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CHARGES FOR URBAN RUNOFF: ISSUES IN IMPLEMENTATION[1]

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ABSTRACT: Maryland officials have identified stormwater utilities as a potential method of financing programs to control nutrients in urban stormwater runoff that are proposed in Maryland's Chesapeake Bay Nutrient Reduction Plan. This paper reviews a number of issues related to the equity, efficiency, and acceptability of user charge schemes. Overall, charges are found to be preferable to property taxes from both equity and efficiency perspectives. In addition, evidence suggests that elected officials will support creation of utilities. Obstacles to the implementation of utilities are identified.
(KEY TERMS: stormwater; runoff; economics; finance; utilities; stormwater management.)

INTRODUCTION

Stormwater utilities have been suggested as a method of financing stormwater management programs proposed in the 1987 Chesapeake Bay Agreements to help achieve nutrient reduction objectives (Shanks and Tassone, 1988). Several economic issues raised by that suggestion are reviewed in this paper.

STORMWATER MANAGEMENT AND STORMWATER UTILITIES

Local governments historically have provided the services of drainage and flood protection. Programs generally have focused on control of runoff volumes and usually have been paid for with property taxes. Officials often have given low priority to maintenance of drainage infrastructure and funding often has been inadequate (APWA, 1984; Grigg, 1986). Now, in response to recent federal and state regulatory initiatives, local governments must develop new programs to control the quality, as well as quantity, of urban runoff. Money is needed to pay for these new programs.

More than 50 communities have created stormwater utilities, local government enterprises that provide the services of flood control, drainage, and stormwater management and are financed with user charges (ASCE, 1985). Users are owners of properties that discharge stormwater to publicly maintained systems. Most utilities base charges on rate factors derived from standard runoff coefficients (e.g., Rational Method Coefficients). Thus, charges are primarily a function of the percentage of impervious area on a property. The utility rate base is defined as the categories of land uses that must pay charges. Since tax exempt parcels (e.g., hospitals, schools) usually are included in the rate base, utilities tap new sources of revenues. Revenues from charges must be placed into restricted accounts that can be used for stormwater programs only (Lindsey, 1988a). With relatively modest charges to residential users (e.g., \$15 to \$44 annually), utilities are able to generate substantial revenues (e.g., \$263,000 to \$8,000,000 annually; Lindsey, 1988b). Owners of nonresidential property typically pay more because their properties are larger and developed more intensively. Because users pay in relation to the amount of runoff they discharge, the utility approach is a step towards cost-based financing.

In addition, stormwater charges somewhat resemble pollution charges which have long been advocated by economists as a way to achieve efficiency in pollution control. This perspective is helpful for the analyses that follow, although it has a number of limitations. For example, the rate factors on which

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charges are based generally do not account for site characteristics other than impervious area (e.g., slope, soils, runoff quality). This failure is an important limitation with respect to setting charges such that they reflect environmental damage actually caused by stormwater discharges. Another conceptual problem with characterizing stormwater user charges as pollution charges concerns the economic distinction between taxes and charges. The important difference is that taxes are compulsory while charges are not. That is, people must pay taxes whether or not they consume or even value the services and programs that the taxes support. Thus, financing a public good (e.g., water quality) with taxes provides no information about real demand for it. Charges, because they are optional, can provide some information about the demand for a public good. That is, people can pay only for the amount they choose to consume, if any. Economic theory suggests that efficiency would increase if people were given the choice of paying a charge for runoff or controlling runoff on-site because people would choose the cheaper option, thus, in the aggregate, reducing costs. From an efficiency perspective, there is a *prima facie* reason for preferring charges.

In practice, most utility managers consciously characterize user fees as charges rather than taxes, mainly because this helps to diffuse political opposition to tax increases. From an economic perspective, however, most utility rate structures actually are combinations of charges and taxes (Lindsey, 1988c). This is because certain categories of users (e.g., single family residential) usually cannot choose how much they pay. Generally, only owners of nonresidential property are allowed to reduce charges by constructing on-site best management practices (BMPs). Charges to residential properties generally account for a significant percentage of total utility revenues (e.g., from 22 percent to 65 percent (Lindsey, 1988b)). These compulsory charges offer no potential for the gains in efficiency envisioned in a pollution charge scheme.

POTENTIAL REVENUES FROM STORMWATER UTILITIES IN MARYLAND

The Maryland Department of Environment (MDE) has recommended a general procedure for estimating potential revenues from stormwater utilities (Lindsey, 1988a). The procedure involves estimation of a charge per equivalent runoff unit (ERU), which is a representation of the amount of runoff from a property. ERUs are calculated simply by multiplying a rate factor times a parcel area. A general equation for computing the charge per ERU is (Lindsey, 1988a):

$$C / ERU = R / [\sum_i F_i * A_i] \qquad (1)$$

where

C/ERU = the charge per equivalent runoff unit;

R = utility revenue requirement;

F_i = the rate factor for each land use category i the rate base;

A_i = the total acreage for each land use category i; and

$F_i * A_i$ = the ERUs for a given land use category i.

This method has been used to estimate potential revenues for funding programs outlined in Maryland's Chesapeake Bay Nutrient Reduction Plan (Table 1). These estimates are conservative because of the assumptions on which they are based. For example, tax exempt properties are excluded from the rate base. Nevertheless, potential revenues are in excess of $56 million annually.

THE SCOPE AND COST OF URBAN NUTRIENT REDUCTION PROGRAMS

The Maryland Nutrient Reduction Plan calls for a 40 percent reduction in nutrient (nitrogen and phosphorus) loadings from all sources of pollution. With respect to urban stormwater, the Plan outlines three general types of programs to be undertaken in a three-phased approach through the year 2000. These programs include (1) the continuation of a State cost share program that is primarily for demonstration retrofit projects; (2) a massive, new retrofit program (to be funded by utilities); and (3) a redevelopment program aimed at "explicit management of development intensity," including the distribution of cover types on individual development sites (Shanks and Tassone, 1988). Examples of actions that would be funded include watershed planning; BMP retrofits; improved maintenance of existing BMPs; new, tighter regulations and controls on site development; and expanded educational and training programs for developers and inspectors.

State officials have developed partial, ball-park estimates of the costs to achieve the nutrient reduction objectives (Shanks and Tassone, 1988). These cost estimates are only a "general index" of the construction costs. They do not include any administrative or planning costs or any of the costs of related regulatory, monitoring, maintenance, and educational programs. The cost estimates also are not site specific; they are based on generalized cost equations for BMPs to treat runoff from typical land use mixes in standard watersheds.

TABLE 1. Potential Stormwater Utility Revenues for Maryland Counties and Baltimore City.

Counties/City	Potential Revenues
Allegany	$1,600,000
Anne Arundel	$5,000,000
Baltimore	$7,750,000
Calvert	$700,000
Caroline	$325,000
Carroll	$1,400,000
Cecil	$2,000,000
Charles	$1,050,000
Dorchester	$700,000
Frederick	$2,600,000
Garrett	$2,600,000
Harford	$2,600,000
Howard	$2,700,000
Kent	$275,000
Montgomery	$4,250,000
Prince George's	$5,000,000
Queen Anne's	$450,000
Somerset	$375,000
St. Mary's	$1,050,000
Talbot	$450,000
Washington	$1,550,000
Wicomico	$900,000
Worcester	$1,400,000
Baltimore City	$9,500,000
TOTAL	**$56,225,000**

Assumptions:

(1) Charges to residential properties less than one-quarter acre equal $15 annually (because anecdotal evidence suggests that residents initially balk at higher charges); residential up to two acres pay proportionately more.

(2) No charges to owners of property in the land use categories of (a) agriculture, residential agriculture, and residential on lots greater than two acres (because urban infrastructure is not used); (b) unimproved (because natural drainage patterns exist); and (c) tax exempt and other (because data on the percentage of impervious cover are not available).

These partial cost estimates are presented by program type and phase in Table 2. Total costs for the three phases are approximately $71 million. Only the cost-share programs, which accounts for less than 15 percent of the total estimated costs, currently exists. It is funded with State bonds. A proposed new stormwater retrofit program would account for almost 80 percent of total costs between 1988 and 2000. Other than utilities (none of which currently exist), funding sources for retrofit projects have not been identified. Sources of funds for proposed redevelopment programs also have not been identified. While the costs in Table 2 are not complete, they represent the best estimate to date of the costs of achieving the nutrient reduction objectives. It is significant that they are much lower than the potential revenues outlined in Table 1.

POLITICAL ECONOMY OF STORMWATER USER CHARGES

The possibility of widespread implementation of stormwater utilities raises a number of issues related to the equity, efficiency, and acceptability. These are explored next.

Equity Issues

One issue is whether a charge system is fair relative to other sources of revenues (e.g., property taxes). As will be shown, this depends in part on how equity is defined. Alternate definitions of equity include: (1) people (including corporations) should pay according to their ability to pay; (2) people should pay according to how much they benefit from the program; (3) users of stormwater systems should pay in relation to the extent to which they "use" the system; and (4) generators of runoff and pollutants should pay to the extent that they cause problems.

The first measure, the ability to pay, is sometimes used to justify property taxes. Although most analysts have found that property taxes are at least mildly regressive, others have argued they may be progressive (Tresch, 1981). Politically, at least, it can be argued that owners of higher values property can better afford to pay. A second definition of equity (which also is used to justify property taxes) is that people should pay in relation to benefits received. It can be argued, for example, that properties benefit from services such as drainage (i.e., by having water carried away) and that the benefits are capitalized in the value of the property. Another benefit of stormwater management is improved water quality. Arguments can be made for financing water quality through broad based property taxes, in part because water quality is a public good and specific beneficiaries cannot be identified.

The notion of paying in relation to "use" of the stormwater system is the rationale for charges

TABLE 2. Estimates of Costs for Programs to Reduce Nutrients in Runoff From Developed Areas in Maryland by 40 Percent (Tassone and Shanks, 1988).

Program Type	Phase I (1985-87)	Phase II (1988-91)	Phase III (1992-2000)	Total
		SWM COST SHARE		
State/Fed	$3,202,750	$2,715,000	$2,715,000	
Private/Local	$500,000	$475,000	$475,000	
Total	$3,702,750	$3,190,000	$3,190,000	$10,082,750
		SW UTILITIES RETROFIT		
State/Fed	NA	$2,800,000	$2,800,000	
Private/Local	NA	$10,000,000	$40,000,000	
Total	NA	$12,800,000	$42,800,000	$55,600,000
		REDEVELOPMENT PROGRAM		
State/Fed	NA	NA	NA	
Private/Local	NA	$1,120,000	$4,480,000	
Total	NA	$1,120,000	$4,480,000	$5,600,000
GRAND TOTAL				$71,282,750

NOTE: Estimates are direct implementation costs only; they do not include manpower, planning, education, regulatory costs, maintenance, etc.

advanced by most utilities. This is related to the benefits received rationale, although it implies a directness that seems absent from the latter. Finally, there is the notion of equity as entailed in the polluter pays concept. To some degree, utility charges fit this categorization, although discharge to stormwater infrastructure generally is a criterion for charging property owners, and there are other limitations as noted above.

One can gain insight into the issue of equity by comparing the distributions of payments under user charge and property tax systems (Table 3). Case A is an example of a user charge system in which all parcels in Baltimore County would be in the rate base. The parcel user charges paid by the owner of an average site parcel in Case A would tend to be representative of a utility operating under a polluter pays rationale. Case B is an example in which the rate base would be the same as that used to make the estimates in Table 1 (land use categories of agricultural, exempt, other, unimproved, residential greater than two acres, and residential agriculture would not be charged). This case illustrates typical payments under a user pays concept. Case C illustrates payments by owners of average valued parcels under a property tax system.

The different financing systems result in different payments by typical property owners in each land use category. In terms of payments by owners of average sized parcels, the following observations can be made:

- Residential property owners would be better off under a charge system. To raise $1 million, an owner of a residential parcel of 0.1 acres would be taxed $2.99; to raise the same amount through charges, the same owner would be charged only $0.84 (Case A) or $1.93 (Case B).
- Industrial property owners would be better off under a property tax system. An owner of a parcel of 12.6 acres would pay $81.11 under a property tax system, but would pay $110.17 and $252.29 under Cases A and B, respectively.
- Whether commercial property owners would be better off depends on the user charge rate structure.
- Owners of agricultural and exempt parcels would be significantly better off under tax systems.

Case A can be distinguished by both the large percentage of total charges that would be paid by agricultural, exempt, and unimproved property owners and the relatively small percentage that would be paid by owners of residential property. The main difference between Case B, a more realistic scenario, and Case C (the tax case) is the size of differences in payments by the industrial, commercial, and residential categories. To the extent that user charges actually reflect the

TABLE 3. Comparison of Parcel Charges and Taxes and Total Categorical Payments Under Different Financing Schemes in Baltimore County.

Category	Average Parcel Size (acres)	Average Parcel Value	Parcel User Charge (Case A)	Parcel User Charge (Case B)	Parcel Property Tax (Case C)
Agriculture	57.0	140,641	71.20	0.00	6.38
Commercial	2.0	491.760	20.48	46.91	22.35
Exempt	13.5	1,187,424	84.31	0.00	0.00
Industrial	12.6	1,784,426	110.17	252.29	81.11
Apartments	7.8	3,050,776	62.35	142.79	138.67
RES 0-0.25 Acres	0.1	65,678	0.84	1.93	2.99
RES > 0.25-0.5 Acres	0.3	87,155	1.27	2.92	3.96
RES > 0.5-1.0 Acres	0.7	113,203	2.07	4.74	5.15
RES > 1 < 2.0 Acres	1.4	134.121	2.70	6.18	6.10
RES > 2.0 Acres	5.0	155,944	6.26	0.00	7.09
Res Ag	10.3	104.418	12.87	0.00	4.75
Condominium	0.1	72,559	0.80	1.83	3.30
Mobile/Trailer	8.9	498,020	71.15	162.93	22.64
Other	6.1	258,699	38.10	0.00	11.76
Unimproved	2.6	18,377	3.21	0.00	0.84

Category	Number of Parcels	Category Share of Charges (Case A) (percent)	Category Share of Charges (Case B) (percent)	Category Share of Taxes (Case C) (percent)
Agriculture	1,742	12.4	0.0	1.1
Commercial	5,329	10.9	24.8	11.9
Exempt	1,804	15.2	0.0	0.0
Industrial	958	10.5	24.0	7.8
Apartments	544	3.4	7.7	7.5
RES 0-0.25 Acres	119,965	10.1	23.1	35.8
RES > 0.25-0.5 Acres	25,739	3.3	7.5	10.2
RES > 0.5-1.0 Acres	12,169	2.5	5.7	6.3
RES > 1 < 2.0 Acres	8,841	2.4	5.4	5.4
RES > 2.0 Acres	7,537	4.7	0.0	5.3
Res Ag	725	0.9	0.0	0.3
Condominium	6,408	0.5	1.2	2.1
Mobile/Trailer	35	0.2	0.6	0.1
Other	751	2.9	0.0	0.9
Unimproved	62,730	20.1	0.0	5.2

Case A = Charges to all parcels, including agriculture, exempt, other, and unimproved.
Case B = No charges to agriculture, exempt, res > 2 acres, res ag, other, and unimproved.
Note: Amount of charges and taxes sufficient to generate $1,000,000 annually in revenues.
Parcels are assessed at approximately 45 percent of market value.

demand (or necessity) for stormwater infrastructure, this example suggests that financing stormwater programs with taxes represents a transfer from residential to nonresidential property owners.

The following conclusions can be drawn. If equity is defined either as paying for use of the system, or if the polluter pays principle is adopted, a charge system seems more fair. Runoff coefficients are clearly correlated more closely with runoff volume and pollutant generation than are property values. If an ability to pay definition is adopted, one still could argue that the charge system is more fair. The main difference between charges and taxes is that, under charges, burden for payment is shifted from the residential sector to the industrial and commercial sectors. One could argue that owners of nonresidential property, who can pass costs along, are better able to pay than owners of residential property. In addition, among residential property owners, owners of the smallest, lowest valued parcels would gain most, proportionately, from the use of a charge system. On the other hand, if the benefits of stormwater management actually are reflected in property values, it may be that a property tax system is more equitable. Overall, from the perspective of equity, it appears that one can make a strong argument for the use of charges to finance stormwater management.

Potential for Gains in Efficiency

To estimate potential gains in efficiency from a charge system, one would need to know property owners' demand curves for stormwater generation and be able to estimate the corresponding price elasticity of demand. Empirical data for this are not available. However, some estimate of the potential for construction of on-site BMPs in response to charges can be made by comparing the cost of construction and maintenance of BMPs with the cost of charges. This will be done using data from Prince George's County for residential, commercial, and industrial properties (Table 4).

Prince George's County currently levies a dedicated property tax solely for purposes of flood control and stormwater management; the current tax rate is $0.135 per $100 assessed valuation. Proceeds from the tax are in the range of $11,000,000 annually. Using this as a revenue requirement, annual user charges have been estimated for average sized parcels under four different scenarios. Case A involves charges to all parcels in the County. In Cases B, C, and D, additional categories have been removed from the rate base to illustrate the effect of smaller rate bases on typical charges. Given the size in reduction of the rate base, typical charges for average sized parcels in Case D would be about twice the charges estimated in Case A. For purposes of comparison, the present value of charges was computed over a 20-year period assuming an interest rate of 8 percent.

The costs of infiltration facilities were estimated using cost equations derived by Wiegand *et al.* (1986), as presented in Schueler (1987). Facilities were sized to control one-half inch of runoff. For residential and commercial parcels, costs were estimated for infiltration trenches, the only BMPs that could be used on-site given the acreage limitations. For a typical industrial parcel, which is larger, costs have been estimated for an infiltration basin. Annual maintenance costs have been assumed to be 5 percent of construction costs. The BMPs were assumed to have a useful life of 20 years; an 8 percent interest rate was used to calculate present value.

Given these assumptions, it appears that only industrial users would consider construction of on-site BMPs in response to charges (Table 4). The present value of constructing and maintaining a trench on a residential property dwarfs the present value of charges. For an average commercial property, the cost of a trench also is significantly greater than the cost of paying charges. Only for average industrial properties, and for these, only under Cases B, C, and D, would any substitution be likely. In these cases, the degree of substitution would depend on the size of the credit.

This example is illustrative, but it suffers from several limitations. From a normative perspective, whether such a system would be beneficial depends on whether the charges levied against the property owner actually reflected the true social damage of the runoff from the property. A practical problem

TABLE 4. Comparative Costs of User Charges and BMPs for Residential, Commercial, and Industrial Properties.

Category	User Charges for Average Property				
	Case A	Case B	Case C	Case D	Cost of BMP
Residential (0.16 acres)	$12	$17	$20	$23	$669
Commercial (2 acres)	$305	$434	$523	$586	$5,157
Industrial (8.8 acres)	$1,146	$1,631	$1,965	$2,203	$11,871

Category	Net Present Value (NPV) of User Charges for Average Property				
	Case A	Case B	Case C	Case D	NPV of BMP
Residential (0.16 acres)	$118	$167	$196	$226	$996
Commercial (2 acres)	$2,994	$4,261	$5,135	$5,753	$7,689
Industrial (8.8 acres)	$11,251	$16,031	$19,292	$21,629	$11,871

Case A: Charges to all properties.
Case B: Charges to all properties except agricultural and unimproved.
Case C: Charges to all properties except agricultural, unimproved, and exempt.
Case D: Charges to all properties except agricultural, unimproved, exempt, and other.
Notes: Land Use Data from Maryland Department of State Planning (1988).
Cost estimates for BMPs after Wiegand *et al.* (1986), in Schueler (1987).

concerns the impacts of credits on revenues. If the tax system were replaced with a charge system and generators were given 100 percent credit for on-site controls, the County would have fewer revenues. While this problem could be addressed by providing partial credits, this would reduce the incentive for on-site controls. This example also illustrates one complex issue surrounding the application of pollution charges. Pollution charge systems achieve least cost or Pareto efficiency only if pollution control is characterized by increasing average cost functions. If pollution control is characterized by decreasing average cost functions (which may be the case for stormwater management because of economies of scale in the construction of BMPs), regional, or centralized, collective control could be efficient.

Overall, it is reasonable to assume that some retrofitting would occur if utilities were formed in Maryland. Managers of utilities report that users do apply for credits. Some utilities (e.g., Fort Collins, Colorado) have developed nomographs that relate credits to on-site retention.

Political Support for Utility Charges

A current trend in local finance is to use fees, charges, and other revenue "enhancers" to supplement or replace unpopular property taxes. Financing stormwater management is no exception: public works journals contain numerous anecdotal accounts of political support for utilities. The issue of whether local leaders will also support a utility can be addressed from a simple public choice perspective. This will be done using the data from Baltimore County. Following Bos (1983), it is assumed that: (1) local officials try to implement policies that are supported by at least 50 percent of the voters; (2) voters support provision of stormwater management programs at some specified level (e.g., $1,000,000); (3) some type of poll is held in which voters are asked whether they would rather pay for the programs with property taxes or utility user charges; and (4) rational voters will prefer the user charge system if their payments are less than under the tax system, and vice versa.

The distributions of payments under the charge and tax systems is illuminating (Table 3). In Case A (assuming that parcel value is roughly correlated with parcel size), property owners in all five residential acreage categories would be better off paying charges than taxes; in Case B, owners of residential property in the three categories up to one acre in size would be better off paying charges. Regardless of the case, it is clear that a significant majority of residential property owners would be better off financially under a charge system. This simple analysis ignores many factors (e.g., charges may not be tax deductible for homeowners; property owners in land use classes that would be more in charges than taxes could oppose the utility; nevertheless, it is reasonable to conclude that an official would have reason to support a charge system.

CONCLUSIONS

Utilities have the potential to generate substantial revenues in Maryland; the revenues appear to be sufficient to fund many of the programs proposed in the urban stormwater component of Maryland's Chesapeake Bay Nutrient Reduction Program. In addition, a utility user charge system may be preferable to a property tax system from both equity and efficiency perspectives. A simple public choice analysis suggests that local decision makers likely would support the utility approach. These conclusions need to be qualified in several ways.

Adequacy of Utility Revenues

The lack of comprehensive cost estimates prevents a thorough review of the adequacy of utilities as a revenue source. The actual costs of programs to achieve the nutrient reduction objectives will be much higher than cost estimates now available. Revised cost estimates are expected with an updated implementation plan for the nutrient reduction objectives. Most jurisdictions that have established utilities have phased out property tax financing of stormwater programs. If jurisdictions in Maryland were to follow suit, it is not clear how many additional, new programs they could afford before charges would reach some limit of acceptability. Current stormwater costs are not well documented; most local jurisdictions presently cannot even document total costs of existing stormwater management programs (Sediment and Stormwater Division, 1986). Finally, the potential revenues from utilities in Table 1 are gross revenues. In addition to programmatic expenses, utilities can involve substantial overhead. Costs of implementation and administration can use up significant percentages of total revenues (Lindsey, 1988b). Estimates of net revenues are needed.

Equity Issues

The argument that charges are more equitable than taxes has a number of limitations. One is that the runoff coefficients that are typically used in computing charges are poor indicators of a property's contribution to in-stream damages. Conceivably, pollutant loading factors such as those presented in Schueler (1987) could be used in billing algorithms. Although some utilities have considered this, none are known to have done so. Political decisions about the structure of the rate base and the rate factors used in determining charges also raise equity issues. Most utilities have been established in municipalities, in urban counties, or in watersheds in counties that are heavily developed. Many (10 of 19 surveyed by MDE; Lindsey, 1988b) charge properties zoned agriculture, even though these may not "use" public stormwater infrastructure. The issue of whether to include agriculture land in the rate bases of utilities in Maryland likely will become an issue, in part because, overall, agricultural property owners contribute more nutrients and cause more damage to the Chesapeake Bay.

A subtle method of influencing charges (and equity) involves manipulation of rate factors. Preliminary analyses using rate structures from three different utilities indicate that charges for users can vary by as much as 100 percent simply from choice of rate factors (Lindsey, 1988d). Decisions about whether to vary charges geographically to account for differences in capital expenditures by watershed also have impacts on the equity of rate structures. Finally, some utilities group runoff coefficients into rate classes. For example, all properties with coefficients from 0.4 to 0.6 may receive a 0.5 coefficient in a billing algorithm. This smoothing of the rate structure, sometimes proposed to account for a lack of precision in data, represents a departure from a strict pay-for-what-you-use system. Because many of these issues are jurisdiction-specific, they are destined to be raised each time a utility is proposed.

Efficiency Issues

To establish an efficient stormwater charge system, charges should be set such that the marginal unit cost for discharging a unit of pollution in urban stormwater is equal to the marginal benefits of a unit improvement in water quality. Aside from the scientific problems involved with modeling the effects of pollutant control measures, few data concerning the economic value of incremental improvements in water quality are available. The uncertainty that surrounds the effects of stormwater charges in reducing pollution is not likely to be reduced in the near future. In practice, any decisions that affect the equity of a charge system (i.e., that change the distribution of charges) also affect the potential for gains in efficiency. In each jurisdiction where utilities are proposed, studies will be needed to determine if the charges are likely to promote on-site controls.

Acceptability

Evidence suggests that decision makers will support utility financing for urban stormwater controls. Ultimately, however, the degree of political support depends on whether people support the scope and cost of programs required to achieve the objectives. There is a great deal of uncertainty about how the public will receive the nutrient reduction programs. In an economic framework, this problem can be characterized as a lack of understanding of people's willingness to pay. One avenue of research that may shed light on willingness to pay, as well as provide practical information for local decision makers, is the estimation of willingness to pay for stormwater programs in contingent valuation surveys.

Implementation

Although utilities appear attractive for financing programs proposed in the nutrient reduction program, implementation may require several years. No jurisdictions are known to have adopted plans to implement a utility. Data show that 1.5 to 2 years generally are required for planning activities prior to council or board authorization to proceed with a utility and that implementation can require an additional 6 to 12 months (Lindsey, 1988b). Numerous obstacles must be overcome before the potential offered by utilities can be realized in Maryland.

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