten the stratospheric ozone layer. This Part also discusses two less successful rights transfer programs: the Los Angeles air pollution bubble program, and the water pollution control program at Fox River, Wisconsin. This Part shows how the success of these transferable use rights programs depends on the extent to which they have complied with the general design guidelines.

\textsuperscript{13} See infra notes 47-48 and accompanying text.
A. Successful Transferable Rights Programs

Both of the successful programs substantially incorporated all of the necessary institutional principles, and thus have achieved their environmental objectives efficiently. These programs demonstrate the broad potential for applying the eight guidelines.

1. Land Use Rights: The New Jersey Pinelands

The most ambitious, innovative, and geographically extensive TDR program in the country is that in the New Jersey Pinelands. The New Jersey Pinelands Commission administers the Pinelands Comprehensive Management Plan. This Plan designates several land use categories with specified development densities, limits development in certain areas (such as those designated for Preservation, Forest, and Agricultural), and channels development to other areas (such as those designated Regional Growth and Pineland Villages and Towns). The Pinelands Commission issues TDRs, called Pineland Development Credits (PDCs), to owners of land in the preservation and agricultural production areas, who must deed-restrict their land through conservation easements to the Pinelands Commission to prohibit any future development. Developers can purchase the credits and use them to increase the permitted density of their developments in growth areas.

14. The New Jersey Pinelands, located in southeastern New Jersey, contains approximately one million acres of forests, wetlands, creeks, and rivers and is the largest pinelands in the world. Congress established it as a National Reserve pursuant to the National Parks and Recreation Act of 1978 §§ (a), (c), 16 U.S.C. § 471 (1982). Both the federal statute, 16 U.S.C. § 471(b) (1982), and the State Pinelands Protection Act, N.J. STAT. ANN. § 13:18A-2 (West Supp. 1988), state that the New Jersey Pinelands is a regionally and nationally significant ecosystem of unusual forest communities, wetlands, and endangered species habitats. A reservoir of high quality groundwater, which is very low in nutrients and somewhat acidic, lays beneath it and is estimated to contain 17 trillion gallons. Because of this unusual ecology, both the federal and state Acts recognized that residential or commercial development should be restricted or precluded throughout significant forested portions of the Pinelands.


16. Id. §§ 7:50-5.21 to -5.32.

17. Id. § 7:50-5.22.

18. Id. § 7:50-5.23.

19. Id. §§ 7:50-5.24 to -5.25.

20. Id. § 7:50-5.28.

21. Id. § 7:50-5.27.

22. Id. §§ 7:50-5.41 to -5.47.
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The Pinelands TDR plan was well designed, and consequently it is a successful program. First, federal and state enabling statutes provided explicit authority for the TDR program. Therefore, the program survived court challenges. Furthermore, although zoning authority is not vested exclusively in the Pinelands Commission, the seven counties and fifty-two municipalities in the Pinelands area are required by law to modify their master plans and zoning ordinances to comply with the Pinelands Plan. If they fail to do so, the Pinelands Commission may assume responsibility for all of a community's land use decisions. The Commission also has the authority to review all of the development approvals that the communities grant. It is therefore difficult to circumvent the Pinelands Commission's power to implement the TDR program.

Second, the Pinelands Commission has staff with technical, economic, and legal expertise. The Commission has been able to predict the value of the rights, defend the program in court, monitor trades, support the establishment of a state PDC bank, and assess any weaknesses in the program. It also has recognized the utility of a credit bank.

27. However, if a local community is strongly opposed to a particular development, it is difficult for a developer to overcome such opposition and to take advantage of the density bonus conferred by the purchase of PDCs, notwithstanding the developer's legal entitlement to use the credits.
28. The Commission could undoubtedly strengthen its PDC program by having at least two professionals on staff working primarily on its implementation. Telephone interview with Frederick W. McCamic, Resource Planner, N.J. Pinelands Commission (Apr. 28, 1989) [hereinafter McCamic interview]. The Pinelands Commission has undertaken periodic reviews of the PDC program to identify deficiencies and to make recommendations for improvement.
Third, the program is largely evasion proof. The Pinelands Commission has land use control over both the TDR donor and receiving areas. Although it has granted some waivers, the Commission has not authorized zoning changes or waivers from base zoning density in the growth areas. The exchange mechanism is the predominant means for developers to increase their density.

Fourth, the resource protection objectives are clearly specified. Federal and state legislation recognize the uniqueness of the Pinelands as a resource to be protected. The Pinelands Commission has supported this assessment by developing a strong scientific case for protecting large tracts of the Pinelands in the preservation area, and it has defined clearly the levels of protection of various classes of land resources and the conditions for development.

Fifth, the resources protected are regional in nature. The wetlands, pitch pine forests, streams, and groundwater resources of those parts of the Pinelands that the Commission's Plan seeks to preserve have widely recognized regional values. Maintaining large contiguous tracts of undeveloped forested areas is critical to sustaining this ecological integrity. Conversely, it has been possible to designate areas around existing population centers suitable for regional clustering of development.

Sixth, the economic value of PDCs is assured because developers are legally entitled to apply acquired credits toward increased density of development in growth areas. Each credit entitles a developer to four additional units per acre above the base level. There are no restrictions on the sale of credits by landowners in the preservation or agricultural areas; they may sell the credits to anyone, including speculators or landowners in growth areas. There is growing pressure for development in the Pinelands, which are adjacent to the Atlantic City, Philadelphia, and New York/Northern New Jersey metropolitan areas, and a sufficiently large area of land on which credits can be used to increase the

29. Some townships, such as Barnaget, allow developers to build to a higher level of density for senior citizen communities or similar types of housing. The Commission has approved this zoning bonus, which represents a loophole in the bonus density program. McCamic interview, supra note 28.

level of growth. Accordingly, the demand for credits should be significant in comparison to the supply of credits.\textsuperscript{31}

Seventh, the transferable rights are allocated fairly, through a relatively simple mechanism. Owners of land in the preservation areas may deed-restrict their land, and in exchange, receive tradeable PDCs according to a formula that recognizes three land value categories. Two credits may be issued for every thirty-nine acres of farmland in the Agricultural Production and Preservation Areas, one for every thirty-nine acres of nonfarmland uplands in the Preservation Area, and two-tenths of a credit for every thirty-nine acres of wetlands within that Area.\textsuperscript{32} Although it would be possible to devise a simpler formula that recognized only one land type and value category, the three-part system is more appropriate here because it considers the variation in value and development pressure among the different types of land in the preservation area.

Eighth, the program has minimized transaction costs. Although the Pinelands Commission originally did not have authority to establish or broker a market in PDCs, Burlington County, the largest county in the Pinelands area, undertook that function. In late 1981, Burlington County stimulated a market for credits by establishing a Conservation Easement and Pineland Development Credit Exchange with authority to acquire credits from landowners.\textsuperscript{33} In 1986, the New Jersey legislature established a Pinelands Development Credit Bank, which facilitates transactions in credits and enables farmers to secure loans based on their credits.\textsuperscript{34} Although the tardiness in getting the PDC Bank off the ground slowed PDC transactions, the number of PDC transactions would increase substantially if the Bank were to expand its brokerage role so that large developers could make use of the availability

\textsuperscript{31} As development outside of the Pinelands exhausts readily available land for development, the demand for land in Pinelands Regional Growth Areas appears to be increasing. This, in turn, favorably affects the economics of the PDC program. See Letter from Frederick W. McCamic, N.J. Pinelands Commission, to James T.B. Tripp (Apr. 27, 1989) (on file with authors).


of sufficient numbers of PDCs. Thus, the New Jersey Pinelands program has been successful and is growing more so.

2. Chemical Production Rights: Chlorofluorocarbons (CFCs)

CFCs, a family of chemical compounds used in refrigeration, air conditioning, plastics, and electrical solvents, have been linked to the depletion of the stratospheric ozone layer. Statutes.

35. As of the end of April 1989, the Pinelands Commission has issued 164 Letters of Interpretation allocating 545.55 PDCs. Of these, 97.25 have been severed from land that is now protected by easement, and 46.75 have been purchased by developers. Of the developments using PDCs, 10 projects have been built using 16 credits; 11 have been approved using 86.75 credits; and 29 projects are actively pursuing approvals, using 70.5 credits. See Letter from Frederick W. McCamic, supra note 31.

The Pinelands Development Credit Bank could play a key role in identifying potential sellers of large number of credits for large developers who may have difficulty in doing so. The Bank is empowered to buy credits under N.J. STAT. ANN. §§ 13:18A-34(g) (West Supp. 1988).

36. Another successful program is that of Montgomery County, Maryland, which preserves 89,000 acres of agricultural land (covering one-third of that county), gives farmers an economic incentive to continue in farming, and channels growth elsewhere in the county. To date, acquisition of TDRs has resulted in the preservation of almost 27,000 acres of farmland through recording of conservation easements. Telephone interview with Melissa Banach, Chief of Community Planning, North Division, Maryland-National Capital Park & Planning Commission (Feb. 8, 1989).

The Montgomery County program embodies the same design guidelines that made the New Jersey Pinelands program successful. Although a legal challenge was successful, Western Montgomery County Citizens Ass'n v. Maryland-National Capital Park & Planning Comm'n, 309 Md. 183, 522 A.2d 1328 (1987) (critical elements of program appeared only in master plan and were not formally adopted in zoning ordinance), the County readily remedied the legal deficiencies noted by the court. The County has a highly qualified staff that pays particular attention to implementation of the program. The County controls overall development, and it has justified retention of large contiguous tracts of farmland, a land resource of recognized regional value. Its allocation formula is simple: one right per five acres. A developer can readily take advantage of TDRs through the County's subdivision process, and the TDRs have recognized value. See generally Banach, Agricultural Preservation Program, Montgomery County, Maryland, in ENVIRONMENTAL DEFENSE FUND, LONG ISLAND PINE BARRENS LAST STAND: PRACTICAL SOLUTIONS TO PROTECT A REGIONAL RESOURCE 17 (Jan. 1987); Canavan, The Montgomery County, Maryland Agricultural Preservation TDR Program, in ENVIRONMENTAL DEFENSE FUND, supra, at 22.


38. The Clean Air Act Amendments of 1977, 42 U.S.C. § 7457(b) (1982), required EPA to protect stratospheric ozone: "the Administrator [of EPA] shall propose regulations for the control of any substance, practice, process, or activity (or any combination thereof) which in his judgment may reasonably be anticipated to affect the stratosphere, especially ozone in the stratosphere . . . ."
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regulations, and international treaties require phased reductions in CFC production and use. In order to achieve a fifty percent reduction of CFC use in the United States by the end of the 1990s, EPA has promulgated regulations that limit the total amount of CFCs that may be produced. These regulations allocate production permits among producers which may be purchased and sold among producers; the system is thus comparable to TDR and waste reduction credit exchange programs in that all use a market mechanism to allocate limited rights to use a resource that is limited by regulation for environmental protection.

EPA's system for limiting and allocating CFC production is likely to be successful, because it was designed in accordance with all the necessary institutional criteria. First, EPA has clear legal authority to implement the program and has exclusive jurisdiction to do so. Second, EPA has the institutional capacity to implement such a credit exchange program and to monitor its functioning, particularly given its institutional experience with implementing air pollution bubble systems. Third, the program is evasion proof: there is no way a CFC producer can produce more CFCs without the necessary permits. Fourth, the resource objectives are substantiated and clearly specified: the current goal is a fifty percent reduction of nationwide CFC production over the next decade. Fifth, the goals of the program are global and involve no particular localized impacts. The permits will also have economic value, because the restricted supply of CFCs is certain to increase market clearing prices, and the permits can be bought and sold freely.

42. See 42 U.S.C. § 157(b) (1982); EPA Final Rule, supra note 41.
43. See U.S. EPA & UNITED NATIONS ENVIRONMENT PROGRAMME, supra note 37; Whitney, Industrial Countries to Aid Poorer Nations on Ozone, N.Y. Times, May 6, 1989, at 6, col. 1.
44. EPA Final Rule, supra note 41, at 30,566.
The method for allocating the CFC permits is quite simple under the original set of regulations. Permits are to be issued free of charge to the five domestic producers in proportion to their 1986 production levels. However, because of the future excess of demand for CFCs over the permitted supply, free allocation of the permits gives the permit holders substantial economic rents and may reduce those producers' incentives to develop and market cheap substitutes for CFCs.

Therefore, EPA has proposed charging the chemical producers for the permits under one of two alternative allocation methods: auctioning the rights or imposing a set fee on them. Either approach would increase the producers' incentives to develop substitute processes and products (unless in a fee system, if EPA were to set the fees at too low an amount). Finally, an auction system is more likely to value the permits at a price reflecting market preferences and to capture that market value for the government. An auction may also minimize transaction costs and eliminate the need for producers to trade permits later by acting as a clearing house through the process of bidding for permits.

B. *Less Successful Rights Transfer Programs*

The two less successful programs discussed here, the Los Angeles air pollution bubble and the Fox River water pollution discharge allocation system, suffered because they did not incorporate the requisite institutional guidelines. Thus, they also provide evidence that supports incorporating the features needed to make rights transfer programs effective.

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46. A consultant for EPA estimated that the proposed allocated quota system would produce $1.8 billion to $7.2 billion in windfall profits for producers. EPA ANPR, *supra* note 41, at 30,606.
47. EPA ANPR, *supra* note 41, at 30,605 (combining a regulatory fee with allocated quotas), 30,610 (auction).
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1. Air Pollution Rights: Emissions Trading in California

EPA's bubble policy, particularly in nonattainment areas, has been controversial and problematic. The most notable application of this policy in an urban nonattainment area is in Los Angeles, administered by the South Coast Air Quality Management District (SCAQMD). This region has not achieved its stated air quality goals. The Los Angeles program identified its air quality goals, formulated clear exchange and allocation rules, and established the boundaries of a regional trading area. Pursuant to this program, polluters have made numerous offset trades. However, despite the program's generally careful design and the active cooperation of some of the regulated entities, the program has not worked effectively.

In particular, the program is not evasion proof. SCAQMD has authorized new loadings of pollutants from large numbers of new stationary sources without requiring them to obtain emissions reduction credits. These loadings vastly exceed those from sources which were required to participate in the capped rights trading program. Because SCAQMD allowed new sources to operate without participating in the program, it effectively expanded the allowable amount of total regional loadings. As a consequence, the rights exchange system has been severely undermined, and the air quality goals of the program have not been met.

In the California system, the emissions credits lack the certainty necessary for them to have economic value because SCAQMD and other local air pollution control agencies must review and


50. See Roberts, Some Problems of Implementing Marketable Pollution Rights Schemes: The Case of the Clear Air Act, in REFORM OF ENVIRONMENTAL REGULATION 93, 97 (W. Magat ed. 1982).

51. See Hahn & Hester, supra note 49, at 120-23.

52. For a detailed critique of emissions trading in California, see CAL. AIR RESOURCES BOARD, DRAFT REPORT TO THE LEGISLATURE ON IMPEDMENTS, IMPROVEMENTS, AND ALTERNATIVES TO EMISSION CREDIT SYSTEMS (Sept. 1988).

53. Between 1976 and 1986, SCAQMD allowed 3,959 sources to release an additional 200,000 pounds per day of hydrocarbon emissions because they were below regulatory trigger levels. Offsets in the same period were only 27,000 pounds per day. Id. at 12.
certify emissions credit trades.\textsuperscript{54} Although this enables them to supervise the location of new sources of particular pollutants, such review builds in a rigidity that conflicts with the goal of easily traded rights in an open market. This inefficiency in trading rights has significantly lowered the value of the credits and the utility of the system.

Finally, trades are hindered by the difficulties of establishing a viable market for the credits.\textsuperscript{55} In California, only thirteen of the forty-one air quality management districts have established emissions banks.\textsuperscript{56} Correction of these deficiencies would greatly enhance the viability of the program.

2. Water Pollution Rights: Fox River, Wisconsin

Under the Clean Water Act, state or regional water pollution control agencies must prepare water quality management plans for entire water basins.\textsuperscript{57} Specific technological controls on point sources of biological-oxygen-demand wastes (BOD) and other organic materials may not be stringent enough to assure compliance with the relevant water quality standards. In that case, the pollution control agency must prepare a total waste level allocation (TWLA) which may impose more stringent limits on what individual sources may discharge.\textsuperscript{58}

The Wisconsin Department of Natural Resources has adopted regulations controlling BOD discharges into the Fox River which include a limited program for cooperative modification of administratively determined waste discharge limits.\textsuperscript{59} A point source of pollution discharges, such as a paper plant, may negotiate with
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another such plant, agree that one source will buy all or part of
the other's discharge allocation, and propose to the agency that
their waste load allocations be modified accordingly. The program
is thus similar to the bubble concept in the air pollution context
and to other programs with transferable rights to pollute or use
resources.

The Fox River program has not been successful, however.
Although the Wisconsin Department of Natural Resources is a
technically competent agency, its resource objectives were clearly
specified, and the method of allocating rights was fairly simple,
the other institutional criteria for a successful rights exchange
program have not been met.

First, the program was implemented without explicit legal
authority to use such innovative trading mechanisms in water
pollution abatement programs subject to the federal Clean Water
Act. Although the Act delegates implementation authority to the
states, it also requires a national policy of uniformity in effluent
limitations, with which the Fox River program does not strictly
conform. Wisconsin's transfer program is therefore vulnerable to
legal challenge or to an EPA veto because applicable EPA regula-
tions do not expressly mention the possibility of trading any
fraction of the effluent limit permits under a basin-wide discharge
reduction program.

Furthermore, the rights to pollute are not freely tradeable
under the Fox River program, which impairs the value of the
rights. All transactions in rights must be approved through an
administrative review that can be complex because of the nature

was adopted to prevent any shift in regional comparative advantage due to water quality
treatment requirements, to facilitate determination of these limits by classes of industries,
and to produce an equitable treatment of firms within industries. However, the uniformity
principle is not entirely sacrosanct: the Clean Water Act § 302 also requires firms in basins
that have particularly severe water pollution problems to decrease their discharges beyond
the technology-based requirements. 33 U.S.C. § 1312 (1982). If trading of effluent discharge
allocations is ever to be more than a legal curiosity, it is essential to clarify the authority
of state regulatory agencies through national legislation, EPA regulations, or case law.
and to veto the issuance of permits by the state. Section 402(d) does not mention tradeable
discharge limits explicitly, but it does enable EPA to object to a permit if issuance would
not conform to the regulations issued under the Act. See 40 C.F.R. §§ 123.61 to 123.63
(1988). However, EPA has not in fact taken any legal action to force Wisconsin to modify
its Fox River regulations.
of the pollutant problem.\textsuperscript{63} In addition, because toxic organic compounds have been found in paper mill effluents, proposed trades may lead to high local concentrations of such toxic pollutants and therefore may not pass administrative review. EPA's use of BOD as a surrogate for toxic compounds and the absence of specific effluent standards for these compounds impedes the use of BOD trading programs.\textsuperscript{64} Finally, the Fox River program suffered from high transaction costs, despite the relatively small number of firms involved, because there was no brokering or banking function.

IV. Application to a Proposed Acid Rain Control Program

On a conceptual basis, many resource protection and waste reduction programs should be able to take advantage of the economic benefits of credit exchange programs. However, lack of experience with such programs has been a major obstacle in designing and implementing them. The experiences described in this Comment, and the institutional guidelines derived from those experiences, can help guide the design and implementation of credit exchange mechanisms to limit pollution and to control the use of resources efficiently.

Acid rain is a major pollution problem\textsuperscript{65} that could be reduced through a program incorporating a credit exchange system.\textsuperscript{66} Acid rain could be reduced by abating the emissions of sulfur oxides and nitrogen oxides from sources throughout a large geographical area. However, the anticipated cost of such a program and the difficulty of allocating those costs are major obstacles in adopting

\textsuperscript{63} Wis. Admin. Code § NR 212.115 (May 1986).

\textsuperscript{64} For example, dioxins have been discovered in the effluents of paper mills that use chlorine to make white paper products. EPA has not yet developed specific effluent limits for dioxins in paper mill wastewater and has instead used BOD as a surrogate for a range of pollutants, including dioxins. See U.S. EPA Office of Water, Guidance for Section 304(f) Listing and Permitting of Pulp and Paper Mills (memorandum from M. Prothro and J. Elder to Water Management Division Directors) (Mar. 15, 1989) (on file with authors); Two E.P.A. Studies Confirm Threat to Fish of Dioxin from Paper Plants, N.Y. Times, Mar. 14, 1989, at C4, col. 1.

\textsuperscript{65} See U.S. EPA, Environmental Criteria and Assessment Office, Air Quality Criteria for Particulate Matter and Sulfur Oxides (Dec. 1982) (delineating health and welfare effects associated with exposure to concentrations of the sulfur oxides that cause acid rain); National Research Council, Acid Deposition: Long Term Trends (rev. ed. 1986) (scientific studies documenting causal link between sulfur dioxide emissions and acid rain, and the resulting environmental damage).

\textsuperscript{66} For an explanation of a market-based economic incentive program to address acid rain, see Project 88, supra note 6, at 50-58.
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an acid rain control program. Thus, an approach that minimizes costs for any given level of acid rain reduction would facilitate congressional adoption of a meaningful program. Economic analyses strongly suggest that a well-designed emissions trading program would have significant cost advantages over a program that requires each major source to reduce its emissions by a specified amount.

An appropriate design of the credit exchange component of an acid rain control program is critical. In such a program, Congress would authorize EPA to issue multiyear permits to industrial sources of sulfur dioxide, with limits for each source based on emissions data for the most recent year of the source's normal operation for which a complete sulfur dioxide inventory is available. The permits would be revised downwards periodically according to the emissions reduction schedule. Sources would receive tradeable credits if they were to reduce their emissions below their permitted levels. If sources' emissions were to exceed their permitted levels, they would be required to purchase the necessary credits and turn them in to EPA.


68. U.S. CONGRESSIONAL BUDGET OFFICE, supra note 67; ICF RESOURCES, INC., ANALYSIS OF SIX AND EIGHT MILLION TON 30-YEAR/NSPS AND 30-YEAR/1.2 POUND SULFUR DIOXIDE EMISSION REDUCTION CASES ES4 to ES6 (Feb. 1986). See also Major EPA Study Finds SO2 'Emissions Trading' Could Slash Compliance Costs, INSIDE E.P.A., Dec. 2, 1988, at 1, 8 (emissions trading could result in cost savings of 25% to 50% for acid rain control program in eastern 31-state region).

69. See PROJECT 88, supra note 6, at 50-58 (explanation of market-based economic incentive program to address acid rain). The Environmental Defense Fund has proposed an acid rain control program requiring (1) continuous monitoring of sulfur dioxide emissions for all sources subject to the program to assure that EPA and states have accurate data by which to measure compliance with permitted levels of emissions; (2) a 60% reduction in emissions of sulfur dioxide, from sources emitting more than 0.5 pounds of sulfur dioxide per million British thermal units (MBTU) of energy produced, over 10 years in the eastern 31-state region; (3) a schedule of reductions in five phases, from no increases to 15%, 30%, 45%, and 60% reductions for each source; (4) an exemption from further reductions for any source emitting below a threshold emissions rate level such as 0.5 pounds of sulfur dioxide per MBTU; (5) issuance of emissions credits to any source with emissions below permitted levels, which may be traded to any other source; (6) additional reductions after 10 years if the aggregate emissions of sulfur dioxide still exceed 10 million tons in the region; and (7) compliance by all sources with existing limits on sulfur dioxide emissions incorporated in air quality standards, state implementation plans, prevention of significant degradation standards, and new source performance standards. See ENVIRONMENTAL DEFENSE FUND, SPECIFICATIONS FOR A SULFUR DIOXIDE REDUCTION PROGRAM THAT INCLUDES MARKETABLE EMISSIONS REDUCTION CREDITS (Draft, Mar. 23, 1989) (on file with authors).
A credit exchange program designed according to the institutional guidelines should strengthen the effectiveness of the program in achieving cost savings while attaining air quality goals. First, Congress should grant EPA explicit legal authority to implement such a program, and it should specify that EPA's authority over sulfur dioxide emissions is exclusive within the region. Second, Congress should provide EPA sufficient funds to attract a professional staff that is capable of designing and implementing a technically rigorous program. Third, to ensure that the program is evasion proof, no source should be eligible for any exemptions or waivers unless sufficient credits are purchased. Fourth, EPA must specify clearly the reductions in sulfur oxide emissions needed to abate acid rain. In addition, it must have accurate data from each source concerning its baseline sulfur oxide emissions. Fifth, the problem is clearly amenable to a regional approach.

Sixth, the program must be as free from administrative burdens as possible to ensure that the emissions credits have economic value without compromising real reductions. The mechanism for certifying that a source qualifies for credits should be effective and expeditious. Any source which subsequently is shown not to be entitled to credits should be required, as a minimum penalty, to purchase the requisite number of credits. Once credits are issued, the qualifying source should be allowed to transfer them to another source as a matter of right.

Seventh, all sources emitting sulfur dioxide above a threshold emissions rate should have to reduce emissions rates by the same prescribed percentage in each reduction phase. This will ensure a fair and administratively simple allocation of permitted emissions levels and assure compliance with the cumulative reduction in loadings called for in the legislation.

Finally, the legislation should authorize EPA to provide information to buyers and sellers of credits to facilitate transactions in credits, and to function as a broker in such transactions. EPA could auction off a small portion of the aggregate permitted emissions, rather than allocating them, to assure a minimal supply of credits. These provisions can ensure that an emissions trading program can be an effective component of an acid rain control policy.

70. The magnitude of the impact on the environment from high levels of acid deposition has been documented. See supra note 65.
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Conclusion

Although we have limited experience with credit exchange mechanisms in pollution abatement programs, we should expand the use of such mechanisms. In addition to the acid rain control program described here, other urban air pollution and waste water effluent abatement programs could benefit from waste reduction credit exchange programs designed using this Comment's guidelines. With careful attention to technical and conceptual details, credit exchange and economic incentive systems can help deal with an even wider range of regional waste reduction problems and to achieve resource allocation goals efficiently.