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THE COST OF PURITY: USE OF THE EFFLUENT CHARGE IN WATER QUALITY CONTROL AND MANAGEMENT

ANITA L. MORSE*

How clean is *clean enough* can only be answered in terms of how much we are willing to pay and how soon we seek success. The effects of such decisions on our domestic economic concerns—jobs, prices, foreign competition—require explicit and rigorous analysis to permit us to maintain a healthy economy while we seek a healthy environment. It is essential that we have both. It is simplistic to seek ecological perfection at the cost of bankrupting the very taxpaying enterprises which must pay for the social advances the nation seeks.¹

INTRODUCTION—THE EFFLUENT CHARGE CONCEPT

The cost of pure water has captured public attention as a part of increasing concern with the quality of our environment. This concern is exemplified at the federal level by the Federal Water Pollution Control Act Amendments of 1972.² States and municipalities are also seriously attempting to meet the problems of expanding water needs and scarce water resources. Laws, however, have not solved the major difficulty of maximizing the beneficial uses of water—financing the cost of purity.³

Federal grants are inadequate and appropriations do not match the goals of federal legislation. Taxpayer resistance limits the efforts of state and local governments. Yet the cost of purity is another important economic cost that the consumer must weigh in balancing his budget.

How much are we willing to spend for pure water? Is it possible to finance the cost of pure water in such a way that each consumer will

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1. COUNCIL ON ENVIRONMENTAL QUALITY, ENVIRONMENTAL QUALITY, THE SECOND ANNUAL REPORT xi (1971) (President's message).

2. Pub. L. No. 92-500 (Oct. 18, 1972).

3. The six New England states and three Middle Atlantic states expended 58.9 percent of the total amount spent on water quality control in fiscal year 1969-70. COUNCIL ON ENVIRONMENTAL QUALITY, ENVIRONMENTAL QUALITY, THE THIRD ANNUAL REPORT 157-200 (1972). State funding for state water quality agencies ranged from a low of \$27,700 in North Dakota to a high of \$4,384,000 in California for the year 1971. In 1972 the amounts were \$31,100 and \$4,934,000 respectively. *Id.* at 198-99.

receive a cost benefit that will make his economic outlay equitable and acceptable? It is submitted that the effluent charge provides an economic method of cost assessment acceptable to consumers and capable of producing adequate revenue to achieve water quality control and management.

Water use classification is now determined by the status of the user (*i.e.*, whether the rightholder is a "riparian" user or "appropriations" user), or according to the classification of the water itself (*i.e.*, whether the water is "ground water" or "surface water"), or on the basis of similar artificial distinctions.⁴ Despite these convenient legal categories, nature insists upon following its own system. Purification of our nation's waters can only be achieved by transcending legal distinctions that are not in accord with reality. Any discussion of water pollution control and water quality management must include all water sources and water uses.⁵ It must be kept in mind, therefore, that the effluent charge recognizes these distinctions and that its application is not restricted within the confines of current legal terminology.

Essentially, the effluent charge system attempts to solve the problem economists refer to as the external diseconomy of water pollution: as long as water is considered a "free good," many users will not internalize the cost of their own water use; instead, these costs will

4. It has been noted that [e]xperts at law have contributed to isolationism by setting up distinct "classes" of water, which have no sound scientific basis, and by formulating unlike rules and hypotheses for each class. This classification commonly includes:

1. Surface water in watercourses—rivers, creeks, and natural streams in general.
2. Ground water in "defined underground streams"—limited to the most obvious occurrences, because the burden of proof is usually placed on the person claiming existence of this class of water. Examples are the water in caverns or in tongues of gravel and sand that underlie stream channels but in turn are underlain and bordered by impermeable rock.
3. "Percolating" water—that is, all other ground water.
4. "Diffused" surface water—that is, water on the land surface but not in water-courses or lakes.
5. Springs—natural discharge points for ground water, and therefore derived from class 2 or class 3.

Piper & Thomas, *Hydrology and Water Law: What is Their Future Common Ground?*, in *WATER RESOURCES AND THE LAW* 9 (University of Michigan Law School 1958).

5. J. HIRSHLEIFER, J. DEHAVEN & J. MILIMAN, *WATER SUPPLY: ECONOMICS, TECHNOLOGY AND POLICY* 36-42 (1960).

be passed along to other users.⁶ The effluent charge system avoids this inequity. The system has been described as

a levy on a party for using the environment by discharging an effluent into it, and depriving someone else of the use he would like to make of the environment. While the concept is sometimes called an effluent tax, or an emission tax, this nomenclature is not strictly correct. A tax is a general charge with no immediate *quid pro quo* for the payer; thus there is a tax on tobacco and on income. A charge by the post office or for grazing on government land is another thing, however. It is a fee for a service rendered or a damage sustained.⁷

The *quid pro quo* referred to above helps insure that water users internalize the cost of their own pollution.

Implementation of such a system is admittedly not a simple task. One problem encountered is determining the cost of pollution—what it is worth at different stages of use and to whom—based on a theory of cost-benefit analysis.⁸ A further difficulty arises in attempting to impose such a system upon a legal structure based on faulty assumptions as to the nature of water.⁹ Integration of the effluent charge into the American framework will be discussed at a later point.¹⁰ At this juncture it seems helpful to illustrate the elements of an effluent charge program with a discussion of the German system.

THE EFFLUENT CHARGE SYSTEM IN THE RUHR VALLEY

The Ruhr system known as the *Genossenschaften* consists of eight associations which operate a regional system for waste disposal and water supply.¹¹ It includes a method of distributing the costs of water quality operations by levying charges on the effluents discharged in each region. The main features of the system are explained as follows:

6. Ostrom, *The Water Economy and its Organization*, in *POLITICS, POLICY, AND NATURAL RESOURCES* 376-96 (D. Thompson ed. 1972).

7. J. HITE, H. MACAULAY, J. STEPP & B. YANDLE JR., *THE ECONOMICS OF ENVIRONMENTAL QUALITY* 109-10 (1972).

8. Maass, *Benefit-Cost Analysis: Its Relevance to Public Investment Decision*, in *POLITICS, POLICY, AND NATURAL RESOURCES* 85-87 (D. Thompson ed. 1972).

9. See note 4 *supra* and accompanying text.

10. See notes 71-80 *infra* and accompanying text.

11. There is a sparsity of English language text on the Ruhr system. A good general description is available in Fair, *Pollution Abatement in the Ruhr District*, in *COMPARISONS IN RESOURCE MANAGEMENT* 142-71 (H. Jarret ed. 1961). There is, however, a vast amount of German text material well catalogued in A. KNEESE & B. BOWER, *MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS* 237-38 (1968).

Very briefly put, the *Emschergerossenschaft* procedure is roughly as follows: (1) There is estimated first an amount of dilution water necessary to dilute a given amount of waste materials subject to sedimentation (no distinction is made between organic and inorganic material) in order that they not [*sic*] be destructive to fish life under the conditions of the area. An amount of dilution water required by such materials in a given effluent is then computed on that basis. (2) An analogous calculation is made for materials subject to biochemical degradation (and which therefore exert an oxygen demand) but which are not subject to sedimentation. (3) The amount of dilution required under specified conditions in order that the toxic material in the effluent not [*sic*] kill fish is computed by direct experimentation. (4) Certain side calculations having to do with water depletion, heat in effluent, etc., are made. The derived dilution requirements are added together for the effluent and form a basis for comparison with all other effluents. In principle, costs are distributed in accordance with the proportion of aggregate dilution requirements accounted for by the specific effluent. One might say that this procedure is based on a particular physical objective, i.e. [*sic*] not to "kill fish." However, the result of the method is used as an "index" of pollution even when effluents are discharged to streams in which lower or higher standards prevail than needed to preserve fish life.

The Ruhrverband [a Ruhr River association] method is also based on a physical objective but on a different one Again, the details are described elsewhere. In essence, however, the method is founded on the concept that toxic wastes by killing bacteria and slowing down the rate at which wastes are degraded have somewhat the same effect on treatment plant effluents and the level of BOD [biochemical oxygen demand] in streams as an *increase* in the amount of degradable material. On the basis of laboratory tests, an equivalence is formed so that toxic as well as degradable wastes are converted into a standard unit—a "population equivalent BOD."¹²

Once costs are determined under the above method they are as-

12. A. Kneese, Water Quality Management by Regional Authorities in the Ruhr Area with Special Emphasis on the Role of Cost Assessment 23-24, Dec. 27, 1962 (paper presented before the Regional Science Association meeting).

essed pursuant to well-defined guidelines. Assessments are based on the principle

that both the cost of pollution abatement and the value of direct as well as indirect benefits derived by a member from the execution, maintenance, and operation of specific installations of the Association are assessable. In the Emschergenossenschaft, enterprises other than mining are obligated in the roster only if their contributions equal or exceed 0.5 percent of the annual budget. If they do not, the member district in which a given enterprise is situated is assessed. Association assessment then gives way to local taxation.¹³

A further important aspect of the system is its requirement of mandatory membership in each association. It is provided that municipal and rural administrations as well as industrial enterprises that discharge their waters into rivers and streams have a voice in the association's operation. Fairness is further assured by a built-in safety mechanism which allows judicial review of all assessments.¹⁴

Much of the system's success can be attributed to its regional orientation. As such it employs various quality and quantity control methods including waste treatment, collective treatment plants, diversion of the flow of streams to promote purity and enhance waste sterilization, use of artificial recharge of underground aquifers, and specialized use of certain streams for waste-effluent carriage. Wastes are then specially cleaned in a treatment plant before they are allowed to enter the Rhine, of which the Ruhr area streams are tributary.¹⁵

The various economic and procedural concepts of the *Genossenschaften* are detailed at length elsewhere.¹⁶ For the purposes of this article, it is sufficient to note the following limitations. First, the system is intended to serve a regional water supply. Second, the system entails a comprehensive plan that includes waste disposal, water supply, flood damage reduction, and land drainage control through planning, design, construction, and operation of water quality management facili-

13. Fair, *Pollution Abatement in the Ruhr District*, in *COMPARISONS IN RESOURCE, MANAGEMENT* 152 (H. Jarret ed. 1961).

14. *Id.* at 153.

15. H. BANKS, E. CLEARY & A. KNEESE, *DEVELOPMENT OF A WATER QUALITY MANAGEMENT PROGRAM FOR THE DELAWARE RIVER BASIN* 10 (1963) (report to the Delaware River Basin Commission).

16. A. KNEESE & B. BOWER, *MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS* 143-79 (1968).

ties and wastewater treatment plants. Third, the system contemplates compulsory membership and participation privileges commensurate with the amount of contribution to the association's expenses. Fourth, the system is based on the principle that costs of constructing and operating the system should be borne both by members who are responsible for the effluent discharges and by those who benefit from the use of the water. Fifth and most important, the system includes strict regulatory supervision by the state.

It should be observed that the system necessarily ignores straight marginal cost pricing in favor of a charge that provides an incentive to preserve scarce resources. The charge levied by this regional system on individual waste discharges serves two purposes. It serves as an equitable means of assessing the cost and distributing the benefits of the regulation and treatment of stream waters. More importantly, it provides an incentive for polluters to reduce waste loads through process adjustment, recovery practices and pretreatment.¹⁷ This latter point is emphasized because it illustrates the importance of using the effluent charge, not as a "permit to pollute," but rather as an incentive to prevent pollution and encourage potential polluters to curtail waste loads.¹⁸

The decision to implement a similar plan in the United States must necessarily depend on the existence of common features that would make the system acceptable and workable on a practical level. Although no system exists in this country comparable to the *Genossenschaften*, there have been certain programs which merit attention. Before turning to the salient features of the water control structure in the United States generally, a few of these programs will be discussed briefly.

THE AMERICAN EXPERIENCE

At present there are at least four programs, ranging from the state to the federal level, which contain characteristics of the effluent charge. The state of California, and more recently Vermont, have some form of this system. On the Eastern Seaboard a regional approach was taken in the Delaware River Basin Compact. Finally, the most promising (but as yet untested) approach is that envisioned by the Federal Pollution Control Act Amendments of 1972.

17. DELAWARE RIVER BASIN REPORT, *supra* note 15, at 11.

18. One writer appears to conceive the effluent charge as a sanction to be placed upon industries for their pollution practices rather than as an integral part of a water resource program that affects every user and those receiving benefits. See Grady, *Effluent Charges and the Industrial Water Pollution Problem*, 5 NEW ENG. L. REV. 61 (1969).

California

California has been a leader in legislative control of water resources.¹⁹ In 1967 the basic organization for water pollution and quality control was modified by the creation of the State Water Resources Control Board and the integration of water quality and quantity control at the state level.²⁰ The reorganization recognized the need for a comprehensive program of water resource planning on a level allowing maximization of benefits on both the social and economic levels through cost savings and optimum use of resources.

A study panel report²¹ recommends certain changes in existing water quality control legislation in California, stating that a major problem is the financing of needed improvements in present waste treatment systems.²² The report takes cognizance of the inadequacies of federal and state financing as well as impediments encountered in local government financing; it recommends that

[t]he state board should be authorized to require the establishment of sewer service charges by public agencies applying for federal grant funds when such agencies cannot otherwise adequately finance the local agency share of the proposed waste treatment facility.²³

It is asserted that such charges will result in a better allocation of resources because each contributor to the pollution load pays his own share; such a system should encourage wiser economic decisions on the part of polluters.²⁴ In support of this recommendation, the report cites the San Francisco Bay-Delta Study (covering a 12 county area) which indicates that 55.4 percent of the revenue for water waste disposal between 1962 and 1967 has come from sewer service charges.²⁵ The report concludes that sewer service charges are advantageous because:

1. Costs are distributed amongst the producers of waste who cause the problem.
2. Local property taxes are not thereby increased.

19. CAL. WATER CODE §§ 1004-07 (West 1971).

20. *Id.* §§ 174-89.

21. STUDY PANEL TO THE CALIFORNIA STATE WATER RESOURCES CONTROL BOARD, RECOMMENDED CHANGES IN WATER QUALITY CONTROL 2-3 (1969).

22. *Id.* at 37.

23. *Id.* at 38.

24. *Id.*

25. *Id.*

3. There is increased flexibility in financing, with the result that rates can be established to reflect local situations.²⁶

Vermont

Compared to the California system, Vermont's experiment in this area is limited and hardly achieves the goals of an effluent charge system. Vermont enacted a water pollution control act which provides for pollution permits (and charges polluters for such privileges) when alternative waste disposal methods are shown to be impracticable.²⁷ It is provided that pollution charges will be adopted which "shall have the purpose of providing an economic incentive for temporary pollution permit holders to comply with the requirements, conditions, and restrictions of their permits."²⁸ The charge is based on the damage to other water users caused by the "degrading effect of various types of waste in varying volumes and frequencies"²⁹

The above formula fails to force the polluter to internalize costs. The annual per person equivalent charge may not be greater than \$30—an insult, at the very least, to cost-benefit analysts.³⁰ In effect it forces the polluter to pay a bribe (and a pitifully small one at that) to other users for the privilege of polluting the waters. It provides no incentive to seek alternative methods of waste control or production.

The Delaware River Basin Compact

On the Eastern Seaboard, water resources management, viewed as a total program of quality and quantity allocation and control, is a new concept, although state and federal interest is growing.³¹ In this region, efforts to deal efficiently with the problems of water resources have been hampered, in theory, by common law doctrines governing riparian water use and, in fact, by an absence of real water scarcity. Little understanding of the problems involved in water quality control has existed in the community and the courts. At present, the growing population and the corresponding increase in water consumption (in the broadest sense of domestic, recreational, agricultural and industrial uses) are producing a scarcity of water resources and are reducing the

26. *Id.*

27. VT. STAT. ANN. tit. 10, § 911(a) (1969).

28. *Id.* § 912a(a)(e)(1).

29. *Id.* § 912a(e)(2).

30. *Id.*

31. .See, e.g., F. MALONEY, S. PLAGER & F. BALDWIN, WATER LAW AND ADMINISTRATION, THE FLORIDA EXPERIENCE (1968); Maloney & Ausness, *Water Quality Control: A Modern Approach to State Regulation*, 35 ALBANY L. REV. 28 (1970).

quality of water because of misuse and pollution of rivers, lakes and streams.

The Delaware River Basin Compact³² is one of the few efforts toward creating an integrated water quality management program on the Eastern Seaboard. Impetus for the Compact resulted from the strategic location of the Delaware River Basin. The basin serves Delaware, New Jersey, New York and Pennsylvania, and therefore must satisfy the domestic, industrial, agricultural and recreational demands of one of the most important industrial and population centers in the United States.

In July 1963 a report to the Delaware River Basin Commission³³ stated that the Compact envisioned a multipurpose water resource plan that would bring the greatest benefits and produce the most service for the public welfare. The report explored the problem of multipurpose uses that may be prejudicial to each other (such as water supply and recreation as against assimilation of waste effluents) and suggested that the benefits and costs of alternative uses must be carefully weighed. It concluded that maximum net benefit

requires, among other things, the systematic formulation of effluent standards and/or a system of charges based upon quantity and quality of waste discharges to achieve the necessary coordination of alternatives.³⁴

Federal Water Pollution Control Act Amendments of 1972

The Federal Water Pollution Control Act Amendments of 1972³⁵ constitute the most ambitious and encompassing legislation in the area of water purity to date. The Act requires that water quality be brought to a standard capable of protecting fish and wildlife and providing recreational benefits by the year 1983.³⁶ It is further provided that discharge of pollutants into the navigable waters of the United States be eliminated by 1985.³⁷ It is anticipated that these goals will be accomplished through close cooperation between the federal government and the various states.³⁸

Important features of the Act may be summarized as follows. Discharge permits for dumping pollutants into the navigable waters of the

32. Pub. L. No. 87-328 (Sept. 27, 1961).

33. See note 15 *supra*.

34. *Id.* at 2.

35. Pub. L. No. 92-500 (Oct. 18, 1972).

36. *Id.* § 101(a)(2).

37. *Id.* § 101(a)(1).

38. *Id.* § 101(b).

United States will be issued under the auspices of the Environmental Protection Agency.³⁹ The states are required to submit for federal approval water quality standards and implementation plans for intrastate and interstate waters based on point discharge effluent limitations.⁴⁰ Federal approval will be based on the state's adherence to federal interstate water standards as set forth in the Act or on promise of future compliance, evidenced by a continuing plan.⁴¹ The continuing plan will provide the working guidelines for long-range goals and is a prerequisite to a state pollution permit system.⁴²

Licensing pollution is, then, a part of both state and federal pollution control programs. This becomes more obvious when the provisions on implementation of standards⁴³ are read in conjunction with the provisions for grants for construction of treatment works.⁴⁴ Under the latter provisions it is provided that

[w]aste treatment management plans and practices shall provide for the application of the best practicable waste treatment technology before any discharge into receiving waters, including reclaiming and recycling of water, and confined disposal of pollutants so they will not migrate to cause water or other environmental pollution and shall provide for consideration of advanced waste treatment techniques.⁴⁵

Read together, the provisions of the Act may be said to acknowledge the integral problems of water quality and management, accept cost-benefit criteria as a guideline for pollution control goals, and require the internalization of costs by the imposition of charges on water users.⁴⁶ If fully implemented,⁴⁷ the impact of the Act should be considerable.

39. *Id.* §§ 201-12; § 511.

40. *Id.* §§ 301-03.

41. *Id.* § 303(e)(3).

42. *Id.* § 402(b).

43. *Id.* § 303.

44. *Id.* §§ 201-12.

45. *Id.* § 201(b).

46. SENATE COMM. ON PUBLIC WORKS, FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972, S. REP. NO. 92-414, 92d Cong., 1st Sess. (1972).

47. The Act was unanimously passed by Congress over President Nixon's veto. The Administration had called for \$6 billion to be spent over a three year period. Congress, however, appropriated \$24.6 billion. The President then announced that he would spend only \$5 billion of the \$11 billion allotted for the next two years. N.Y. Times, Dec. 3, 1972, § 4, at 1.

As the above survey of systems indicates, the effluent charge plan, in some form, has been offered as a possible solution for the successful creation and operation of a water resources control program. Little progress, however, has been made in implementing such an effluent charge system in multipurpose water use programs. Imposition of such a system depends, in large part, on whether it can be adapted to present systems on a practical level. The remainder of this article will explore this problem.

VARIATIONS OF THE CHARGE SYSTEM IN THE UNITED STATES

There are two major financing systems now used in the United States to effect water pollution control or water resources allocation. These are the imposition of user charges by municipalities and the use of tax incentives to encourage installation of water pollution control devices.

The user charge resembles an effluent charge in that it has mandatory aspects and can be used as a part of a comprehensive plan for water resources control. On the other hand, tax incentives (such as property tax relief or fast depreciation write-offs) depend on the voluntary action of private individuals to construct and operate pollution control facilities.

The use of tax incentives is considered only briefly here because of the lack of direct relationship between a scheme such as the effluent charge, which contemplates regulatory supervision and mandatory association, and one based on voluntary cooperation. It is the opinion of this writer that the basic failure of the tax incentive plan is that it merely gives industry a greater return on an already profitable investment, since the original expenditure for pollution controls is, in most instances, based upon profit motive. The voluntary nature of the plan insures that pollution controls will not be installed unless the investment will produce an adequate marginal return. Therefore tax incentives will only work where there will be increased profit. The only case in which tax incentives may work to induce investment that otherwise might not have been made is that in which the marginal returns from investment in pollution control as compared to a possible alternative is enhanced by the added inducement of a tax incentive. This is not the typical situation.

The use of tax incentive legislation as a means of encouraging industry to participate in pollution control and as a means of arousing public interest and pressure on industry cannot be overlooked, however, when more efficient methods are unavailable. But the problems of distinguishing between pollution control equipment and normal and necessary capital expenditures make the granting of tax breaks difficult to

administer. As a practical matter, such relief often amounts to a gift to industry.⁴⁸

As noted above, the user charge, on the other hand, contains certain aspects of the effluent charge that may render the imposition of the latter system more feasible. The following discussion details the elements of the user charge and sets forth user charge programs employed in the United States.

User Charges

The Federal Water Pollution Control Administration has compiled a three volume study of waste treatment in the United States.⁴⁹ The following discussion relies primarily on Volume III of the study.

User charges have been instituted in large part as a method of meeting the increasing expenditures for pollution control at federal, state and local levels. Volume III estimates that over 70 percent of municipalities of populations 5,000 or over (as well as many with populations under 5,000) utilize such a charge system. Almost all municipalities have a tap or connection fee. Municipal use of sewer service charges also increased from 30 percent to 62 percent between the years 1953-62. Reasons for recent expansion in adopting sewer service charges include debt limitations placed on municipalities and restrictions on the tax resources available to them.⁵⁰

User charges are based on varying formulae. Some municipalities charge a flat monthly rate against all customers while others employ a complex formula that might include the type of customer, the number of plumbing fixtures and the quantity of water purchased. The tap or connection fee can also be on a fixed or a formula basis. The most widely employed methods of calculating charges are outlined below:

- (1) *Water use*: This formula is based on a percentage of the water bill, the volume of water used, or a combined formula that includes both a sewer and a water charge or the volume

48. COUNCIL ON ENVIRONMENTAL QUALITY, ENVIRONMENTAL QUALITY, THE SECOND ANNUAL REPORT 141 (1971).

49. FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, THE COST OF CLEAN WATER AND ITS ECONOMIC IMPACT (1969). The report consists of three volumes. Volume I, The Report, updates the Department of the Interior's 1968 cost analysis. Volume II, Appendix, provides summary data from the Federal Water Pollution Control Administration's municipal waste inventories of 1962 and 1968. Volume III, Sewerage Charges [hereinafter cited as Volume III], discusses the financing of wastewater collection systems and the considerations pertinent to the selection of a user charge program by a local governmental unit as a means of raising revenue.

50. Volume III 12-23.

of water and characteristics of the sewage. Water use is most frequently employed by large municipalities containing industrial complexes.⁵¹

(2) *Plumbing fixtures*: This method charges in relation to the amount and type of fixtures and is not commonly utilized. Texas may be the only state that employs this formula.⁵²

(3) *Flat rate*: This method is used by the majority of cities having a population of 5,000 or less; however, it is seldom employed by large municipalities. Its advantage is its simplicity; charges, however, are in no way related to costs. This is why its use is limited most commonly to small communities where industry is slight and water uses are generally uniform.⁵³

(4) *Modified flat rate*: This is a sophisticated version of the flat rate that varies the charge by the type of customer. Usually this is accomplished through the use of a system separating users into residential, business, municipal, and light and heavy industrial classes. The system allows a more equitable system for the user and also an increase in revenue for the municipality.⁵⁴

(5) *Sewer connection and tap fees*: Nearly all municipalities have an initial charge. The variations in method of charge include: (a) the size of the sewer connection or water meter, (b) the frontage, (c) the condition of the street, and (d) the location of the customer. The charges are usually minimal.⁵⁵

(6) *Charges to outside customers*: There has been an increase in the amount of sewage service offered to customers outside municipal limits. The expansion has included assumption of city sewer functions by utility districts. Over 50 percent of municipalities above 50,000 provide service to outside users. Generally, however, no distinction is made between old and new customers on a sewer addition.⁵⁶

As the above survey indicates, municipalities have found some form of charge acceptable and necessary. This experience with user charges should provide a significant structure on which the more sophis-

51. *Id.* at 16-18.

52. *Id.* at 19-20.

53. *Id.* at 21.

54. *Id.* at 22-23.

55. *Id.* at 24-25.

56. *Id.* at 29.

ticated effluent charge may be imposed. It is also important to note that the heavy discharge of effluents from industrial complexes has prompted the employment of charges in joint treatment facilities by municipalities and industry.

Joint Treatment and Industrial Surcharges

There has been a great expansion of the joint treatment of municipal and industrial wastes due to expansion of sanitary districts and the willingness of industry to join municipal waste treatment systems. Normal procedures for such joint treatment facilities are promulgated by the American Public Works Association.⁵⁷

The regulations normally control the types of waste that are acceptable in the treatment system. Nonacceptable waste must be given pretreatment. There are indications, however, that such regulations are not vigorously enforced, with the result that industrial users are not charged full costs.⁵⁸ As a consequence, some municipalities incur large costs that are passed on to local taxpayers and other users. A comprehensive method of calculating surcharges and strict enforcement of pretreatment regulations provide the only practical approach to the efficient and beneficial use of a combined sewage treatment facility.

Surcharges are based on four formulae: the constant rate formula, the quality-quantity formula, the California formula and the Joint Committee formula. The constant rate formula is most frequently used because of its ease of administration. Variables involved in setting the rate include many of the features of the user charge. For example, charges can be based on water use or type of business. There is, however, little indication that any testing of the effluent is involved in setting the rate; thus, the charge offers little or no inducement to business to improve or reduce its effluent.⁵⁹

The quality-quantity formula is employed by a small but growing number of municipalities. It takes into account both the amount and characteristics of the sewage and allocates costs among the actual polluters. The formula also serves as an inducement to business to improve its own methods of pretreatment or to reduce the quantity of waste load. However, the method involves a total administrative scheme of testing,

57. AM. PUB. WORKS ADMINISTRATION, GUIDELINES FOR DRAFTING A MUNICIPAL ORDINANCE ON INDUSTRIAL WASTE REGULATIONS AND SURCHARGES (Special Report No. 23, Chicago 1959).

58. Volume I, *supra* note 49, at 10.

59. Volume III 29.

enforcement and calculation of treatment charges, which impedes its implementation in areas with inadequate technical competence.⁶⁰

The California formula looks both to flat rate charges and to quality-quantity charges, and selects the plan that will best suit the area in question. A third possibility in California is to use the amount of municipal taxes paid by the business in assessing the charge.⁶¹ This formula is "historic" because it places costs on the basis of prior classification; it provides no equitable or realistic measure of the user's actual share of the cost.

The Joint Committee formula is discussed in the next section. Briefly, the formula would divide the costs into nonuser fees collected through property taxes or special assessments and user fees assessable through the quality-quantity formula.⁶²

The existence of the various charge programs just discussed has prompted the development of various theories and methods by which the systems might best be employed to allocate the cost burden of water resource management. Some of these proposals are discussed below.

Division of Cost Responsibility Between Users and Nonusers

Politicians, economists, administrators and lawyers are in the forefront in devising methods and theories which take into account cost assessment practices in water resource management. Each discipline places emphasis on a particular goal, and theories vary in method of cost allocation in proportion to the degree of emphasis placed on diverging or similar goals. The theories summarized below represent but a sampling of plans for allocating the cost burden of water resource management:

- (1) *Public utility theory*: Sewage service is conceived as a commercial enterprise such as the production of electricity. Rates are computed on the metered amount of water the user consumes and the most common method of assessment is a modified flat rate based on the classification of the user (residential, industrial, business, municipal) and on the amount of

60. *Id.* at 30-31. The quantity (amount of water used) and quality (type of effluents discharged) formula will only be successful if specific discharge limitations are imposed. It has been noted that industrial users can cut down on the amount of water they use and increase the amount of wastes dumped into less water in order to decrease costs. See D. ZWICK & M. BENSTOCK, WATER WASTELAND: RALPH NADER'S STUDY GROUP REPORT ON WATER POLLUTION 327 (1971).

61. Volume III 32.

62. *Id.*

use. It places direct responsibility on the users of the service.⁶³

(2) *Diffused benefits theory*: This theory assumes a "right to pollute" and states that benefits are derived by all individuals, inside and beyond the municipality, from the collection and treatment of sanitary sewage and industrial waste. It takes all responsibility away from the polluter and allocates costs among the federal, state and local levels of government by general tax levies.⁶⁴

(3) *Added expenditure theory*: This theory argues that the additional cost, once the primary function of the sewage system is determined (whether it be storm sewage or sanitary and business sewage), should be charged to the user.⁶⁵

(4) *Alternative revenue theory*: This procedure arrives at the same result as the public utility theory; it states that user charges are more acceptable than increased property taxes.⁶⁶ Stated another way, the theory looks toward the availability of revenue and the ability to impose the cost burden on the general public; it concludes that user charges are more economically efficient than traditional methods of taxation as well as being more acceptable to the public.

(5) *Capital and operation cost theory*: This theory assigns capital costs to nonusers (property owners who benefit from the enhanced property value) and operating costs to users (those who discharge wastes into the system).⁶⁷ Assignment of costs, however, does not answer the question of how to collect the assessments.

(6) *Differential benefits theory*: Here cost is divided in proportion to the benefits derived from the service. The theory would take away any direct responsibility for pollution control from the creator of the waste. It also involves numerous complex evaluations, such as assessing the cost of recreational benefits or the hypothetical loss incurred if there were no service.⁶⁸

(7) *Relative use theory*: The system is divided into parts such as the collection system and the treatment plant system. Costs are then allocated on the basis of the volume of sewage flowing through each part.⁶⁹ Nonusers would then be responsible for

63. *Id.* at 38.

64. *Id.*

65. *Id.* at 39.

66. *Id.* at 40.

67. *Id.*

68. *Id.* at 40-41.

69. *Id.* at 41.

collection costs (storm and infiltration water) and users would be responsible for treatment of sewage.

(8) *Joint Committee theory*: This theory was formulated by representatives of eight national committees on water resource control. It divides costs between property and users based on annual fixed and operating costs. Fixed costs are divided into collection, interception, pumping station and plant categories. The costs are then allocated to user, storm water, future growth and infiltration categories on the basis of volume and characteristics of each type of sewage. Property is allocated the cost for future growth, infiltration and storm water. The same accounting methods are used for calculating operating costs. The property share is payable through special assessments or property taxes and the user share by user charges.⁷⁰

All of the theories involve an interplay of considerations of equity, economic efficiency, administrative simplicity and revenue adequacy. Flat rate charges are the least equitable, provide low economic efficiency, inadequate revenue, and score high only on administrative simplicity. The Joint Committee formula, on the other hand, scores high on all counts except administrative simplicity. Water use provides an intermediate method that provides an acceptable but not wholly adequate alternative to the Joint Committee theory.

It is apparent that the user charge system is widespread⁷¹ and that attempts have been made to construct formulae by which such charges can be better utilized. The pervasiveness of user charges, coupled with the many features they have in common with the effluent charge, makes the latter system a viable alternative. Advocates of the effluent charge must be constantly alert to these similarities and utilize them to best advantage.

The remainder of this article will be devoted to selected effluent charge models which have been suggested, followed by a discussion of possible modifications.

EFFLUENT CHARGE PROPOSALS

Various proposals have been advanced for implementing some form of effluent charge system in the United States. One writer suggests the use of broad scale planning and development of comprehensive area

70. *Id.* at 41-45.

71. *Id.* at 61-98.

or river basin water use projects.⁷² An organization would be created that could design a total system and authorize the allocation of costs:

This could be accomplished through various combinations of central planning, construction, and operating facilities (dams, sewage treatment facilities, holding lagoons, water-supply treatment facilities, etc.) on the one hand, and a system of charges, bounties, and regulations on the other.⁷³

The cost of creating and maintaining a comprehensive water use project should be distributed among those who cause the pollution and those who benefit from its alleviation.⁷⁴ To date, the experience of the Delaware River Basin Commission, the first federal interstate compact commission for the comprehensive development of a river basin, indicates the existence of both the physical and technological capability and the expressed desire to implement comprehensive water projects on a cost sharing basis.

A report of the Federal Water Pollution Administration on the Delaware River Basin represents one of the first efforts to create a computer model upon which charges could be based.⁷⁵ The report has been summarized as follows:

1. Effluent charges should be seriously considered as a method for attaining quality development;
2. Cost of waste treatment induced by a charge level will approach the least-cost treatment plan;
3. A charge level of eight to ten cents per pound of oxygen-demanding material discharged appears to produce relatively large increases in critical dissolved oxygen levels;
4. A charge of that level is not expected to cause major regional economic adjustments (such as the closing of industrial plants) in the study;
5. An effluent charge method entails greater administrative costs and management difficulties than conventional methods of water quality improvement but the problems are not insurmountable and are not sufficiently great to negate the advantages of the charge method;

72. A. KNEESE, WATER POLLUTION: ECONOMIC ASPECTS AND RESEARCH NEEDS 30 (1962).

73. *Id.*

74. A. KNEESE & B. BOWER, MANAGING WATER QUALITY: ECONOMICS, TECHNOLOGY, INSTITUTIONS 237-38 (1968).

75. FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, REPORT ON THE EFFLUENT CHARGE STUDY (1966).

6. The charge method attains the same goal as conventional methods of improving water quality, but treatment costs are lower, and the effect on waste dischargers is more equitable. Also the charge provides a continuing incentive for the discharger to reduce his waste discharge and serves as a guide to public investment decisions.⁷⁶

The similarity of sewer and industrial waste charges levied by municipalities to the effluent charge obviates any difficulties in imposing the more comprehensive effluent charge.⁷⁷

One writer suggests a program of control based on the premise that waste discharges upstream be cut back in a prearranged, proportional manner during periods of low flow in order to maintain the stated quality conditions at some downstream point of use.⁷⁸ One criticism of the plan is that it does not consider all possible economic aspects of water use and allocation; optimum use may be sacrificed to a lesser use of the downstream riparian when protection of the downstream riparian's rights could be effected through repurification rather than prohibition of waste discharges. However, the advantage of the plan is that the effluent charge method can be used both to maintain the quality levels prescribed by any quality control program and to encourage and finance better economic use of water resources.⁷⁹

Regional associations for watersheds or river basins can be established to promote comprehensive water use control, resource allocation and pollution control programs within a single state as well. The California and Delaware River Basin experiences are good examples of comprehensive planning on both the intrastate and interstate levels.

Regardless of the model adopted, certain operational procedures should be instituted to assure the smooth functioning of such a program and to render it more acceptable from a political standpoint. The following proposals are advanced as a means of accomplishing these objectives.

The use of the effluent charge as a part of total water control systems should be administered so as to correspond with the present system of sewer and municipal waste charges. The municipality or sani-

76. See note 74 *supra*, at 160-61.

77. *Id.* at 143-72.

78. E. CLEARY, *THE ORSANCO STORY: WATER QUALITY MANAGEMENT IN THE OHIO VALLEY UNDER AN INTERSTATE COMPACT* 313-17 (1967).

79. See Roberts, *River Basin Authorities: A National Solution to Water Pollution*, 83 *HARV. L. REV.* 1527, 1541-44 (1970).

tary waste district should be the conduit for moneys that relate to costs of use and benefit to municipal facilities and residents. The state would act as the next level of collection and distribution with power to administer surcharges, added levies, fines and incentive plans for industrial units. The state would act as the supervisor and regulator of both municipalities and industries. All parties should be provided with a voice in the planning of water resource use and with a method of appeal of unfair and inequitable actions by officials.⁸⁰ Such a comprehensive system, if it maintained sufficient technological competence, would be able to enforce mandatory regulations, determine the amount of effluents a particular user was adding to the waste load, and encourage and assist users in improving techniques for pretreatment and reduction of waste loads.

Furthermore, the diverse expertise required for equitable and economic decision-making calls for the use of a water master or ombudsman on the staff of each conservancy area. The water master, acting in an independent capacity as a protector of the rights and interests of all parties, would serve as an informed liaison among regulatory officials and those who use and those who benefit from the system. He would hear evidence, make findings of fact and present his recommendations to the appropriate board or court. An ombudsman would be able to initiate and pursue investigations of either regulatory officials or users. Adding a protector of the public interest to the administrative framework of water regulation would contribute immeasurably to the equity of administration and to the continued improvement of a comprehensive water resource plan.

This same plan should be applied on the interstate level. The federal interstate river basin compact provides a method for comprehensive river planning in the same manner that the state conservancy district provides a method for either intrastate rivershed or ground water use planning. The Ohio River Valley Water Sanitation Commission (ORSANCO) and Delaware River Basin models, allowing each state to act as the conduit and administrator of its part of the project, are politically feasible means of proceeding.

Water resource use, although possessing national and international implications, is a local problem that is handled more efficiently and flexibly at the lowest level of political administration. Regulation and supervision, however, should be at the highest level, *i.e.*, the federal

80. *Id.* at 1544-50.

level, with a right of representation and a method of appeal available to all affected parties. If followed, the above procedures provide an orderly and efficient framework in which a system can operate. Furthermore, by giving a voice to all parties concerned, the possibility of inequity in the system is minimized.

CONCLUSION

The problem of water pollution in this country is fast approaching a stage of crisis. The public is beginning to realize that clean water is everyone's concern. As the Federal Water Pollution Control Act Amendments of 1972 indicate, this concern has instigated a concerted quest for an efficient solution.

It is clear that water control methods which may have been adequate in the past will not solve the problems of the future. It is also apparent that the answer to water pollution abatement lies in a program of total water control rather than piecemeal attacks. It is similarly evident that such programs will be costly.

The United States seems ready to accept its responsibility in the field of water resource control and allocation—as indeed it must. It is submitted that the costs of natural resource allocation and preservation are best shared by the general public and that, at one time or another, each member of the public will share in the benefits of an effective system of water purification.

