

CONTROLLING INDUSTRIAL WATER POLLUTION: COLOR THE PROBLEM GREEN

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I. INTRODUCTION

The green color alluded to in the title is not a reference to the nauseous cast imparted to thousands of miles of waterways by acids draining from nearby mining operations; nor to the dazzling array of unnatural water colorations produced by the effluents from chemical and textile industries; nor to the characteristic hue of the algal growths and other noxious water plants currently strangling our rivers and filling our lakes as the result of the high nutrient content of the waste loads they receive. Each of these references would have been accurate and relevant; however, the allusion intended was to *money*.

While it is undoubtedly true that most of the nation's social ills could be greatly ameliorated by the wise expenditure of enough money, it is submitted that environmental pollution is unique in the extent to which the relevant value conflicts may be translated into fiscal alternatives. The one proposition upon which there seems nearly unanimous agreement among environmental quality experts is that economic factors have been and continue to be the principal deterrent to cleaning up the pollution that threatens to engulf us. No disabling void in scientific knowledge nor critical gap in engineering technology bars the realization of our environmental quality goals.¹ To be sure, perfection is not the state of the art in scientific waste management but, to date, a gross deficiency of investment in available waste treatment measures has singularly frustrated abatement of environmental pollution.

Americans have been polluting their physical environment for a long time, but only in the last decade has the flood of pollutants attracted sufficient public concern to create meaningful pressures on many fronts to halt the despoiling of our air, land and water resources.² The direct remedy for nearly all of our environmental pollution problems

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¹ See Report on Environmental Pollution by the Subcomm. on Science, Research and Development of the House Comm. on Science and Astronautics, 89th Cong., 2d Sess. (1966).

² One evidence of the climate of public opinion is the avalanche of nontechnical books and articles devoted to pollution that have appeared in the last few years. See, e.g., P. Briggs, *Water the Vital Essence* (1967); D. Carr, *Death of the Sweet Waters* (1966); F. Graham, *Disaster by Default, Politics and Water Pollution* (1966); L. Herber, *Crises in Our Cities* (1965); League of Women Voters, *Education Fund, The Big Water Fight* (1960); P. Rodale, *Our Poisoned Earth and Sky* (1964); J. Wright, *The Coming Water Famine* (1966); Dugan, *Nor Any Drop to Drink*, *Playboy*, Sept. 1966, at 150; *The Crisis in Water*, 48 *Saturday Review* 23-44, 76-80 (Oct. 23, 1965).

lies in the creation and application of procedures to capture and cleanse the innumerable wastes generated by our modern industrial civilization. The aggregate cost of effecting a substantial restoration in environmental quality is monumental.³

Because our water resources have suffered the most severe deterioration in quality, water pollution abatement carries the highest price tag. Estimates of the total cost of eliminating the backlog in waste treatment facilities while keeping pace with the torrent of wastes produced by our burgeoning population and our expanding industries run as high as 110 billion dollars over the next three decades.⁴ The share of this projected cost attributable to industrial waste treatment is probably greater than 50 percent.⁵

This article will explore the nation's water pollution problem as it relates to industrial waste disposal. Two basic issues pervade the discussion: What cost is reasonable and how should the cost burden be distributed? In addressing these issues, first, a brief examination will be made of the facts of industrial water pollution. Second, specific pollution problems created by major industrial water users will be considered. Next, the existence of a national water quality policy will be explored, and finally an analysis will be made of various methods for generating investment necessary to implement the policy.

II. THE FACTS OF INDUSTRIAL WATER POLLUTION

Before discussing the alternatives for generating the needed investment in industrial waste treatment, two aspects of the pollution problem must be noted. First, the case should be made that such a need truly exists. Second, the reasons why industry has done an inadequate job of waste treatment should be considered.

As to the first aspect, great skills of advocacy are hardly required. Barring significant breakthroughs in weather modification or desaliniza-

³ See generally Nat'l Acad. of Sci., Nat'l Research Council, *Waste Management and Control*, Pub. No. 1400 (1966); Report of the Environmental Pollution Panel, President's Science Advisory Comm., *Restoring the Quality of Our Environment* (1965).

⁴ Hanks & Kube, *Industry Action to Combat Pollution*, 44 Harv. Bus. Rev. 49, 57-59 (Sept.-Oct. 1966). The figure frequently suggested by Sen. Muskie is 100 billion dollars by the year 2000. Hearings on S. 2947 (and related bills) Before the Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 89th Cong., 2d Sess. 23 (1966) [hereinafter cited as 1966 Senate Hearings]. Most recent cost estimates on the short-term cost place the required investments between 1969 and 1973 at over 26 billion dollars. U.S. Department of the Interior, Federal Water Pollution Control Administration, *The Cost of Clean Water*, Vol. I, Summary Report 3-4 (1968) [hereinafter cited as *Costs*]. Short-term cost estimates are found in S. Rep. No. 1367, 89th Cong., 2d Sess. 11-12 (1966).

⁵ Estimates of needed industrial investment are sketchy because only a small segment of industry has begun to meet its pollution control responsibilities. U.S. Department of the Interior, Program of the Federal Water Pollution Control Administration 5 (July 1967) [hereinafter cited as *Program*]. Recent estimates of needed industrial investment for 1967-1973 run as high as 4.6 billion dollars. *Costs*, supra note 4, at 4.

tion, by the year 1980 water use in the United States will exceed the dependable supply of fresh water by 85 billion gallons per day. By 2000 the gap will be 350 billion gallons per day.⁶ Wholesale reuse of water becomes essential under these circumstances, just as it has been necessary in many parts of the country for some time.⁷ To be reusable, water must be maintained at quality levels reasonably suitable for the purposes of the downstream users. On these bare facts, it is not difficult to understand why water pollution control is the number one environmental quality problem.

Industry is the largest user of water, currently using around 200 billion gallons of water a day.⁸ By 1980 industrial use is expected to double. Although industry's quality requirements are not high in comparison to most other users, badly degraded water is not suitable for many industrial purposes. Therefore, industry has a substantial interest in the quality of water entering its intake pipes.

Industry is also the most flagrant abuser of water quality. Industry discharges into the nation's waters organic wastes with a pollutional strength of at least double the sewage of all municipalities combined.⁹ In addition, industry effluent contains an untold quantity of inorganic wastes. Industrial pollution was responsible for 53 percent of the over nine million fish killed by pollution in 1966.¹⁰ In 1964 only 30 percent of the waste water discharged by industry received any treatment whatsoever; and much of what was treated passed through municipal sewage plants.¹¹ Projections to the year 2000 show a seven-fold increase in the wastes of water-using industries.¹²

Industrial wastes impair water quality in diverse ways. Wastes may contain bacteria or viruses harmful to human health. Besides obvious aesthetic considerations, the decomposition of organic wastes robs water of dissolved oxygen essential to support the life processes of aquatic creatures. Salts, acids, phenols, alkalies and other compounds present in industrial waste waters degrade water for a wide range of uses, while the various organic or inorganic chemicals industry discharges into water disrupt the delicate food chains of lower levels

⁶ Engineering estimates place the maximum amount of fresh water that can be used in the continental United States at 650 billion gallons per day. In 1960 the maximum available supply was 315 billion gallons per day. By 1980 engineering works may increase this to 515 billion gallons. See Staff Report to the Senate Comm. on Public Works, 88th Cong., 1st Sess., *A Study of Pollution—Water 1-7* (Comm. Print 1963) [hereinafter cited as Staff Report].

⁷ One frequently quoted statistic on reuse is that water in the Ohio River is used 3.7 times before it enters the Mississippi River. See *id.* at 6, 8.

⁸ In 1964, 8925 industries accounted for 97% of the nation's industrial water use of 170 billion gallons per day. Program, *supra* note 5, at 2, 4.

⁹ Industrial Water Pollution Control, in *Mill and Factory* 58 (Nov. 1966).

¹⁰ 2 CCH Water Control News, No. 24, at 6-7 (Oct. 30, 1967).

¹¹ Program, *supra* note 5, at 2.

¹² Nat'l Acad. of Sci., *supra* note 3, at 12.

of animal and vegetable life and ultimately may prove toxic to people. At the opposite extreme, chemical nutrients stimulate the growth of nuisance aquatic vegetation, and hasten the natural aging processes of lakes. Dissolved and suspended inert solids affect the turbidity of water and may congest the watercourse as they precipitate. Heat added to water in industrial cooling processes may alter the physical characteristics of the water in a manner similar to an organic waste load. Finally, the escape of radioactive material into water poses an increasing threat to all forms of life.

As to the second aspect of the pollution problem—why industry has done an inadequate job of waste treatment—the explanation lies in simple economics. Industrial concerns are in business for one basic reason: to turn a profit. Waste treatment facilities cost money to construct, maintain and operate. Except in rare cases, where the treatment process recovers products with a value in excess of the cost of the treatment, money invested in waste treatment constitutes an economic loss. The choice, then, between investing fixed and operating capital in waste treatment or investing it in some other phase of the industrial process that will yield a return on investment, provides no real challenge to the industrial decision maker.¹³

Industry's wastes must be disposed of, but that is one reason industrial firms locate on watercourses in the first place. Through most of the nation's economic development water use has been regarded as a free economic good.¹⁴ Under the traditional policy of industrial waste disposal, the merits of any waste disposal process were judged by two criteria: (1) Was the waste placed beyond the range of the sense organs of the disposer and (2) was the process essentially cost free? Because it is so easy and inexpensive to dump wastes into a stream, adjustment to the notion of investing in special treatment procedures is difficult.

Unfortunately, we cannot all live upstream. To the extent the wastes cannot be dissolved immediately and assimilated by the receiving water, the costs of the laissez-faire approach to waste disposal

¹³ Summing up industry's attitude, Mr. William R. Adams, on behalf of the Pulp, Paper & Paperboard Institute, said to a Senate Subcommittee:

Today, as professional managers, we must ordinarily justify the expenditure of money for capital improvements on the basis of the rate of return on the dollars invested. However, the cost of waste treatment facilities does not provide any adequate return on investment. Therefore, such investments consume capital which would otherwise be available for investment in job-creating facilities. The dilemma confronting the professional manager is summed up like this:

The general public wants both blue water in streams and adequate employment for the community.

Hearings on S. 4 Before the Special Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 89th Cong., 1st Sess. 56 (1965).

¹⁴ See R. Hammond, *Benefit-Cost Analysis and Water-Pollution Control* 39-54 (1960); A. Kneese, *Water Pollution, Economic Aspects and Research Needs* 18-28 (1962).

are borne by the downstream user who has to cleanse the water to make it suitable for his use. The general public also bears a portion of the cost in the form of opportunity loss resulting from the diminished range of desired uses which can be made of the polluted water.¹⁵ As a member of the water-using public, industry may accrue a proportionate share of the indirect cost of pollution through loss in property value or inability to attract a high quality work force to the area; but generally, these costs are so hidden that they are either not perceived or are regarded as inconsequential in comparison to the cost of instituting and maintaining an adequate waste management program.

The long history of the development and exploitation of this nation's natural resources by private enterprise demonstrates conclusively that, in the absence of legal compulsions, only when it is to the clear economic advantage of the developer-exploiter will water resources be conserved and the public interest in their prudent use recognized. Popular concern for the degradation of our water resources is widespread and seemingly mounts with each year of additional spoilage. For water-polluting industries who market products directly to the public, it would appear the time is nigh when economic factors relating to public relations will require adequate treatment of water-destined waste discharges.¹⁶

III. MAJOR SOURCES OF INDUSTRIAL POLLUTION

It is difficult to provide a fair overview of industrial water pollution since the water quality problems posed by different industry wastes are disparate in their effect as well as in their prevention and cure. The difficulties are further increased because the "facts" of industrial waste management are not easily assembled, partly because no reliable factual inventory of industrial waste treatment practices exists,¹⁷ and partly because the interpretation to be placed on what data is available is in dispute.

In recognition of the differences among industries in the nature and degree of their pollution problems, the following discussion is focused on what are generally acknowledged to be the major sources

¹⁵ A. Kneese, *The Economics of Regional Water Quality Management* 54-55 (1964); Delogu, *Effluent Charges: A Method of Enforcing Stream Standards*, 19 *Maine L. Rev.* 29, 40 (1967).

¹⁶ See FWPCA Commissioner Quigley's discussion of the growing public relations considerations in industrial pollution control in *Industrial Water Pollution Control*, in *Mill and Factory* 44-49 (Nov. 1966).

¹⁷ The FWPCA is currently conducting a nationwide industrial waste inventory to attempt to gain specific knowledge about the character and level of industrial pollution. Industry cooperation in this effort has been something less than wholehearted. Apparently, the fear is that the facts revealed may be subsequently used in enforcement proceedings. *Hearings Before the House Comm. on Public Works*, 90th Cong., 1st Sess. 46 (1967) [hereinafter cited as 1967 House Hearings] (statement of Assistant Secretary of the Interior Frank C. Di Luzio).

of industrial pollution. This brief survey is offered as an objective presentation of the industrial pollution situation as discoverable from public information sources.

It is submitted that the following group of problem industries appear on practically every published list of serious present and potential sources of industrial water pollution: Pulp and Paper, Food Processing, Chemicals, Metal Manufacturing, Textiles, Mining, Petroleum, Power Production, and Nuclear. This listing is not intended to rank industries on the basis of the pollution threat they pose;¹⁸ nor to be an exhaustive inventory of industries with waste disposal problems.¹⁹ Rather, the following examination is an attempt to describe the pollutional characteristics of these industries' most critical wastes, including the general nature of the wastes produced, the effect of the wastes on receiving waters, the waste treatment techniques available for purifying the wastes, and the relative magnitude of the pollution load caused by the industry.

A. *Pulp and Paper*

The conversion of wood into pulp and pulp into paper are extremely wet processes that require immense amounts of water and produce large amounts of raw pollutants in the form of suspended wood fibers and "pulping liquor."²⁰ If discharged directly, these pollutants may cause significant discoloration and place an oxygen demand on the receiving waters so great as to suffocate all aquatic life in the immediate vicinity of the discharge. The wood fibers may form sludge banks which settle to the bottom and slowly decompose, blocking stream flow and robbing the water of precious oxygen.²¹

Widely practiced treatment processes for handling pulp and paper wastes include closed system filtering and recycling of waste water to recover valuable fibers and fillers, aerobic biological processes to digest organic wastes, chemical precipitation to remove discoloration

¹⁸ In response to a direct question from an industry journalist, Secretary of the Interior Udall has singled out steel, chemical, meat packing and pulp and paper as the major industrial polluters. 2 Chemical 26 No. 12 (Dec. 1966).

¹⁹ Examples of other large industries considered to contribute substantially to the industrial pollution problem include leather processing, automobile manufacturing and soap production. See generally Hanks & Kube, *supra* note 4, at 57-78.

²⁰ "The production of one ton of kraft pulp by traditional methods requires approximately 36,000 gallons of water and creates raw wastes with a strength equivalent to the oxygen demand of one day's domestic sewage from about 360 people." Some large Wisconsin pulp mills have production capacities of over 300 tons per day. Carmichael, *Forty Years of Water Pollution Control in Wisconsin: A Case Study*, 1967 Wis. L. Rev. 350, 403. "Pulping liquor" is composed of the chemicals used to separate the wood fibers from the raw wood and the residue of wood chemicals and binding agents that remain after the wood fibers have been extracted. *Id.* at 403-05.

²¹ A giant paper mill on the Coose River in Georgia discharges an effluent placing an oxygen demand on the receiving waters equivalent to the untreated sewage of a city of 200,000 people. D. Carr, *supra* note 2, at 150.

and lagooning of waste water for extended periods.²² Because several different pulping processes are utilized within the industry to separate the wood fibers, the types of wastes produced and the waste treatment practices employed vary from mill to mill.²³ In-plant recovery processes and lagooning are the most frequently used waste treatment measures.

Long identified as an egregious polluter, the wood pulp industry has been working on an organized basis for over 20 years to discover improved methods for dealing with its waste disposal problems.²⁴ The industry claims to have reduced the pollution load per ton of paper by 60 percent in the past 20 years,²⁵ and there seems little doubt that in new plants special care is given to the engineering of adequate waste treatment facilities.²⁶ Nevertheless, one-fifth of the existing pulp and paper mills have no pollution control processes and, in many of the plants that do treat their wastes, the treatment is far from complete.²⁷ Therefore, the wood pulp industry is still a front runner in the industrial pollution derby.

B. Food Processing

Food processing is a rubric applied to a large variety of independent manufacturing concerns whose principal common denominator is the similarity of their waste products. The food processing industries discharge an organic effluent which, if untreated, may severely strain the assimilative capacity of the receiving water. Typical liquid wastes include spoiled, raw and manufactured animal or vegetable materials, washing waters, transporting waters, cooking and processing wastes, overflows and unusable portions of the raw material. The most widely publicized pollution villains among food processors are probably the meat packing industry and dairy products manufacturers.²⁸ The waste

²² N. Nemerow, *Theories and Practices of Industrial Waste Treatment* 378 (1963).

²³ See H. Gehm, *Pulp, Paper and Paperboard*, in *Industrial Wastes, Their Disposal and Treatment* 194 (Rudolf ed. 1953); 1966 Senate Hearings, *supra* note 4, at 512-29.

²⁴ One interesting use made of sulfite mill liquor is to spread the waste over country dirt roads where it acts to settle dust and to bind the loose particles together to make a firmer road. Hearings on S. 649 Before a Special Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 88th Cong., 1st Sess. 548 (1963).

²⁵ 1966 Senate Hearings, *supra* note 4, at 522. Wisconsin paper mills are currently spending 10% of their capital investments for pollution control. 2 CCH Water Control News, No. 28, at 9 (Nov. 27, 1967).

²⁶ The Pacific Northwest Pollution Control Ass'n recently cited the Weyerhaeuser Company for the efficient pollution control design and operation of its Cosmopolis, Washington, pulp plant. 2 CCH Water Control News, No. 25, at 10 (Nov. 6, 1967).

²⁷ One basic problem of the industry is its size and the volume of processing done. Pulp and paper is the nation's fifth largest industry and its third most rapidly growing. The volume of wastes handled is such that even 95% effective treatment may be inadequate to permit discharge of the treated waste water into receiving waters.

²⁸ Other food processing industries with significant waste disposal problems are canning, cereal grain processing, distilling, brewing, yeast manufacturing, vegetable oil processing and beet sugar refining.

products from both of these industries are particularly offensive if introduced into neighboring waters in an untreated form. Not only do the blood, hooves, paunch manure, and grease dumped by the meat packer, and the spoiled milk, cream, and whey discharged by the dairy processor defile the appearance of water in a disgusting fashion,²⁹ but they may also exhaust the dissolved oxygen in the water for miles below their point of introduction, killing fish and other aquatic life.

The standard methods for treating food processing wastes are very similar to the bio-oxidation measures employed for human sewage.³⁰ For this reason, in-town food processors are increasingly trying to realize economies of scale by contracting with local governments for treatment of their industrial wastes in municipal plants. Separate waste treatment facilities may be required of large in-town food processors³¹ and such facilities are clearly necessary for processing plants located in rural areas. Some progress is being made in treating food processing wastes, but much of it has come only because the food processors have been under orders of local pollution control agencies. Although food processing ranks high among the nation's polluters, improvements in this industry's waste disposal practices seem to come only after protracted delays.³² Stalling tactics may serve only to postpone the inevitable closing of the small creameries and other marginal food processors for whom reasonable waste treatment is economically impossible.

C. Chemicals

The chemical industry is expanding more rapidly than any other American industry.³³ A great portion of this phenomenal growth is attributable to the development of synthetic organic chemicals from which are made such products as plastics, nylon, medicines, dyes,

²⁹ For a graphic description of the effect of the packing plant discharges, see J. Wright, *supra* note 2, at 134-37. For a discussion of the effect of dairy product manufacturing on waste water, see Carmichael, *supra* note 20, at 402.

³⁰ See N. Nemerow, *supra* note 22, at 311, 314, 325, 346.

³¹ A municipal treatment plant may not have the physical capacity or the treatment ability to handle the added volume or potency of a food processor's waste load. See *id.* at 8-11. For an interesting case growing out of this situation, see the North Carolina Att'y Gen.'s Op., Aug. 21, 1967, reported in 2 CCH Water Control News, No. 19, at 7-8 (Sept. 25, 1967), ruling unlawful a city's attempt to contribute funds to a local pickle plant to construct its own treatment facilities. The brine waste from the pickling process threatened to destroy the effectiveness of the city's disposal plant and the city engineers suggested that the financial aid to the pickle plant would have been the least cost solution to the problem.

³² For example, meat packing firms in Omaha that have been subject to federal enforcement since 1957 are only now getting their wastes processed at a minimal level of treatment. See F. Graham, *supra* note 2, at 52-84. See also Carmichael, *supra* note 20, at 400-02 (delays resulting from lack of cooperation within the milk industry).

³³ In 1963, the chemical industry ranked fourth in total assets and fifth in sales among American industries. Projections are that chemical sales will double by 1975, having increased fivefold between 1939 and 1963. Staff Report, *supra* note 6, at 14.

adhesives, detergents and pesticides.³⁴ With the emergence of the synthetic chemical industry has come a new kind of water pollution problem because wastes from the manufacture and use of these synthetic chemical products are increasingly finding their way into the nation's waters. It is known that some of the synthetic chemicals are directly toxic to various forms of aquatic life,³⁵ while others act to break down the natural aquatic food chains. Whether they may have long-term toxic effects on humans is not known for certain. In fact, the most disturbing aspect of these new inhabitants of our environment is that we do not know very much about them: we do not know their effects on water and water users; we do not have reliable devices to detect their presence;³⁶ nor do we know how to remove them from water effectively.³⁷ All that is known is that these chemicals are reaching public water supplies in increasing amounts.³⁸

At the moment, a considerable research effort is being mounted to evaluate the environment-polluting effects of the synthetics and their wastes. Synthetic chemical products and wastes behave peculiarly in water, sometimes combining with other substances to form mysterious new compounds.³⁹ Many synthetic compounds do not respond to ordinary waste treatment procedures (in fact, some of the chemicals impede the treatment of other wastes)⁴⁰ and some are not readily broken down even by the natural biologic processes that take place in the moving waters into which they are discharged. Researchers are seeking methods for creating biodegradable synthetic chemicals, a technological breakthrough which would be comparable to that achieved with "soft" detergents.⁴¹ The major synthetic producers have done a creditable job in assuming the responsibility for monitoring and treating their effluents.⁴² In many instances, the synthetic chemical industry

³⁴ An exhibit listing examples of products of the basic chemical manufacturing industry occupies eight pages in the published record of the 1965 Senate Hearings. Hearings Before the Special Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 89th Cong., 1st Sess., pt. 3, at 1009-16 (1965) [hereinafter cited at 1965 Senate Hearings].

³⁵ Over 5 million fish were killed in the lower reaches of the Mississippi River in 1963 when Endrin, a chlorinated hydrocarbon insecticide, turned up in the water in a dilute, yet lethal, concentration. The efforts to pin the fish kills on the chemical and to trace the chemical's source are described in F. Graham, *supra* note 2, at 107-35. See generally R. Carson, *The Silent Spring* 39-51, 129-52 (1962).

³⁶ Staff Report, *supra* note 6, at 15.

³⁷ It is worth noting that one of the leading authorities on waste treatment devotes only two pages to the treatment of insecticides and concludes with the ominous note that, although there is increasing concern, "At the present time, little treatment of these wastes . . . is being practiced." N. Nemerow, *supra* note 22, at 489-90.

³⁸ Report of the Environmental Pollution Panel, *supra* note 3, at 73.

³⁹ See Rodale, *supra* note 2, at 420.

⁴⁰ Staff Report, *supra* note 6, at 15.

⁴¹ 1965 Senate Hearings, *supra* note 34, pt. 1, at 158-60.

⁴² The Du Pont Corporation spends in excess of 1 million dollars a year for pollution

is an involuntary polluter, many of whose exotic products and wastes currently defy cleansing.

The sizable segment of the chemical industry not engaged in the production of synthetics also presents pollution problems. Organic wastes from industries such as those concerned with petrochemicals and inorganic wastes from many other chemical production processes diminish water quality in a variety of ways. The effect of natural organic chemical wastes on water is generally similar to the action of other organic pollutants and, therefore, pollution conditions are usually the result of inadequate application of known waste treatment techniques.⁴³

Inorganic chemicals degrade water in less overt ways, causing undesirable tastes, odors, and colors and an increased mineralization that results in water hardness and corrosion. While many inorganic chemicals are toxic in high concentration, others, such as phosphorus and nitrogen, act to nourish plant organisms. The resulting growth is largely responsible for the nuisance vegetation now choking many streams and for the eutrophication threatening numerous lakes.⁴⁴ The treatment methods available for removing inorganic chemicals from water are generally more complex and costly than those for treating organic wastes. For this reason, inorganic wastes, in high volume,⁴⁵ are frequently poured directly into receiving waters.

D. *Metals Manufacturing*

The manufacturing process by which raw ores are converted into useful metal products requires substantial amounts of water for cooling and processing. The waste water produced by metal making contains various concentrations of metallic substances, acids, alkalies, phenols and grease. The liquid wastes creating the most serious disposal problem are the so-called "pickling liquor" used to remove the oxide scale from certain steel products prior to further processing and the rinse water used to wash the steel after it has been pickled.⁴⁶ The pickling liquor contains diluted sulfuric acid and a high concentration of ferrous

control in its plant on the Kanawha River in West Virginia. P. Briggs, *supra* note 2, at 158.

⁴³ 1965 Senate Hearings, *supra* note 34, pt. 3, at 1002-09.

⁴⁴ Eutrophication is the aging process that affects all bodies of water, eventually causing them to fill with solid matter. There is strong evidence that man's careless waste disposal practices accelerate this process remarkably. For excellent discussions of lake eutrophication problems, see Hearings on S. 1591 and S. 1604 Before the Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 90th Cong., 1st sess., pt. 1, at 423-92 (1967) [hereinafter cited as 1967 Senate Hearings].

⁴⁵ See Staff Report, *supra* note 6, at 14; 1965 Senate Hearings, *supra* note 34, pt. 3, at 1007.

⁴⁶ R. Hoak, *Steel Pickling*, in *Industrial Wastes, Their Disposal and Treatment* 255 (Rudolfs ed. 1953).

sulfate; the rinse water contains the same wastes, but in a much less concentrated form. The pollution effect of discharging these wastes directly into water is more aesthetic than it is biologic. High concentrations of the acids are toxic to aquatic life and gradual oxidation of the iron suspended in nontoxic discharges turns the receiving waters a rust color. Although not of great potency, the volume of the pickling wastes is such that some form of treatment is essential.⁴⁷ Generally, in-plant recovery processes are not economically efficient. Therefore, the industry practice is either to neutralize the acidity of the wastes with an alkaline material and then lagoon them or to inject them untreated into suitable underground strata.⁴⁸ The phenol, cyanide, oil and other less voluminous metal processing wastes may place a more severe overall burden on receiving waters if discharged without treatment.⁴⁹ These organic wastes require the same type of biologic treatment as sanitary sewage.

Much of the steel industry's reputation as a polluter has grown from the waste disposal methods practiced at the industry's older and often outmoded plants. For example, in the Mahoning River Valley of Ohio and Pennsylvania where the American steel industry began, the wastes of the steel mills in the valley have literally killed a substantial portion of the Mahoning River. Reportedly, the river cannot sustain aquatic life and its waters are unsuitable for any other type of use.⁵⁰ The industry's recent record for waste treatment is not altogether unimpressive;⁵¹ however, a great deal of additional effort appears necessary to bring many of its waste disposal practices within tolerable limits.⁵²

⁴⁷ It is estimated that the industry currently produces over 600 million gallons of pickling liquor annually and four to twenty times that amount of waste rinse water. *Id.* at 256.

⁴⁸ N. Nemerow, *supra* note 22, at 400-03.

⁴⁹ A 1965 Public Health Service report on pollution in southern Lake Michigan stated that one large steel plant was daily discharging into the lake 230 million gallons of waste water containing 13,750 pounds of ammonia nitrogen, 1500 pounds of phenol, 1700 pounds of cyanide, and 54,000 pounds of oil. See F. Graham, *supra* note 2, at 149.

⁵⁰ P. Briggs, *supra* note 2, at 148-49. The temperature of the river was once recorded at 117° F. *Id.* at 148.

⁵¹ In re Pollution of the Interstate Waters of the Grand Calumet River, 5 U.S. Dep't of H.E.W. 1510-24 (1965) (reporting the progress in pollution control by the Chicago area steel mills). 2 CCH Water Control News, No. 30, at 12 (Dec. 11, 1967) (steel company constructing 20 million dollar waste treatment facility).

⁵² In a Senate Hearing exhibit, the Armco Steel Corporation stated that it would be required to expend 65 million dollars over the next five years to meet the proposed air and water quality standards. 1966 Senate Hearings, *supra* note 4, at 643. This sum is compared to the 16.9 million dollars spent by the company during the preceding 15 years. *Id.* More solid figures on needed improvements are provided by an announcement by Bethlehem Steel that the company will spend 25-30 million dollars between 1966 and 1970 on pollution corrective measures in its Lackawanna plant in response to a violation order issued by the New York State Department of Health. 1 CCH Water Control News, No. 22, at 4 (Oct. 17, 1966).

E. *Mining*

The mining and processing of nearly every mineral create waste products that will pollute waters if not carefully handled. Acid drainage from coal mines, however, clearly poses the most immediate threat to the quality of the nation's waters.⁵³ Sulfur-bearing minerals exposed in coal mining combine with air and water to form sulfuric acid which, in turn, drains into watercourses destroying aquatic life⁵⁴ and generally rendering the waters unfit for most beneficial uses.⁵⁵ Today, it is estimated that acid pollution from both surface and underground mine drainage is attacking over 4000 miles of United States streams.⁵⁶ More than half of this pollution originates in abandoned mines, the acids coming from surface waters running over mine wastes or escaping from underground mines improperly closed. The acid drainage originating from inactive mines presents a particularly challenging pollution control problem because of the difficulty in effectively assigning responsibility for carrying out corrective measures.

In the case of active mining operations, the control of the acid waste discharge involves either treatment to neutralize the waste flow or planning to prevent the formation of the wastes.⁵⁷ Neutralization techniques are expensive and frequently create a new waste with which to contend.⁵⁸ Therefore, industry prefers preventive measures. Because water and air are both necessary to support the chemical action producing the mine acids, it is estimated that preventive measures such as careful water flow control during mining operations and flooding or air sealing inactive mine areas could wipe out over 70 percent of existing mine acid pollution.⁵⁹ These problems are receiving a good deal of current attention as both state and federal pollution control officials are beginning to apply pressure to stop the flow of mine acids.⁶⁰

⁵³ 93% of the acid mining pollution in impoundments and 97% in streams result from coal mining. 1967 Senate Hearings, *supra* note 44, at 322. In the Appalachian area, two-thirds of all streams tested were acid polluted to the point that they could not support fish life. *Id.*

⁵⁴ Acid mine drainage killed about one million fish in the Allegheny River during August, 1966. 2 CCH Water Control News, No. 24, at 7 (Oct. 30, 1967).

⁵⁵ An estimated over 4 million tons of acid-equivalents are annually discharged into streams by active and abandoned coal mines. 3.2 million acres of land are producing acid drainage and this figure is increasing at the rate of 150,000 acres per year. Costs, *supra* note 4, at 36.

⁵⁶ Program, *supra* note 5, at 2.

⁵⁷ See W. Hodge, Waste Disposal Problem in the Coal Mining Industry, in *Industrial Wastes, Their Disposal and Treatment* 312-411 (Rudolfs ed. 1953).

⁵⁸ New and less costly neutralization techniques are being sought. Bureau of Mines researchers have produced a relatively efficient neutralization process using coarse native limestone. 2 CCH Water Control News, No. 2, at 4 (May 29, 1967).

⁵⁹ 1967 Senate Hearings, *supra* note 44, at 322-23.

⁶⁰ Pennsylvania stiffened its acid mine drainage laws in 1965 and already is re-

F. *Textiles*

The textile industry has long been guilty of discharging polluting wastes into northern rivers, but generally the volume of wastes discharged has been small in relation to the flow of the receiving waters. Thus, serious pollution situations have been fairly isolated. In contrast, however, the expansion of the textile industry in the South in recent years has placed a great assimilation burden on the warmer, slower moving southern rivers, with the result that pollution situations attributed to the textile industries occur more frequently.⁶¹

The wastes produced in the manufacture of textile products vary somewhat in pollution characteristics depending on the nature of the fibers being processed. Wool processing produces a "scouring liquor" highly contaminated with grease, dirt and spent cleansing agents.⁶² Cotton, flax, hemp and jute processing involves the removal of natural waxes, fats and coloring from the fibers by scouring, bleaching and dyeing procedures that produce a waste water rich in polluting materials.⁶³ The waste treatment methods conventionally employed are approximately the same for both animal and vegetable fibers, the principal difference being the use of a special cracking process to remove the grease from wool processing liquor. The cleansed liquor may then be treated biologically through any one of several standard processes.⁶⁴ Caustic wastes produced in the finishing of cotton and other textiles require a more complex treatment.

When the textile plants first began to concentrate their activities in southern states the industrialization they represented was highly coveted and complaints about their waste disposal practices were rarely heard. It would appear that the honeymoon is ending as the various state pollution control agencies in the South are beginning to take cognizance of the pollution conditions associated with the industry.⁶⁵

porting improvements. See 2 CCH Water Control News, No. 18, at 5 (Sept. 18, 1967); id. No. 35, at 5 (Jan. 15, 1968). Legislation was introduced in the last session of Congress to amend the Federal Water Pollution Control Act to provide for acid pollution control demonstration projects. S. 1870, 90th Cong., 1st Sess. (1967). This bill passed the Senate on Dec. 11, 1967. 2 CCH Water Control News, No. 31, at 1 (Dec. 18, 1967).

⁶¹ One textile mill on the Chattooga River in Georgia is reported to discharge an effluent with a strength equivalent to the sanitary sewage of 112,000 people. D. Carr, *Death of the Sweet Waters* 150 (1966).

⁶² See S. Coburn, *Textile Dying and Finishing*, in *Industrial Wastes, Their Disposal and Treatment* 171 (Rudolfs ed. 1953), where it is stated that from 1000 to 4000 gallons of waste water are produced for each 1000 pounds of wool processed.

⁶³ Scouring cotton produces 3400 gallons of waste water for every 1000 pounds of cotton produced. E. Besselièvre, *Industrial Waste Treatment* 193 (1952).

⁶⁴ See S. Coburn, *supra* note 62, at 172-91.

⁶⁵ Pollution control officials of both Alabama and Georgia recently admitted that the textile plants in their states were among the most serious of their polluters. 1965 Senate Hearings, *supra* note 34, pt. 2, at 547, 565.

G. *Petroleum*

In the petroleum industry, manufacturing is divided into two separate operations: production and refining. The water pollution problems associated with oil production are quite different in nature from the difficulties created by the cracking and refining process. Long a leader in the design and operation of pollution control measures at both stages of its manufacturing business,⁶⁶ the petroleum industry has been so successful that the major danger from oil pollution today stems from accidental spills or seepage and from the escape of the brine that often appears in the drilling process. The pollution from the recent wreck of the tanker *Torrey Canyon* off the coast of Cornwall, England illustrates the hazards of transporting petroleum products by water.⁶⁷ When oil spillage or seepage and brine find their way to underground or surface waters, their polluttional effect is severe.⁶⁸ Modern production techniques, however, are credited with reducing such dangers to a minimum.⁶⁹

One characteristic of the modern oil industry is that the waste product from one process becomes the raw product for another. Therefore, a good deal of the potential pollution load from oil operations never escapes the plant but is salvaged as a useful product through various recovery techniques. Nevertheless, each step in the process does produce unusable liquid wastes that require disposal. The treatment methods required to purify this variety of wastes are too numerous and complex to merit description here,⁷⁰ except to note they are well known to the industry and are generally practiced with a conscientiousness that other industries might do well to emulate.⁷¹

⁶⁶ See P. Briggs, *Water the Vital Essence* 154-56 (1966). The oil industry has not always worn a white hat in waste disposal matters. As recently as 1963 a major oil company confessed its contribution to the degrading of Arthur Kill, New Jersey. Hearings on Water Pollution Control and Abatement Before a Subcomm. of the House Comm. on Government Operations, 88th Cong., 1st Sess., pt. 1A, at 898 (1963).

⁶⁷ The *Torrey Canyon* broke apart on Seven Stones Reef, March 18, 1967, discharging 118,000 tons of crude oil into the North Atlantic, much of which washed ashore along the English coast. See generally Utton, *Protective Measures and the "Torrey Canyon,"* 9 B.C. Ind. & Com. L. Rev. 613 (1968). The British government has threatened legal action against the American owner of the tanker. 1 CCH Water Control News, No. 50, at 7 (May 1, 1967). In this country the disaster sparked the introduction in Congress of a spate of bills to amend the federal Oil Production Act to provide a remedy for the *Torrey Canyon* type of problem. See 1967 Senate Hearings, *supra* note 44.

⁶⁸ The Arkansas and Red Rivers are reported still suffering some polluttional after-effects from oil-field brines that have escaped into their tributaries. L. Herber, *Crisis in Our Cities* 85 (1965).

⁶⁹ Old oil production operations still cause some pollution. See 2 CCH Water Control News, No. 1, at 8 (May 22, 1967), where Pennsylvania authorities report oil pollution of the upper reaches of the Allegheny River.

⁷⁰ See generally R. Weston, R. Merman & J. DeMann, *Waste Disposal Problems of the Petroleum Industry, in Industrial Wastes, Their Disposal and Treatment* 419 (Rudolfs ed. 1953); N. Nemerow, *supra* note 22, at 429-40.

⁷¹ In the Public Health Service studies of the Lake Michigan pollution situation,

H. *Power Production*

Almost two-thirds of the water withdrawn by industry is used for cooling purposes and the largest single user of cooling waters is the electric power production industry. Water returned after use in a cooling process is generally unaltered in all of its physical properties save one—its temperature. Today's most efficient steam-electric generating stations dissipate about 50 percent of the heat value in condensing circulating water.⁷² A modern nuclear power plant can raise the temperature of waters used for cooling as much as 20°.⁷³

The addition of heat to water causes many of the same effects as the discharge of an organic pollution load. Increasing the temperature of water diminishes the amount of oxygen which can be held in solution and correspondingly reduces waste assimilation capacity of the water and its ability to support aquatic life.⁷⁴ Thus, the addition of heat to water is regarded as a polluting activity—thermal pollution. "Waste" treatment procedures include the use of cooling towers and canals and the design of facilities that add less of a heat load to the waters used.

Electric power production has approximately doubled every decade, and the current introduction of nuclear powered electric plants may act to accelerate that growth rate. The use of water for cooling purposes in the power production process is expected to increase in a direct relationship with the expansion of the industry.⁷⁵ As more of the nation's waters are impounded and river and stream flows subjected to greater controls, thermal pollution will become an increasingly more important factor in water quality management.⁷⁶

Cities Service's pollution control effort was singled out for praise. Shell's refinery at Anacortes, Washington, discharges a waste water stream so pure that it must be piped beyond the oyster beds near shore because the oysters require a saltier water. Humble's oil refinery at Baytown, Texas, won for the company the Izaak Walton League's Honor Roll Award for its comprehensive waste treatment systems. 1 CCH Water Control News, No. 13, at 6 (Aug. 15, 1966).

⁷² See Report of the Environmental Pollution Panel, President's Science Advisory Comm., *Restoring the Quality of Our Environment* 71-72 (1965).

⁷³ An interesting clash occurred in the fall of 1967 between Senator Muskie and the AEC over the question of thermal pollution. It was the AEC's position that it did not have authority to consider the heat pollution effects of nuclear power plants as a part of its licensing function. Senator Muskie disputed this vigorously. An exchange of correspondence on the issue is reproduced in 2 CCH Water Control News, No. 27, at 3-6 (Nov. 20, 1967).

⁷⁴ Warming water also increases bacterial action which further accelerates depletion of the water's oxygen resources. N. Nemerow, *Theories and Practices of Industrial Waste Treatment* 5 (1963).

⁷⁵ Growth projections for the year 2000 show a fivefold to tenfold increase in electric power capacity. Nat'l Acad. of Sci., Nat'l Research Council, *Waste Management and Control*, Pub. No. 1400, at 13 (1966).

⁷⁶ See 2 CCH Water Control News, No. 31, at 3 (Dec. 18, 1967) Bregman, *Putting Waste Heat in its Place*, U.S. Dept. of the Interior News Release, Aug. 1, 1968; Edwards, *Legal Control of Thermal Pollution*, id. Aug. 6, 1968.

I. *Nuclear*

Industries based on nuclear technology are still in their infancy; however, the wastes from this expanding group of industries loom very large on the environmental pollution horizon. Sources of radioactive pollution include residue produced in the mining and refining of radioactive minerals, wastes from nuclear reactors, and waste products resulting from radioactive substances used in science, medicine and industry.⁷⁷ Radioactivity in the nation's waters is now well below the safe allowable levels, but the danger from isolated, accidental discharges of radioactive materials is ever present.⁷⁸ Several procedures have been developed for treating radioactive waters,⁷⁹ but the ultimate disposal of liquid nuclear waste products is usually accomplished through depositing the wastes in nonporous underground formations. Not even this waste disposal technique is wholly free from danger and the fear of accidental radioactive spillage is understandably disquieting to persons concerned with downstream water quality.⁸⁰

J. *Summing Up the Industrial Pollution Problem*

To the nine major problem areas discussed above must be added the wastes of dozens of other manufacturing and processing industries of lesser size involving thousands of individual plants, each one of which creates an effluent that must be disposed of in some manner. It is not possible to assess accurately the total debilitating effect on our natural environment caused by this flood of industrial wastes. The most casual empirical observation substantiates the thesis that our waters have suffered an enormous deterioration in quality as a result of the industrial wastes discharged into them. Also clear is the prophesy that, unless drastic changes are made in industry's waste disposal habits, the worst is yet to come.

To state the problem in a nutshell, industry currently does an inadequate job of waste water treatment. Over the next three decades industry's wastes will increase seven times. Merely to preserve the present quality of the nation's waters during this period would require gigantic strides in industrial waste management. To carry out the

⁷⁷ Staff Report, *supra* note 6, at 15.

⁷⁸ A federal enforcement conference was held in connection with the Animas River in Colorado in 1958, when it was discovered that the radioactivity level in the river was unnaturally high owing to wastes discharged from the mill tailing of a uranium mine. The situation has now been substantially corrected, although some problems still exist. Hearings on Radioactive Water Pollution in the Colorado River Basin Before the Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 89th Cong., 2d Sess. (1966).

⁷⁹ N. Nemerow, *supra* note 74, at 515-37.

⁸⁰ See, e.g., Comments of the Fish and Wildlife Service in connection with a proposed nuclear power station on the James River in Virginia, in 2 CCH Water Control News, No. 23, at 13-15 (Oct. 23, 1967).

water quality enhancement program on which this nation has apparently embarked will require a crash program in industrial waste management of truly awesome dimensions.

IV. EVOLUTION OF A NATIONAL WATER QUALITY POLICY

The purpose of [this Act] is to enhance the quality and value of our water resources and to establish a national policy for the prevention, control, and abatement of water pollution.⁸¹

This declaration of policy was added to the Water Pollution Control Act by the Water Quality Act of 1965.⁸² Congressional supporters of vigorous pollution control celebrated the passage of the 1965 Act as marking an historic milestone on the road to improving environmental quality.⁸³ President Johnson characterized the statute as reflecting the nation's determination to attack its pollution problems and to control its environment.⁸⁴ The 1965 Act was followed in rapid succession by a wholesale reorganization of the federal pollution control effort⁸⁵ and passage of the 1966 Clean Water Restoration Act,⁸⁶ which substantially increased the federal funds allocated to solving water pollution problems.⁸⁷ Without doubt, the federal activity of the past few years has generated a great nationwide interest in water pol-

⁸¹ Water Pollution Control Act, 33 U.S.C. § 466(a) (1964), as amended, (Supp. I 1965) [hereinafter cited as Control Act].

⁸² 33 U.S.C. § 466(a) (Supp. I 1965).

⁸³ See 2 CCH Water Control News, No. 2, at 2 (May 29, 1967) where Secretary Udall refers to the recent federal activity as "the turning point in the war on water pollution."

Senator Muskie has said, "Prior to the enactment of this legislation, our primary concern was with repairing past damage and slowing the advance of pollution. Now, we have turned the corner, to focus on tomorrow's needs as well as today's crises." Univ. of Mich., Proceedings of the National Symposium on Quality Standards for Natural Waters 6 (July 1966) [hereinafter cited as Symposium].

Congressman Blatnik has similarly noted that, "We finally realize that such national goals as pollution abatement are properly compared to our goals in military science or space exploration. The priority of the pollution abatement effort is rising as knowledge increases and apathy is replaced by a call for action." 1967 House Hearings, *supra* note 17, at 2.

⁸⁴ Message from the President of the United States, H.R. Doc. No. 237, 90th Cong., 2d Sess. 3-4 (1968).

⁸⁵ Administrative responsibility for the Federal Water Pollution Control Administration was transferred from the Department of Health, Education and Welfare to the Department of the Interior. Reorganization Plan No. 2 of 1966, 5 U.S.C. § 1332-13 (Supp. II 1965-66).

⁸⁶ 80 Stat. 1246 (1966), amending 33 U.S.C. §§ 466a, c-1, c, d, e, g, j (1964), as amended, 33 U.S.C. §§ 466-66k (Supp. I 1965).

⁸⁷ The 1966 Act was an important legislative step in the pollution control activity of the federal government. Among the Act's more important features was the encouragement of basin planning agencies. For a brief analysis of the key provisions of the Act, see Hines, *Nor Añy Drop to Drink: Public Regulation of Water Quality Part III: The Federal Effort*, 52 Iowa L. Rev. 799, 837-38 (1967).

lution problems and has provided a valuable momentum to efforts to protect and improve the quality of the nation's waters.⁸⁸ An important question raised by these congressional and executive acts and their subsequent implementation is whether there is emerging a specific national policy concerning water quality.

Initially, it should be noted that water pollution control has traditionally been regarded as an activity to be carried out through the police power of state and local governments.⁸⁹ The federal role has always been conceived as a supplementary one, providing program support, technical assistance, research, financial assistance in facility construction and back-up enforcement. In recent federal activity, care has been taken not to tread too heavily on the primacy reserved to state and local pollution control programs.⁹⁰ Nevertheless, the 1965 and 1966 federal acts clearly express a congressional judgment that the states were doing too little, too slowly, in the abatement of pollution.

The Water Quality Act of 1965 is the key measure in the federal effort to accelerate the attack on pollution. The 1965 Act was considered by three sessions of Congress before all of the wrinkles were ironed out. As finally passed and implemented by the Federal Water Pollution Control Administration (FWPCA), which it created, the 1965 Act represents a masterful exercise in federal-state brinkmanship. The dissatisfaction with the results of state abatement efforts was tactfully expressed through the announcement of a national policy to enhance water quality. In order to spur the tempo of state pollution control, the Act requires nationwide water quality standards to be established.⁹¹

⁸⁸ Senator Muskie has described the change in national attitude in these terms: "The discussion has shifted from the issue of whether or not we should improve the quality of our water to the issue of how to best accomplish our objectives." 1966 Senate Hearings, *supra* note 4, at 306. For a discussion of the importance of momentum in the water quality control effort, see 1967 House Hearings, *supra* note 17, at 2-73 (statements of John Charles Daly and Hon. Stewart L. Udall, Secretary of the Interior).

⁸⁹ [I]t is declared to be the policy of Congress to recognize, preserve, and protect the primary responsibilities and rights of the states in preventing and controlling water pollution, to support and aid technical research relating to the prevention and control of water pollution, and to provide Federal technical services and financial aid to State and interstate agencies and to municipalities in connection with the prevention and control of water pollution.

Control Act, *supra* note 81, § 466(b).

⁹⁰ A proposal to strengthen substantially the federal enforcement arm was firmly rejected in 1966. The incursion on state authority was a major ground for the rejection. See 1966 Senate Hearings, *supra* note 4, at 327-45. Preserving a balance between state and federal responsibilities in the water pollution field has been a dilemma for Congress for some time. See H.R. Rep. No. 215, 89th Cong., 1st Sess. (1965), reprinted in 2 U.S. Code Cong. & Ad. News 3313-24 (1965); Hines, *supra* note 87, at 800-03.

⁹¹ It should not be assumed that the idea of national water quality standards only recently emerged on the pollution control scene. The 1955 Act, which created the Federal Water Pollution Control Agency on a permanent basis, originally contained provisions requiring the establishment of federal water quality standards. Hearings on S.

Although federal power with respect to water quality standards is expressly limited to interstate waters, federal officials frankly admit that they would be surprised if the states do not generally proceed to set similar standards for intrastate waters as well.⁹² This expectation seems founded on sound administrative principles. Liberal provision was made for federal funding of local pollution control programs and facilities; however, the availability of federal largess was carefully conditioned on compliance with federal requirements in the planning and execution of the local control effort.⁹³

Although the federal effort was temporarily impeded by an administrative reorganization⁹⁴ and has been slowed recently by a tightening of the federal purse,⁹⁵ the purpose of the 1965 Act—to accelerate the war on pollution—now seems certain of success as the pace of pollution control activity has quickened during the last two years. The 1965 Act stands as a classic example of how, through imaginative application of the federal carrot and stick, national goals can be achieved through primary reliance on the machinery of local government. Conceding that a considerable degree of political “savvy” lay behind the 1965 Act, the question still remains whether it is possible to discern in that law and subsequent federal actions a meaningful national policy relating to water quality.

In S. 649, the bill first introduced in 1963 that ultimately gained passage in revised form as the Water Quality Act of 1965, the following language was employed to declare the national policy:

It is the purpose of this Act to establish a positive national water pollution control policy of keeping waters as clean as possible as opposed to the negative policy of attempt-

890 and S. 928 Before a Subcomm. of the Senate Comm. on Public Works, 84th Cong., 1st Sess. 45 (1955).

⁹² See 1967 House Hearings, *supra* note 17, at 110 (statements of FWPCA Commissioner Quigley). The Clean Water Restoration Act of 1966 provided an incentive to establish intrastate water quality standards. If a state establishes intrastate standards it can qualify for a 10% bonus under the Federal Construction Grant Program. 33 U.S.C. § 466e (Supp. II 1965-66).

⁹³ See Water Quality Act of 1965, 33 U.S.C. § 466c-1 (Supp. I 1965), as amended, (Supp. II 1965-66) (grants for research and development); *id.* § 466d (grants for water pollution control programs); *id.* § 466e (grants for construction).

The Clean Water Restoration Act of 1966 continued these efforts to purchase improvement in the local pollution control programs. See 33 U.S.C. §§ 466a(c)(1), 466e(d) (Supp. II 1965-66).

⁹⁴ For discussions of the extent of impediment to the program caused by the reorganization, see 1966 Senate Hearings, *supra* note 4, at 133-37.

⁹⁵ Although the budgetary askings for the federal water pollution control program are substantially below the congressional authorizations, this program has not suffered proportionately as much as many other nonmilitary federal programs. *N.Y. Times*, Jan. 30, 1968, at 20, col. 8 (Summary of President Johnson's Fiscal 1969 Budget).

ing to use the full capacity of such waters for waste assimilation.⁹⁶

Industry severely criticized this phrasing,⁹⁷ and it was ultimately deleted in favor of the broader policy declaration that now appears in the law. A fair reading of the subsequent federal activity, however, reveals that the spirit of this deleted language seems to pervade the federal water quality program as it is emerging through the FWPCA's activity in approving state standards. Both the legislators and administrators responsible for making and enforcing federal water quality policies appear genuinely committed to a national policy of upgrading waters to as close to their natural state of cleanliness as is reasonably possible. Although it is easy to discount glib political endorsements of a "clean water" policy,⁹⁸ it is submitted that under federal leadership the nation has embarked on an ambitious water quality improvement program pointed toward an ultimate goal of nationwide natural water quality.⁹⁹

The 1965 Act provided relatively little guidance to the states in developing the required water quality standards beyond the statement that they should be consistent with the federal policy of enhancing water quality and that they should give consideration to certain legitimate water uses.¹⁰⁰ To help fill this void of specificity the FWPCA distributed to the states guidelines reflecting the matters to which the federal agency would give most careful scrutiny in reviewing the state

⁹⁶ S. 649, § 1, 88th Cong., 1st Sess. (1963).

⁹⁷ For a discussion of the industry position on the control of water quality, see Hearings on S. 4 Before a Special Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 89th Cong., 1st Sess. 37-58 (1965) (statements of Mr. A. J. vonFrank and Mr. William R. Adams).

⁹⁸ Secretary Udall is reported to have noted poetically, "[B]oth sides of the Congressional aisles are full of aspiring 'Mr. Cleans', vying for the whitest hats and the fullest canteens." 1967 House Hearings, *supra* note 17, at 8.

⁹⁹ Secretary Udall, in response to a request for a definition of goals in the field of environmental pollution, said, "Goals are not difficult to define. . . . Ultimately, I think we are going to want all of our lakes and streams to be clean. When it becomes generally known that this is not an impossible goal, the means will be found to achieve it." 2 Chemical 26, No. 12, at 2 (Dec. 1966). James Quigley, Commissioner of the FWPCA, declared: "We have a national commitment to clean water, and we are committed regardless of the economics." Symposium, *supra* note 83, at 11.

Frank C. Di Luzio, Assistant Secretary of the Interior for Water Pollution Control, has predicted that:

[T]he time is not far off when even a statement that water pollution in America "must be controlled" will prove to be inadequate and that a different word or combination of words will be substituted for the word "controlled" . . . [W]e are a lot closer to the concept of eliminating pollution in this country, as against merely controlling it, than many of us may realize today.

Di Luzio, Water Pollution Control—An American Must, 39 Water Pollution Control Federation J. 1, 3 (1967).

¹⁰⁰ Control Act, *supra* note 81, § 466g(c)(3) (Supp. I 1965).

standards.¹⁰¹ It is in these guidelines that the true thrust of the federal water quality enhancement program is disclosed.

Guideline 1 warns that in no case will standards providing for less than existing water quality be acceptable, thus locking in high quality water wherever it now exists. This guideline drew considerable criticism from some states, relatively underdeveloped economically, who are actively recruiting new industries. The so-called "degradation issue" was resolved in February 1968, when Secretary Udall issued a statement reaffirming the federal government's commitment to the policy of safeguarding high quality waters against avoidable degradation.¹⁰² Guideline 2 represents the water quality floor as it provides that no standards are acceptable that have the effect of designating any stream for the sole or principal purpose of transporting wastes.¹⁰³

Guideline 8 is most reflective of the underlying federal philosophy. It provides that no standard will be approved that allows any wastes amenable to treatment or control to be discharged into water without treatment or control regardless of the use to be made of the receiving waters. Further, the state standards must require all wastes to receive the "*best practicable treatment or control*" prior to discharge unless it can be proved that a lesser degree of treatment and control will provide for water quality enhancement commensurate with proposed present and future uses of the water.¹⁰⁴ The guidelines recognize that for the immediate future it may not be economically feasible or practical to require a complete cessation in quality impairing discharges;¹⁰⁵ however, acceptance of this objective as a program *goal* seems implicit in the charge given the states in the guidelines.¹⁰⁶ The overall import of the guidelines, then, is that no standards will be acceptable that reflect

¹⁰¹ U.S. Department of the Interior, Guidelines for Establishing Water Quality Standards for Interstate Waters (1966) [hereinafter cited as Guidelines].

¹⁰² Id. at 4, 5. Secretary Udall has explained this guideline as requiring "any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution of high quality waters, . . . as part of the initial project design, to provide the highest and best degree of waste treatment available under existing technology." 2 CCH Water Control News, No. 38, at 10 (Feb. 5, 1968).

¹⁰³ Guidelines, *supra* note 101, at 5.

¹⁰⁴ Id. at 7.

¹⁰⁵ "If it is impossible to provide for prompt improvement in water quality at the time initial standards are set, the standards should be designed to prevent any increase in pollution." Id. at 5. See Edwards, Water Quality Standards—Current Policy Issues, U.S. Dept. of the Interior News Release, June 27, 1968, at 5-7; Moore, Man's Environment and the Quality of Life, *id.* May 24, 1968, at 3.

¹⁰⁶ This policy interpretation is to be enforced. See Guideline 5(b), which requires that state standards provide for the "upgrading and *enhancement* of water quality and the use or uses of streams or portions thereof that are presently affected by pollution." Id. at 6 (emphasis added); "To meet the goals established by the Act, water quality standards must be adequate to protect and *upgrade* water quality in the face of population and industrial growth, urbanization, and technological change." Id. at 9 (emphasis added).

a regulatory philosophy based on the traditional waste management purpose of maximizing the use of the waste dilution and assimilation capacity of the nation's waters.¹⁰⁷

From industry's viewpoint, if the water quality policy currently being promoted by federal authorities is the accepted national policy, a revolutionary change has been worked in the rules of the waste disposal game. If pollution regulation is now concerned with not just those diminutions in water quality that are harmful to some other beneficial use, but with *all* discharges that degrade the natural quality of the water, a basic premise of conventional waste management may be threatened.¹⁰⁸ Under universally accepted engineering practices, the natural self-purification processes of the receiving waters have been relied upon to carry out the final stages of most waste treatment procedures.¹⁰⁹ This practice is linked to the well-settled riparian principle that each water user has a right to use the neighboring watercourse for waste disposal subject only to the limitation that his wastes not unreasonably interfere with other beneficial uses of the water.¹¹⁰ Public regulation has always imposed limitations on the exercise of this right; however, under the prevalent interpretation of the recent legislation, Congress apparently has denied the validity of that right, at least in respect to the use of interstate waters.¹¹¹

¹⁰⁷ For criticism of the "clean as possible" approach represented by the Guidelines, see Wendell, *Intergovernmental Relations in Water Quality Control*, in Symposium, *supra* note 83, at 15.

¹⁰⁸ At the House Hearings in 1967, the following dialogue occurred between Congressman Harsha and Commissioner Quigley:

Mr. Harsha. All right. Now, does the Federal Water Pollution Control Administration believe that the discharge may be eliminated before clean water can be attained?

Mr. Quigley. As a theoretical question, I do not think the answer to that could ever be yes. I think as a practical matter, in many instances, this is the only way you are going to eliminate the pollution. But I could recognize a situation where because of the flow, high quality of it, and lack of other discharges, that you would not have to.

1967 House Hearings, *supra* note 17, at 110-11.

¹⁰⁹ See Baumann, *Physical, Scientific, and Engineering Aspects of Pollution*, in *Water Pollution Control and Abatement* 13 (Willich & Hines ed. 1967); Smith, *The Industrial Point of View*, in *id.* at 134.

¹¹⁰ Unreasonable interference has traditionally been judged on nuisance principles. W. Prosser, *Torts* § 90, at 621-23 (3d ed. 1964).

¹¹¹ See Guidelines, *supra* note 101, at 5, quoting President Johnson's statement when signing the 1965 Act into law: "The banks of the rivers may belong to one man or one industry or one state, but the waters which flow between these banks should belong to all the people."

The policy implications of the Water Quality Act of 1965 have not gone totally unnoticed by the courts. In a recent condemnation case in the 4th Circuit, the condemnee's claim for damages was based on loss of his riparian right to discharge waste into the stream. The court held that under state law he had no such legal right and then mentioned the recent federal legislation "to show that National policy buttresses" the policy of the state. *United States v. 531.13 Acres of Land*, 366 F.2d 915, 920 (4th Cir. 1966).

Without taking sides on industry's resistance to adopting natural water quality as a national goal, it is possible to be tolerant of questions addressed to the justification for this degree of "progress." The supposed new policy in some respects seems to be a reversion to the ancient common law doctrine of "natural flow."¹¹² This principle was rejected by American courts nearly a century ago on the ground that it was incompatible with a modern industrial economy.¹¹³ Social and economic conditions would seem to have undergone drastic enough changes in the last hundred years, however, to render a full-circle return to a "natural flow" policy of water stewardship as at least defensible.

Additional manifestations of federal intent will be required to test the reliability of the foregoing analysis of national water quality policy¹¹⁴ and to assess the degree of commitment to such a policy.¹¹⁵ One thing is clear, however: if the federal government is committed to move with some speed toward realization of the goal of nationwide natural water quality, the financial implications of such a program to industrial waste treatment are truly staggering.

V. MEANS FOR GENERATING INVESTMENT IN POLLUTION CONTROL

Because there is no market in water resources adequate to reflect society's economic preferences for water use, reliance must be placed on political-legal mechanisms to assert and protect the public interest in water. In water quality matters, private remedies available to persons suffering injury from misuse of water have proved ineffective to protect the public interest in reasonable water use.¹¹⁶ Therefore, public

¹¹² "Under this [natural flow] theory the primary or fundamental right of each riparian proprietor on a watercourse or lake is to have the body of water maintained in its natural state, not sensibly diminished in quantity or impaired in quality." *Restatement of Torts*, ch. 41, at 342-43 (1939).

¹¹³ See *Monroe Carp Pond Co. v. River Raisin Paper Co.*, 240 Mich. 279-388, 215 N.W. 325, 328 (1927); *Borough of Westville v. Whitney Home Builders, Inc.*, 40 N.J. Super. 62, 79-80, 122 A.2d 233, 242 (Super. Ct. 1956); *Pennsylvania Coal Co. v. Sanderson*, 113 Pa. 126, 149, 6 A. 453, 459 (1886).

¹¹⁴ FWPCA Commissioner Quigley, in response to the question, "Will there be a Federal policy on what the investment should be?" responded: "The judgment of what the Federal policy will be will become evident in the reviewing of the standards submitted by the States. The Federal government will make a policy decision" Symposium, *supra* note 83, at 11.

¹¹⁵ It is at least worthy of note that two of the positions of administrative leadership in the federal pollution program changed hands early in 1968. Max N. Edwards replaced Frank C. Di Luzio in the post of Ass't Sec. of the Interior for Water Pollution Control and Joe G. Moore, Jr. succeeded James M. Quigley as Commissioner of the FWPCA. At this writing it is too early to tell what effect, if any, these changes will have on the development of the federal water quality program; however, recent speeches made by both officials seem to demonstrate a determination to continue and extend the policies developed by their predecessors. See Edwards, *supra* note 105; Moore, *supra* note 105.

¹¹⁶ Public regulation of water quality in no way precludes the bringing of a private action to recover damages suffered as the result of pollution or to enjoin the pollution.

regulation of pollution-creating water use activities has become the principal means of injecting the incentives and constraints so clearly lacking in the raw economics of industrial waste disposal. Doubts have been raised, however, whether the effectiveness of public regulation of pollution has kept pace with the emerging water quality objectives of society as expressed with increasing clarity at various levels of the political process. Substantial question also exists whether increased enforcement of stricter pollution laws alone is the fairest and most efficient means of generating the needed investment.

Governmental assistance and incentives to industry and an effluent charge system are the two approaches currently receiving the most attention as alternative methods for providing the requisite external stimulus. The principal areas in which these approaches differ from enforcement are in the manner of initial allocation of facility construction cost, the likely level of economic efficiency attained in waste treatment, and the time required to put an adequate waste treatment program in operation. Stronger pollution enforcement, financial measures and effluent charges are by no means mutually exclusive approaches to generating the needed investment. Rather, the problem is one of discovering the most workable combination of the three.

A. *Public Regulation*

The power to regulate water pollution is possessed and exercised by specialized agencies in all 50 states, by a handful of interstate

Such suits are still brought with some frequency and often the injured party recovers damages. *O'Brien v. Primm*, 243 Ark. 186, 419 S.W.2d 323 (1967); *Carson v. Hercules Powder Co.*, 240 Ark. 887, 402 S.W.2d 640 (1966). Occasionally, the plaintiff is successful in enjoining the polluting activity. *Urie v. Franconia Paper Corp.*, 107 N.H. 131, 218 A.2d 360 (1966).

Historically, private actions to remedy pollution have not been easily won. Everyone adversely affected by pollution does not have standing to sue the polluter. Even if the party does have standing to sue, the burden of proving a case may be awesome. The defenses open to the polluter are plentiful. *Montet v. Nicklos Drilling Co.*, 135 So. 2d 805 (La. 1961) (failure to prove that damage to rice crop resulted from pollution); *City of Henryetta v. Runyan*, 370 P.2d 565 (Okla. 1962) (failure to prove damages adequately); *Swango v. County Squire Motel, Inc.*, 431 P.2d 839 (Ore. 1967) (failure to prove pollution caused illness of cattle). See generally W. Prosser, *Torts* § 90 (3d ed. 1964); Allison & Mann, *The Trial of a Water Pollution Case*, 13 *Baylor L. Rev.* 199 (1961); Note, *Rights and Remedies in the Law of Stream Pollution*, 35 *Va. L. Rev.* 774 (1949). A finding that the polluter is responsible for the harm alleged does not assume that his discharges will be stopped. See Taylor, *Control of Stream Pollution*, 33 *Texas L. Rev.* 370 (1955); Note, *Statutory Treatment of Industrial Stream Pollution*, 24 *Geo. Wash. L. Rev.* 302 (1956).

A more basic difficulty in relying on private actions to regulate industrial pollution effectively is that our adversary system is not conducive to that goal. In a private action between two parties, it is very difficult to obtain adequate representation of the public interest. Courts are generally not well suited to perform the function required for effective pollution control. For a discussion of this point in some detail, see Hines, *Nor Any Drop to Drink: Public Regulation of Water Quality, Part I: State Pollution Control Programs*, 52 *Iowa L. Rev.* 186, 196-201 (1966).

agencies and by the federal government. Although for some years public regulation has been the prevalent means of attempting to extract from industry improved performances in waste treatment, coercive measures have not been the norm. In theory, a cease-and-desist order from a public water pollution control agency can put an industry to the choice of cleaning up or closing up. In practice, however, there are few cases on record of an industry having closed up because of noncompliance with a pollution abatement order. Current federal and interstate pollution control programs are not well designed to utilize coercive enforcement techniques. At the state and local level the potential for meaningful enforcement has long existed, but only now is it being realized.

To date, at all of the regulatory levels, water quality control has been primarily a crisis-solving operation. The typical agency has responded to complaints of localized damage from pollution conditions, but has not carried out a comprehensive preventive program of monitoring and maintaining surveillance of the quality of all waters subject to regulation. It is anticipated that the establishment of water quality standards will mark the opening of a new phase of water pollution control and that day-to-day supervision and management of water quality will become the standard practice among local pollution control agencies.

1. *Federal Enforcement.*—Because enforcement of pollution control laws generally is conceded to be a function of local and state governments,¹¹⁷ the federal enforcement power was originally intended to deal only with situations in which jurisdictional limitations frustrated the pollution control efforts of local agencies.¹¹⁸ This potential exists wherever pollution conditions affect more than one state, either because the polluted water runs from one state to another, or because the water forms the border between the states. The federal enforcement machinery was designed to provide a means of coordinating the pollution control efforts of state agencies facing a common problem over which no state had complete jurisdiction. Although the scope of the federal enforcement power has been substantially enlarged over the years, the

¹¹⁷ "Consistent with the policy declaration of this act, state and interstate action to abate pollution of interstate or navigable waters shall be encouraged and shall not, except as otherwise provided by or pursuant to court order under subsection (g) of this section, be displaced by Federal enforcement action." Control Act, *supra* note 81, § 466g(b) (Supp. II 1965-66).

¹¹⁸ Water Pollution Control Act § 2, 62 Stat. 1155 (1948). See Hearings on S. 890 and S. 928 Before the Subcomm. of the Senate Comm. on Public Works, 84th Cong., 1st Sess. 45-47 (1955); Note, Statutory Stream Pollution Control, 100 U. Pa. L. Rev. 225, 238 (1951).

enforcement procedures still retain the conciliatory character consistent with the original, more limited purpose.¹¹⁹

The FWPCA's enforcement jurisdiction extends to all navigable and interstate waters in the nation, including coastal waters and tributaries of interstate streams.¹²⁰ Federal enforcement may also be invoked in situations where pollution has international effects.¹²¹ Federal authority to initiate enforcement actions is limited to situations where pollution in one state endangers the health or welfare of persons in another state.¹²² Where the pollution source and all of its effects are confined to the territorial limits of a single state, the federal enforcement powers may be invoked only at the express request of the state.¹²³ In situations of international pollution, enforcement action must be requested by the Secretary of State.

The federal enforcement procedure consists of three stages: a conference with state and interstate agencies,¹²⁴ a public hearing before a board appointed by the Secretary of Interior,¹²⁵ and federal court action instituted by the Attorney General at the request of the Secretary. Where the pollution's causes and effects occur wholly within one state, the written consent of the state Governor is required before

¹¹⁹ For the development of the federal enforcement powers, see Hines, *supra* note 87, at 809-38.

¹²⁰ Control Act, *supra* note 81, § 466g(a). For a discussion of the liberal definition applied to "navigable waters" under federal law, see Hearings on S. 649, S. 737, S. 1118 and S. 1183 Before a Special Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 88th Cong., 1st Sess. 50-51 (1963) [hereinafter cited as 1963 Senate Hearings] (testimony of Murray Stein, Public Health Service Enforcement Officer).

¹²¹ Control Act, *supra* note 81, § 466g(d)(2) (Supp. II 1965-66).

¹²² *Id.* § 466g(d)(1). Also, if it is found that pollution is causing a substantial economic injury due to an inability to market shellfish or shellfish products in interstate commerce, the federal agency may initiate an enforcement action. *Id.*

¹²³ *Id.* The request may come from either the governor of the state or the state water pollution control agency, or the governing body of any municipality in the state, if the governor and the state water pollution control agency for the state concur in the request. *Id.*

¹²⁴ *Id.* §§ 466g(d)(1)-(4).

¹²⁵ *Id.* §§ 466g(e), (f). The public hearing is called by the Secretary of the Interior no sooner than six months after the date that he has specifically recommended to the appropriate state water pollution control agencies that they take necessary remedial action. The procedure set forth in the Act regarding the public hearing is fairly complicated. It is specifically provided that the hearing board be made up of a group of five or more persons appointed by the Secretary not less than a majority of whom must be persons other than officers or employees of the Department of Health, Education and Welfare. A new reporting provision was added at the hearing stage by the Clean Water Restoration Act of 1966, 80 Stat. 1246. The Secretary may now require any person whose alleged activities result in pollution to file a report based on existing data furnishing such information as may be reasonably required as to the character, kind, and quantity of such discharges and the use of facilities or other means to prevent or reduce such discharges by the party filing the report. 33 U.S.C. § 466g(f)(2) (Supp. II 1965-66). This provision was added to the Act as a result of difficulties experienced in obtaining production and waste treatment information from industry in the enforcement process. 1966 Senate Hearings, *supra* note 4, at 442 (testimony of Murray Stein, Chief, Enforcement Program, FWPCA).

a federal abatement suit may be instituted.¹²⁶ Each succeeding step of the enforcement procedure is pursued only if satisfactory progress is not achieved under the previous step. It is at the conference stage that the major portion of the federal effort has been expended thus far. In the 42 instances in which federal enforcement action has been instituted through April, 1968, only three have proceeded beyond the conference level¹²⁷ and in only one of these cases was court action necessary.¹²⁸

The federal strategy in the enforcement conference has been first to produce a detailed and complete analysis of the pollution situation under study, including the precise character of the damage and the sources of contributing pollutants. The notion is that once the facts of the case are marshalled and proved to the satisfaction of the affected parties, the commitment to take remedial steps becomes relatively easy to obtain.¹²⁹ Second, every person alleged to be contributing to the pollution or affected by it is afforded an opportunity to present a full statement of his views.¹³⁰ Third, after all of the information has been submitted, the conferees jointly study it, assessing the seriousness of the pollution situation, identifying and ordering the problems requiring solution, and evaluating the effects of existing local control programs. Finally, an attempt is made to agree on the remedial steps necessary to eliminate the pollution and to establish a timetable to carry out the corrective measures.¹³¹ Almost all of the conference settlements represent the unanimous agreement of the conferees and the concurrence of the municipalities and industries involved.¹³² Surveillance of the situation is maintained after the adjournment of the conference, and if new problems develop or the schedule for corrective action is not met, the conference is reconvened.¹³³ In recent conferences cooperation between industry, municipalities and the public regulatory agencies has been clearly evident—a far cry from the situation that obtained

¹²⁶ Control Act, *supra* note 81, § 466g(g) (Supp. II 1965-66). As will be discussed later, this consent requirement limits federal enforcement of water quality standards.

¹²⁷ Program, *supra* note 5, at 24-29. The enforcement actions have involved 40 states and the District of Columbia. *Id.* at 22.

¹²⁸ This action was filed against the city of St. Joseph, Missouri, in the federal district court at St. Joseph on September 29, 1960. A court order was issued on October 31, 1961. See 1966 Senate Hearings, *supra* note 4, at 444.

¹²⁹ 1967 House Hearings, *supra* note 17, at 101.

¹³⁰ Control Act, *supra* note 81, § 466g(d)(3) (Supp. II 1965-66). Apparently a written statement is contemplated. 1 CCH Water Control News, No. 23, at 25 (Oct. 24, 1966) (Comment on § 466g(d)(3)).

¹³¹ See 1966 Senate Hearings, *supra* note 4, at 441. Once an acceptable remedial course has been established, "the federal purpose is to disengage from the enforcement procedures as rapidly as possible, [and] allow the State and the localities to handle that themselves. . . ." 1963 Senate Hearings, *supra* note 120, at 49.

¹³² 1967 House Hearings, *supra* note 17, at 101.

¹³³ In a number of cases two or more conference sessions have been held, and in one case five sessions have been called. 1966 Senate Hearings, *supra* note 4, at 443-48.

only a few years ago.¹³⁴ Although the procedure admittedly derives most of its force from the "Court of Public Opinion,"¹³⁵ the conference device has proved a relatively effective catalyst for meaningful action to upgrade water quality.¹³⁶

2. *Interstate Enforcement.*—There is very little to be reported concerning the enforcement programs of interstate agencies for the simple reason that there has been very little interstate enforcement activity.¹³⁷ The Ohio River Basin Sanitation Commission (ORSANCO),¹³⁸ the Delaware Basin Commission¹³⁹ and the Interstate Sanitation Commis-

¹³⁴ At one point in an earlier investigation, federal agents were forced to use boats to obtain information about the waste discharge of an industry which refused to release any data about its processes. 1966 Senate Hearings, *supra* note 4, at 449.

¹³⁵ See FWPCA Commissioner Quigley's comments on this facet of federal enforcement. Industrial Water Pollution Control, in *Mill and Factory* 48 (Nov. 1966).

¹³⁶ Of the 37 enforcement conferences, 22 were initiated by the federal agency, 11 at the request of the states, and 4 on the basis of joint, state-federal initiative. No exercise has yet been made of the jurisdiction over international waters granted by the 1966 Act. Federal enforcement actions have involved over 1000 municipalities, in excess of 1200 industries and have covered over 7000 miles of streams and rivers. 1966 Senate Hearings, *supra* note 4, at 440-50.

The success of the conciliatory approach has not been total, but Congress has been unwilling to unleash federal enforcement authority in any substantial manner, although frequently petitioned to do so. The proposals of the Johnson Administration in the Clean Rivers Restoration legislation of 1966 would have substantially strengthened the federal enforcement arm. Those proposals were:

- (1) An emergency power in the federal agency to abate pollution in interstate or navigable waters where an imminent danger to public health is posed.
- (2) To extend the application of federal water quality standards to navigable waters and to authorize federal initiative of enforcement proceedings in intrastate pollution cases.
- (3) To eliminate the two six-month waiting periods.
- (4) To grant the Secretary power to issue subpoenas to compel attendance of witnesses at hearings.
- (5) To require registration of all facilities that constitute existing or potential sources of pollution.
- (6) To give representatives of the federal agency the right to inspect business operations that may be pollution sources, actually or potentially.
- (7) To authorize suit in federal district courts by any person seeking relief from pollution.
- (8) To remove the *de novo* review of the findings and recommendations of Hearing Boards by the federal courts and substitute a review on the record.

See S. 2947, H.R. 13104, 89th Cong., 2d Sess. (1966). For the case arguing these changes, see 1966 Senate Hearings, *supra* note 4, at 106-29 (statements of Secretary Udall and Mr. James Quigley), 434-43 (statement of Mr. Murray Stein).

¹³⁷ For a discussion of the regulation of water quality by interstate agencies, see generally E. Cleary, *The ORSANCO Story* (1967); McKinley, *The Management of Water Resources under the American Federal System*, in *Federalism Mature and Emergent* 328 (MacMahon ed. 1955); G. Hart, *Creative Federalism: Recent Trends in Regional Water Resources Planning and Development*, 39 *Colo. L. Rev.* 29 (1966); R. Leach, *The Federal Government and Interstate Compacts*, 29 *Fordham L. Rev.* 421 (1961); Zimmerman & Wendell, *New Horizons on the Delaware*, 36 *State Gov't* 157 (1963).

¹³⁸ Ohio River Valley Water Sanitation Compact, Art. IV, 54 Stat. 752 (1940).

¹³⁹ Delaware River Basin Compact, Art. 2, § 2.1, 75 Stat. 691 (1961).

sion (ISC)¹⁴⁰ possess the power to issue abatement orders and pursue court enforcement against delinquents.¹⁴¹ ORSANCO and ISC have both issued a number of compliance orders,¹⁴² but only ISC has had any experience venturing into state courts to secure enforcements and generally it has been successful in making its orders stand up in court.¹⁴³

By and large, however, the long-standing policy of both ORSANCO and ISC and the other newer interstate agencies concerned with pollution control has been to prefer education and informal persuasion to enforcement in attacking their water quality problems.¹⁴⁴ Considering the unique political position of the interstate agency, this approach is understandable, but serious doubts have been raised concerning the meaningfulness of the gains cited to prove the success of these "soft-sell" tactics.¹⁴⁵ The future of the interstate agency in regional water quality regulation is somewhat uncertain at the moment, although every sign seems to point toward greater reliance on regional institutions in water resource management.¹⁴⁶

3. *State and Local Enforcement.*—Never in the history of water quality management has there been such a ferment as is now occurring in state and local pollution control programs.¹⁴⁷ Nearly every state has substantially reformed its antipollution laws in the last decade: many have overhauled their statutes in the last two years.¹⁴⁸ A good

¹⁴⁰ Tri-State Compact, Art. IV, 49 Stat. 932 (1935).

¹⁴¹ Art. IX, 54 Stat. at 755 (ORSANCO); Art. V, 75 Stat. at 696-97 (Del.); Art. IX, 49 Stat. at 936 (ISC). The Tennessee River Basin Water Pollution Control Compact also grants enforcement powers but the Compact commission apparently has not evolved to an active level thus far. See Art. VIII, 72 Stat. 823 (1958).

¹⁴² See E. Cleary, *supra* note 137, at 117-22.

¹⁴³ See 1965 Interstate Sanitation Comm'n Rep. 31-33.

¹⁴⁴ "The theme [of ORSANCO] has been: Persuasion if possible, but compulsion where necessary." 1963 Senate Hearings, *supra* note 120, at 238.

¹⁴⁵ See F. Graham, *Disaster by Default* 217-18 (1966); R. Leach & R. Sugg, *The Administration of Interstate Compacts* 185-87 (1959).

¹⁴⁶ The FWPCA is pushing ahead with its efforts to prepare comprehensive river basin planning studies and to encourage the formation of river basin planning agencies. 2 CCH Water Control News, No. 18, at 9 (Sept. 18, 1967); *id.* No. 6, at 1 (June 26, 1967).

The Clean Water Restoration Act of 1966 boosted the utilization of river basin planning agencies by making available a special 50% program grant to state or interstate agencies developing comprehensive water quality programs on a river basin basis. 33 U.S.C. § 466a(c)(1) (Supp. II 1965-66).

¹⁴⁷ [A]s I think most of the members of this committee know, water pollution has been front page news all across the country, at the State level and local level. Hearings that are held by State water pollution officials are not news. You will not read about them in the Washington press; but they are very important news and there has been a tremendous ferment at the State level and it is there today because the State agencies have been holding hearings across the States and this has generated a tremendous interest and enthusiasm. 1967 House Hearings, *supra* note 17, at 28 (remarks of Secretary Udall).

¹⁴⁸ See, e.g., *Ariz. Rev. Stat. Ann.* §§ 36-1851 to -1868 (Supp. 1967); *Cal. Water*

portion of the current activity is attributable to the standard-setting requirement of the 1965 federal legislation, but much of the current planning and enforcement activity had its seeds in a general upgrading of state water quality programs in response to local antipollution pressures.¹⁴⁹ Many local control agencies now seem ready to follow the enforcement example of states like Pennsylvania which has launched a concerted drive to bring to court industries and municipalities delinquent in their response to pollution abatement orders.¹⁵⁰ This represents a marked change in the character of local pollution control as it existed only a few years ago.¹⁵¹

Until the recent adoption of water quality standards, the state determination of the existence of a pollution situation requiring abatement was generally done on an ad hoc basis.¹⁵² Under the old state procedures, ordinarily a complaint was necessary to set the enforcement machinery in motion. This requirement itself proved a boon to pollution because it usually meant no remedial action would be taken until the pollution condition became sufficiently severe to cause harm. When a complaint was received, the alleged pollution situation was investigated and a determination made whether the pollution complained of was unlawful, who was responsible, and what, if anything, should be done about it.¹⁵³ Under all state acts the alleged polluter is entitled to a hearing on these issues.¹⁵⁴

Code §§ 120-39 (West Supp. 1967); Conn. Gen. Stat. Ann. §§ 25-19 to -23 (Supp. 1966); Fla. Stat. Ann. §§ 403.011-261 (Supp. 1968); Ga. Code Ann. §§ 17-501 to -530 (Supp. 1967); Ill. Ann. Stat. ch. 19, §§ 145.2-6, .16-.17 (Smith-Hurd Supp. 1967); Kan. Gen. Stat. Ann. §§ 65-165 to -171 (Supp. 1967); Ky. Rev. Stat. Ann. §§ 146.010-.110 (Supp. 1967); Mass. Gen. Laws Ann. ch. 21, §§ 26-50 (Supp. 1968); Minn. Stat. Ann. §§ 116.01-.09 (Supp. 1967); Miss. Code Ann. §§ 7106-111 to -136 (Supp. 1967); N.H. Rev. Stat. §§ 149:1 to :8-a (Supp. 1967); N.M. Stat. Ann. §§ 75-39-1 to -12 (1968); N.C. Gen. Stat. §§ 143-211 to -215.10 (Supp. 1967); Ohio Rev. Code Ann. §§ 6111.01-.40 (Baldwin Supp. 1967); Tex. Rev. Civ. Stat. art. 7621d-1 (Supp. 1967); Utah Code Ann. §§ 73-14-2.5 to -3 (Supp. 1967); Vt. Stat. Ann. tit. 10, §§ 901-51 (Supp. 1967); Wash. Rev. Code Ann. §§ 90.48-.1 to -.13 (Supp. 1967); Wis. Stat. Ann. §§ 144.01-.57 (Supp. 1967).

¹⁴⁹ See Carmichael, *Forty Years of Water Pollution Control in Wisconsin: A Case Study*, 1967 Wis. L. Rev. 350.

¹⁵⁰ See 1 CCH Water Control News, No. 29, at 7-8 (Dec. 5, 1966) (Pa. board threatened legal action against paper company if it violated order to abate pollution); 2 id. No. 26, at 10 (Nov. 13, 1967) (Pa. five-year plan approved by FWPCA); 2 id. No. 35, at 5 (Jan. 15, 1968) (failure to obtain discharge permit closes Pa. coal mine). For examples of other state activities, see 1 id. No. 27, at 4 (Nov. 21, 1966) (Mich. reports on water pollution control activities); 2 id. No. 13, at 17 (Aug. 14, 1967) (pollution penalty sought against Ill. coal firm); 2 id. No. 27, at 8 (Nov. 20, 1967) (antipollution orders in N.J.).

¹⁵¹ See E. Murphy, *Water Purity* 68-69 (1961); Hines, *supra* note 116, at 215-34.

¹⁵² Wilson, *Legal Aspects of Water Pollution Control*, Proceedings, The National Conference on Water Pollution 354, 365 (1960).

¹⁵³ Stein, *Problems and Programs in Water Pollution*, 2 *Natural Resources J.* 388, 404-06 (1962); Wilson, *supra* note 152, at 371-74. See United States Department of the Interior, *Suggested State Water Pollution Control Act*, Revised, § 7 (1965) [hereinafter cited as *Suggested State Act*].

Armed with only the statutory definition as a measuring stick, the pollution control agency frequently became involved in extended arguments with alleged polluters over whether or not the condition in issue constituted pollution¹⁵⁵ and whether an abatement order was justified under all of the circumstances of the case.¹⁵⁶ Once it was determined that a particular waste discharge practice constituted pollution and warranted abatement, an order was issued directing corrective measures. If the order was not complied with, criminal penalties could be invoked¹⁵⁷ and injunctive relief was usually available.¹⁵⁸

Besides its inherent slowness, another serious problem with this common law approach was that it tended to retard planning measures designed to prevent pollution. The occasional waste discharger, who was anxious to avoid the label of polluter, could never be quite sure what level of performance was required. Despite an honest effort on the part of the control agency to treat similar cases alike, every case seemed to be unique. Many states use a waste discharge permit system to control pollution from new installations;¹⁵⁹ however, this has not proved to be a completely satisfactory preventive measure and, of course, it has no effect on existing pollution sources.

In summary, without some sort of unifying program guidelines,

¹⁵⁴ See, e.g., Ga. Code Ann. § 17-512 (Supp. 1967); Iowa Code Ann. § 455B.15 (Supp. 1968); Mass. Gen. Laws Ann. ch. 111, § 162 (1966).

¹⁵⁵ Statutory definitions are often either too vague to be useful or so all encompassing as to raise arguments over the practicality of enforcing them to the letter of the law. For example, the Water Pollution Control Act does not define the pollution subjected to federal regulation except to require that it "endangers the health or welfare of any persons." Control Act, *supra* note 81, § 466g(a). Most modern state antipollution laws contain detailed definitions similar to that offered in the recently revised Suggested State Water Pollution Control Act:

"Pollution" means such contamination, or other alteration of the physical, chemical or biological properties, of any waters of the State, including change in temperature, taste, color, turbidity, or odor of the waters, or such discharge of any liquid, gaseous, solid, radioactive, or other substance into any waters of the State as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legitimate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life.

Suggested State Act, *supra* note 153, § 2(a).

¹⁵⁶ Under state pollution control as it was practiced until very recently, orders were issued cautiously and enforced reluctantly. See Hines, *supra* note 116, at 227-30.

¹⁵⁷ Suggested State Act, *supra* note 153, § 10. See, e.g., Cal. Water Code § 13055.1 (West Supp. 1967); Tenn. Code Ann. § 70-203 (1955); W. Va. Code Ann. § 20-5A-19 (Supp. 1967).

¹⁵⁸ See, e.g., Ga. Code Ann. § 17-521 (Supp. 1967); Md. Ann. Code art. 96A, § 20 (1964); Suggested State Act, *supra* note 153, § 10.

¹⁵⁹ See, e.g., Ga. Code Ann. § 17-510(2) (Supp. 1967); Minn. Stat. Ann. § 115.07 (1964); Mont. Rev. Codes Ann. § 69-1332 (1947); Suggested State Act, *supra* note 153, § 5(b).

A separate penalty section for violation of the permit requirement is often included to add teeth to this type of regulation. See Mich. Stat. Ann. § 3.533(15) (1961); S.C. Code Ann. § 70-117 (Supp. 1967).

state enforcement has tended to be haphazard and prevention efforts by would-be polluters, highly conjectural. The general lack of success in pollution control under the ad hoc approach made clear the need for some type of common denominator in evaluating water quality.

4. *The Standards Approach to Water Quality Regulation.*—The water quality standards presently being adopted around the country represent an effort to bring some rationality and consistency to water quality regulation. Standards are water quality norms established for specific waters based on the present and future uses to be made of the waters and expressed, either descriptively or scientifically, in terms of the accepted quality parameters required for the designated uses. A number of state and interstate agencies have utilized water quality standards in their pollution control program for some years;¹⁶⁰ however, not all of the early state experience with standards was successful from the standpoint of improving water quality.¹⁶¹ The Water Quality Act of 1965, by requiring the creation of water quality standards to be used in regulating pollution and enhancing water quality in all of the nation's interstate waters,¹⁶² provided significant impetus to the setting of meaningful state standards.¹⁶³ Although one of the principal justifi-

¹⁶⁰ See, e.g., Me. Rev. Stat. Ann. tit. 38, § 361 (1964); N.H. Rev. Stat. Ann. § 149.3 (1964); Vt. Stat. Ann. tit. 24, § 3614 (1967).

¹⁶¹ Advocates of water quality improvement claim that in several instances the setting of standards was used as an excuse for not instituting vigorous enforcement actions or the standards that were set tended to lock in low water quality and retard quality improvement. Hearing on S. 4 Before a Special Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works, 89th Cong., 1st Sess. 74 (1965).

¹⁶² It should be noted that the standards requirement relates only to interstate waters and does not extend to the federal jurisdiction over navigable waters. The Administration proposal to enlarge the scope of the standards was rejected in 1966. See discussion note 136 *supra*. Interstate waters are defined in the federal guidelines to include "all rivers, lakes, and other waters that flow across or form a part of State boundaries, including coastal waters." Guidelines, *supra* note 101, at 10.

Several reasons have been cited for the restriction of standards to interstate waters, among them the notion that there may be a jurisdictional question whether the federal government can regulate water quality on navigable waters. Wendell, *Intergovernmental Relations In Water Quality Control*, in Symposium, *supra* note 83, at 13-16.

¹⁶³ Two distinct patterns developed in the establishment of standards prior to the 1965 Act. Under so-called "effluent standards," quality requirements were expressed in either the character of the effluent that may be discharged (strength or volume) or the degree of treatment that must be applied to the effluent before discharge. See, e.g., Md. Ann. Code art. 96A, § 23 (1957) (Commission to recommend standards for sewage or waste effluents discharged); Miss. Code Ann. § 5929-04 (1955) (Commission to set standards for purity of effluent). Under the more prevalent "receiving water" standards, the required quality was described in terms of the waters into which waste discharges are made. See, e.g., Mont. Rev. Codes Ann. § 69-1330(c) (1947); Okla. Stat. Ann. tit. 82, § 906(f) (Supp. 1967); S.C. Code Ann. § 70-109 (1962).

The difference between these two approaches is not as great as might appear. If both types of standards are established under procedures designed to implement a comprehensive water quality program based on use classification, the effluent standard should represent a useful extrapolation from the receiving water standard, a calculation that otherwise must be made by the individual waste discharger. See Kneese, *The Economics*

cations for nationwide standards was to relieve local control agencies from the threat that vigorous enforcement might drive off industry, it was not anticipated that a single set of national standards would be created. The expectation of Congress was that both establishment and enforcement of the standards would be primarily a local responsibility.¹⁶⁴

The states were given the initial opportunity to formulate the standards to be applied to interstate waters within or bordering the states.¹⁶⁵ If the state does not act, or if the adopted state standards are not acceptable to the federal authorities,¹⁶⁶ the Secretary of the Interior is authorized to promulgate standards. The power of the Secretary to establish standards himself is limited by a maze of procedural requirements;¹⁶⁷ however, the effect of requiring his approval of standards submitted by the states vests him with enormous practical control over the standard-establishing process.¹⁶⁸ Regardless of who ultimately asserts responsibility for their adoption,¹⁶⁹ water quality standards will soon be in force for all of the nation's interstate rivers, lakes and coastal waters.

The water quality standards required under the Water Quality Act of 1965 involve three essential components: First, a determination

of Regional Water Quality Management 82-85 (1964). As practiced, however, effluent standards have tended to be crude expressions of the minimal quality of discharge generally acceptable from different pollution sources. Staff Report, *supra* note 6, at 79-82.

¹⁶⁴ 2 U.S. Code Cong. & Ad. News 3313, 3321 (1965).

¹⁶⁵ Control Act, *supra* note 81, § 466g(c)(1) (Supp. II 1965-66). A jurisdictional question has been raised concerning rivers that originate in a state and flow into the ocean. Are these interstate waters for purposes of the standards requirements? The position of the FWPCA is that interstate waters include coastal waters in estuarine areas and bays and also include rivers that run into the ocean to the extent they are influenced by tide action. Guidelines, *supra* note 101, at 10; 1966 Senate Hearings, *supra* note 4, at 436-37, 440-41.

¹⁶⁶ The states were given until July 1, 1967, to establish standards and to file them with the Secretary of the Interior. To assist the states in establishing water quality standards in compliance with the federal act, the Secretary issued the Guidelines in May, 1966, and later followed this release with a statement outlining the materials that should be included in the presentation of the state's standards and plans to the Secretary for his review. Guidelines, *supra* note 101; 1 CCH Water Control News, No. 33, at 1 (Jan. 3, 1967); *id.* No. 39, at 1 (Feb. 13, 1967).

¹⁶⁷ Control Act, *supra* note 81, §§ 466g(c)(2), (4) (Supp. I 1965).

¹⁶⁸ This substantial power in the Secretary caused considerable debate during Congress' consideration of the water quality standards issue in 1964-65. See S. Rep. No. 10, 89th Cong., 1st Sess. 12-17 (1965). The argument that finally carried the day was that if the federal agency did not have substantial powers in the area of reviewing state standards, the objective of consistent nationwide standards could not be fulfilled. Hearing on S. 4, *supra* note 161, at 40-41, 43-44, 49-50, 78-98; Hearings on H.R. 3988, S. 4, and Related Bills Before the House Comm. on Public Works, 89th Cong., 1st Sess. 191-93 (1965).

¹⁶⁹ The Secretary has stated that, although he does not cherish the responsibility for setting standards, he stands ready to do the job if the states do not adequately shoulder the responsibility. See 1967 House Hearings, *supra* note 17, at 32.

is made concerning the present and future uses to be made of each body or stretch of interstate water. Public hearings are required as a part of the decision-making process regarding use designations.¹⁷⁰ Second, the specific water quality characteristics allowed or required for such uses must be identified and descriptive or numerical values established for each of them.¹⁷¹ These so-called water quality criteria include such matters as dissolved oxygen, temperature, chlorides, phenols, alkalinity, salinity, alkalinity-acidity balance, hardness, number of coliforms, sedimentation, and suspended solids or turbidity.¹⁷² The establishment of such criteria in relation to every reach of interstate waters provides a ready measure for evaluating the quality of these waters. The third component of the standards is a precise, detailed plan for achieving and preserving the criteria established, including such ingredients as preventive steps, construction schedules, enforcement actions, surveillance and monitoring.¹⁷³

All 50 states, Puerto Rico, the Virgin Islands and the District of Columbia have filed water quality standards for the interstate waters within or bordering the state. At this writing, 28 of the state standards had been approved in whole or in part.¹⁷⁴ The FWPCA is in the process of reviewing the standards of the other states and indications are that approvals will soon be granted at an accelerated rate.¹⁷⁵ Presumably,

¹⁷⁰ Control Act, *supra* note 81, § 466g(f)(1) (Supp. II 1965-66). The states were advised to make as good a hearing record as possible, including a wide representation of interest groups. Guidelines, *supra* note 101, at 8-9. Apparently, some of the early hearings tended to be one-sided with conservation groups dominating the testimony. Symposium, *supra* note 83, at 9 (remarks of Commissioner Quigley).

¹⁷¹ In February 1967, Secretary Udall appointed five national technical advisory committees to recommend scientific bases for evaluating the adequacy of the water quality standards submitted by the states. The five areas in which the committees' advice was sought were: (1) agriculture; (2) recreation and aesthetics; (3) industrial water supplies; (4) public water supplies; and (5) fish, other aquatic life and wild life. These committees filed a comprehensive interim report with the Secretary on June 30, 1967, and that report has been utilized in evaluating the state standards. 2 CCH Water Control News, No. 10, at 5-10 (July 24, 1967).

¹⁷² For example, under the New York standards, which have been approved, Class AA waters are specified for use as water supply for drinking, culinary or food processing purposes and any other uses. These waters must be free of floating or settleable solids, oil, taste or odor producing substances, sewage or waste effluents. They must have a pH range between 6.5 and 8.5 and no less than 4.0 parts per million of dissolved oxygen. They must contain no toxic wastes, deleterious substances, colored or other wastes—including *heat*—that would be injurious to fish life or impair the waters for other best usage. New York Codes, Rules and Regulations, tit. 6, part 701.3.

¹⁷³ Guidelines, *supra* note 101, at 7.

¹⁷⁴ 2 CCH Water Control News, No. 47, at 2 (April 8, 1968).

¹⁷⁵ The FWPCA indicated in midsummer of 1967 that it was expected that most of the state standards would be acted upon by the end of the year. *Id.* No. 10, at 3-5 (July 24, 1967).

Several reasons exist for the slowness with which the standards are being approved. The sheer volume of the work is one factor. See 1967 House Hearings, *supra* note 17, at 85. There has apparently been some difficulty in some state standards concerning the degree to which secondary treatment of wastes is required by the standards. See 2

enforcement of the standards will begin as soon as they become final; however, it should be noted that many of the interstate waters where pollution is most critical are already involved in federal enforcement proceedings.¹⁷⁶

The merit of the water quality standards approach to pollution control has been and continues to be a controversial subject. Ten years of congressional debate¹⁷⁷ preceded the passage of the standards program included in the Water Quality Act of 1965 and discussions about implementation and development of the program have continued ever since the Act was signed.¹⁷⁸ Adoption of water quality standards has also been a long-standing issue in many states.¹⁷⁹ The federal requirement of standards for interstate waters has now served to rekindle this debate in relation to the establishment of parallel state standards for intrastate waters.

Most of the pollution control advantages to be gained through water quality standards have already been mentioned. Comprehensive standards promote consistency in antipollution enforcement, permit meaningful surveillance of water quality to detect and control pollution before harm occurs, serve as guidelines for the institution of pollution preventive measures, and form the basis for planning water quality improvement on a "problemshed" basis. Many of the alleged disadvantages result not from deficiencies in the theory of using standards to regulate water quality, but from real and imagined problems in putting the theory into operation.¹⁸⁰ The objectives and operational requirements developed for the current federal standards program go far in ameliorating the less serious of the conventional objections to standards.¹⁸¹

CCH Water Control News, *supra* at 1. In addition, temperature criteria have caused some concern. *Id.* No. 14, at 1 (Aug. 21, 1967).

¹⁷⁶ One of the requirements in setting the state standards was that the standards must conform to the water quality "requirements" and the time schedules worked out in the various federal enforcement proceedings. See Guidelines, *supra* note 101, at 4, 9.

¹⁷⁷ See generally Hearings on S. 890 and S. 928 Before a Subcomm. of the Senate Comm. on Public Works, 84th Cong., 1st Sess. (1955).

¹⁷⁸ See, e.g., 1966 Senate Hearings, *supra* note 4, at 104, 138b, 442; 1967 House Hearings, *supra* note 17, at 85-103.

¹⁷⁹ See Wilson, *supra* note 152, at 364-69.

¹⁸⁰ One indication that standards may represent a reasonable approach to water quality management is the fact that they have been opposed by both industry and conservationists—on different grounds, of course. See Hearing on S. 4, *supra* note 161, at 39, 74 (statements of Mr. A. J. vonFrank of the Manufacturing Chemists Ass'n and Mr. Louis S. Clapper of the National Wildlife Fed'n).

¹⁸¹ Three objections frequently aired are: (1) that the setting of standards has been used as an excuse to delay enforcement; (2) that standards are not justifiable at this time because the state of water quality knowledge is not sufficient to permit informed decision making; (3) that standards setting is such potent political power it should not be entrusted to an administrative agency of such limited vision as the typical state pollution board. The first objection seems effectively destroyed in relation to the federal program by the July 1, 1967, deadline Congress placed on the submission of state

The theme that consistently runs through criticism of the "standards" approach by conservation interests is the fear that standards will initially be set too low and then will be so difficult to change that they will in effect create licenses to pollute.¹⁸² This concern is not without substance. As a practical matter, because quality standards are usually forged in the heat of controversy, it can be expected that they often represent a compromise between water completely suitable for all reasonable uses and manifest pollution. It is also undoubtedly true that it will be appreciably more difficult to change the standard in order to correct a recognized water quality deficiency than to remedy the problem in an ad hoc fashion. Further, human nature is such that polluters tend to translate minimal water quality requirements into maximum waste treatment objectives. Thus, standards may reduce incentives for quality improvement. These difficulties were obviously anticipated in the preparation of the guidelines setting forth standards requirements for the federal program. Considerable effort was devoted to communicating the idea that, to be acceptable, the state standards must be designed not only to preserve but to *enhance* the quality of the waters regulated.¹⁸³ Express provision must be made for periodic review and upgrading of the standards.¹⁸⁴

Although amendment of a standard will be more difficult than ad hoc abatement of an unwanted waste discharge, enforcement efficiency is so greatly abetted by the adoption of standards that on balance this possible disparity seems of little consequence. In the designation of uses under the federal guidelines, specific provision must be made for "potential and future water uses as well as the present intended use and uses."¹⁸⁵ If this instruction is conscientiously followed few sit-

standards. The second complaint is a standard argument against undertaking any new venture. While it is true that extensive research is needed, enough would seem to be known about water quality to permit establishment of a workable standards program. The federal guidelines contemplate revision of standards as technology increases. Guidelines, *supra* note 101, at 9-10. The third point raises a sensitive issue. Through water standards, regions of a state may effectively be zoned against certain types of economic development. The question is whether these decisions should be made by water quality experts or by the state legislature. The federal standards program provides for public hearings in the designation of water uses and requires that a substantial record be made to support the use designations. *Id.* at 7-8. Legislative classification of waters is the norm in several states and is certainly permissible under the guidelines.

¹⁸² See F. Graham, *Disaster by Default* 189 (1966); Wilson, *supra* note 179, at 365-66. A "vested right" to pollute is a shadow that seems to frighten many foes of standards. *Id.* at 366-67; Heath, *The Legal Implications of Water Quality Standards*, in Symposium, *supra* note 83, at 52-53. It is difficult to understand how correctly administered standards could ever create such a right. See 1965 Senate Hearings, *supra* note 34, pt. 2, at 648 (remarks of Senator Muskie).

¹⁸³ Guidelines, *supra* note 101, at 2.

¹⁸⁴ *Id.* at 9-10.

¹⁸⁵ *Id.* at 6.

uations should arise where immediate change in the standards is required to protect water quality.¹⁸⁶

The matter of potential regulatory difficulties in responding effectively to changes in water quality suggests another troublesome problem frequently cited by critics of the standards approach. Under the standards, how does the control agency handle the case of a new industry whose potential waste discharge would lower the receiving waters below the required quality level? Assuming that the new discharge would not reduce quality below the standard except that the existing water users were already using the waste dilution capacity close to the allowable limit, the question for the state agency is should it refuse to allow the new industry to discharge *any* wastes or should the other waste dischargers be required to improve their treatment practices. In the past, the latter solution has been the norm, with the undesirable result that water quality frequently suffered while the necessary improvements were effected by the existing users.¹⁸⁷ Under the federal requirements the states are expected to plan for future uses in setting standards.¹⁸⁸ However, unanticipated uses are certain to arise. If, under the federal standards program, a new user is in effect required to refrain entirely from discharging wastes into the waters, existing users are being granted a waste disposal priority. This may be sound policy, but its overall effect on the community should be carefully evaluated when this issue comes up for decision by the local agency.

Federal enforcement of the water quality standards raises several important questions. One curious aspect of the quality standards program is that in some situations the federal government's power to require the establishment of standards is not coextensive with its authority to enforce the standards established. This situation is caused by the fact that the 1965 Act, while extending the federal power to enforce violations of water quality standards¹⁸⁹ and establishing a special provision relating to the notice period,¹⁹⁰ did not alter the balance of the enforcement procedure. Thus, the FWPCA can move immediately in cases of water quality violations that are interstate in character, but cannot commence enforcement action against standards violators where the violation and the damage caused occur wholly

¹⁸⁶ It has been suggested that a "safety factor" should be built into the standards. See 1 CCH Water Control News, No. 27, at 5 (Nov. 21, 1966).

¹⁸⁷ See Rambo & Sylvester, *Methodology in Establishing Water Quality Standards*, 39 *Water Pollution Control Fed'n J.* 1155 (1967), where it is argued that this problem could be substantially avoided through setting very high standards.

¹⁸⁸ Guidelines, *supra* note 101, at 6-7.

¹⁸⁹ Control Act, *supra* note 81, § 466g(c) (5) (Supp. II 1965-66).

¹⁹⁰ *Id.* The conference and hearing steps of the enforcement procedure are short circuited, along with their two 6-month waiting periods. In their place is substituted a 180-day notice period. After the expiration of the notice period, the Secretary may proceed directly with an abatement action in the courts. *Id.*

within the boundaries of one state unless requested to proceed by the state. Furthermore, where a standards violation is intrastate in nature and the state invites the FWPCA to act, the FWPCA's power to seek court enforcement of its orders is conditioned on the consent of the local governor.¹⁹¹

These minor dislocations in enforcement authority probably will not cause serious problems in implementing the water quality standards program for two reasons. First, it is not anticipated that the federal enforcement machinery will be extensively utilized in enforcing the standards. The basic aim underlying the federal standards program is to elevate and accelerate local pollution control activity simultaneously. To qualify their standards for the Secretary's approval, the states must submit a satisfactory control and enforcement plan including evidence of their capacity to carry out the plan.¹⁹² In short, the state standards are designed to be self-executing. Therefore, a deficiency in federal enforcement jurisdiction should not retard accomplishment of the objectives of the standards program.

A second reason that the federal enforcement power is not crucial is that the standards are not intended to serve *primarily* enforcement purposes.¹⁹³ Standards are certainly important to effective enforcement, but their major value lies in their use in controlling and preventing pollution. Once responsible standards are adopted, the door is opened to a great variety of meaningful planning and preventive activities: Relevant surveillance systems can be developed; the specifications for new waste treatment facilities rationally evaluated; critical path planning undertaken to improve quality levels in waters designated for a greater variety of future uses; and experimentation conducted with unconventional methods for improving water quality. As Secretary Udall reported to the Senate last August,

the end result of the standards provision is that for the first time in water areas throughout the country, a specified set of conditions to adhere to and look for in enhancing and protecting water quality is provided. . . . The major and most meaningful activities of the water quality standards program lie ahead.¹⁹⁴

5. *Is Stricter Regulation Advisable?*—To probe the question posed by the heading, it is necessary to refine it somewhat. The degree of

¹⁹¹ Id. § 466g(g)(2). See 1966 Senate Hearings, *supra* note 4, at 435.

¹⁹² Guidelines, *supra* note 101, at 7. Reliance on state enforcement has the added advantage of avoiding the de novo court review required under federal enforcement procedures and the specific invocation of an economic feasibility test. See Control Act, *supra* note 81, § 466g(h) (Supp. II 1965-66).

¹⁹³ Guidelines, *supra* note 101, at 4.

¹⁹⁴ Summary Status Report to the Subcomm. on Air and Water Pollution of the Senate Comm. on Public Works 3, 5 (Aug. 1967) (as yet unpublished).

strictness contemplated must be specified. Crucial to this process is the consideration of what are the permissible bounds of regulation in the water quality area. What do the relevant statutory provisions authorize and how are they likely to be handled by the courts? Finally whether enforcement is to be instituted by state or federal authorities must also be considered.

Looking first at state regulation, the modern state acts confer on the pollution control agencies a broad grant of regulatory powers to protect the legitimate beneficial uses of water.¹⁹⁵ Under most state acts the regulatory agency would seem to be granted the discretion to regulate as strictly as it deemed appropriate.¹⁹⁶ Ordinarily, the orders of the state regulatory agency are expressly subject to review by state courts. In a few states this review is *de novo*,¹⁹⁷ but in most states the review is on the record, which means the agency's findings of facts are deemed final unless not supported by substantial evidence. Thus, the agency's orders are *prima facie* reasonable and valid.¹⁹⁸ It would appear, then, that an industry appealing the abatement order of a typical state pollution control agency could raise three issues: the regulation is unconstitutional; the fact findings are not supported by the evidence; or the agency's order is so unreasonable and arbitrary as to be invalid. The constitutionality issue is most surely untenable¹⁹⁹ and it is usually difficult to quarrel with findings of fact. So the industry is left to argue the reasonableness of the abatement order. Based on several recent state court decisions, it would appear that the courts are not unaware of the public ire concerning the degradation of local waters.²⁰⁰

¹⁹⁵ See Suggested State Act, *supra* note 153, §§ 1, 4.

¹⁹⁶ See Hines, *Nor Any Drop to Drink: Public Regulation of Water Quality, Part I: State Pollution Control Programs*, 52 Iowa L. Rev. 186, 219 (1966).

¹⁹⁷ See, e.g., Ala. Code tit. 22, § 140(9)(n) (Supp. 1965); Iowa Code Ann. § 455B.18 (Supp. 1968). In some states an interdepartmental review is provided prior to an appeal to the courts. See, e.g., Del. Code Ann. tit. 23, § 710(1) (1953); La. Rev. Stat. § 56:1442 (1966); W. Va. Code Ann. § 20-5A-15 (Supp. 1967).

¹⁹⁸ See, e.g., N.H. Rev. Stat. Ann. § 149:14 (1964); Okla. Stat. Ann. tit. 82, § 913 (Supp. 1967); Suggested State Act, *supra* note 153, § 11(c).

¹⁹⁹ Two possible constitutional law issues could be raised. First, it could be claimed that the regulation constitutes a taking of property without due process. The notion here is that the right to use a watercourse for waste disposal is a property right that cannot be terminated without the payment of just compensation. The vested rights argument is particularly appropriate to the creation and alteration of water quality standards. The other constitutional issue that might be raised is that the regulatory activity conducted by the pollution control agency represents an improper delegation of legislative power to the agency. The modern tolerance for legislative delegation makes this argument of little likely avail. These constitutional issues are fully discussed in Hines, *supra* note 196, at 211-15.

²⁰⁰ See *Town of Waterford v. Water Pollution Control Bd.*, 5 N.Y.2d 171, 182 N.Y.S.2d 785, 156 N.E.2d 427 (1959) (financial hardship not relevant to Water Pollution Control Board's classification of a particular body of water); *Commonwealth ex rel. Alessandrini v. Borough of Coudersport*, 85 Dauph. 82 (Dauphin County Ct., Pa. 1966) (financial hardship will not excuse noncompliance with an abatement order); *Vermont Woolen Corp. v. Wackerman*, 122 Vt. 219, 227-28, 167 A.2d 533, 538-39 (1961)

It is not clear how substantial an economic burden may be placed on an industry by a state pollution abatement order, but it seems obvious that industry's historical position—that it should not be forced to incur waste treatment costs that are not economically justified from a production standpoint—will not prevail.

The regulatory powers of the federal pollution program appear much more assailable than those of state agencies. The federal grant of powers is drafted in terms of pollution "endangering the health or welfare of persons,"²⁰¹ language which sounds suspiciously like a public health oriented regulatory mission. The recent legislative history would suggest a much broader sphere of interest,²⁰² but on its face the federal power appears narrower than the equivalent state authority.²⁰³

The particular industry prosecuted under the federal act has a much more favorable situation if the case reaches the courts because a federal court has the power to hear the matter *de novo* if it chooses.²⁰⁴ In any event, in reviewing the order of the federal agency, the court is expressly directed to give "due consideration to the practicability and to the physical and economic feasibility of securing abatement of any pollution proved . . ."²⁰⁵ Because no federal enforcement case involving an industry has ever raised the issue it is uncertain what interpretation would be given to the "economic feasibility" language, but it would appear that economics arguments would have a greater likelihood of success in a federal proceeding than in a state review.

Assuming that considerable latitude exists, at least at the state level, for tightening pollution enforcement, the next question presented

(financial hardship imposed by antipollution order does not render such order unreasonable or unconstitutional, in view of the strong public interest in pollution abatement).

²⁰¹ Control Act, *supra* note 81, § 466g(d)(1) (Supp. II 1965-66). Economic injury to the interstate commerce in shellfish products is also a ground for federal action. *Id.*

²⁰² The explanation for the health orientation lies in the fact that originally the federal pollution control effort was administered by the Surgeon General of the Department of Health, Education and Welfare. Water Pollution Control Act, 62 Stat. 1155 (1948). When administrative responsibility was transferred to the Secretary of the Interior, the language of the Act was not rewritten. However, the interpretation to be placed on the term welfare seems rather clear in view of the language of the water quality standards provisions, Control Act, *supra* note 81, § 466g(c)(3) (Supp. II 1965-66), and the legislative history behind the shift. H.R. Rep. No. 215, 89th Cong., 1st Sess. (1965) (reprinted in 2 U.S. Code Cong. & Ad. News 3313 (1965)); S. Rep. No. 10, 89th Cong., 1st Sess. 4 (1965).

²⁰³ At least one commentator has suggested that a major reason that the federal power is generally more vaguely defined than equivalent state powers relates to the uncertainties surrounding the federal constitutional power to regulate in the water pollution field. Wendell, *Intergovernmental Relations in Water Quality Control*, in Symposium, *supra* note 83, at 14. Because no police power exists in the federal government, Congress' power to regulate water quality must be derived from its power to protect interstate commerce. See Corwin, *The Constitution of the United States of America* 159 (1964 ed.).

²⁰⁴ Control Act, *supra* note 81, § 466g(h) (Supp. II 1965-66).

²⁰⁵ *Id.*

is whether stringent regulation is a policy likely to be adopted by pollution control agencies. If history is any guide,²⁰⁶ the answer is probably no; however, in water quality matters, predictions based on past performance have been notably unreliable in recent years. Undoubtedly, a substantial increase in the rigor of pollution regulation is inevitable if any hope is held for achieving the national water quality policy discussed earlier. In the final analysis, the degree of regulatory pressure applied to pollution sources probably will turn on an assessment of the relative effectiveness of regulation versus other means for hastening the attainment of the nation's water quality goals. Without doubt, rigid regulation is the most direct means for obtaining the desired waste management. The problem, however, is achieving the nation's water quality aspirations without unduly sacrificing other of society's recognized values. For this reason, it is somewhat premature to speculate on what the future holds for water quality regulation before exploring the other alternatives for generating industrial investment in waste treatment facilities.

This much, however, should be noted: Strengthened regulation is likely to have a considerable impact on the inclusion of adequate waste treatment measures in the construction and operation of *new* industrial plants. There is increasing evidence that industry is on the threshold of accepting the notion that waste treatment is a production cost to be considered in both the design and operation of new plants.²⁰⁷ On the new construction front, aggressive regulation based on water quality standards may be the most successful technique for water quality management. It should be borne in mind, however, that regulation of this type only serves to prevent the addition of new pollution sources.

The existing plants of established industries pose a much different problem. These plants were designed and built under a different code of waste management rules than now prevails. In many cases, the modifications required in order to conform to present water quality standards may be economically prohibitive.²⁰⁸ Strict enforcement of antipollution laws against this segment of industry may achieve the objective of improved water quality at the expense of eliminating the

²⁰⁶ As noted earlier, the history of pollution control enforcement in this country has not been one of vigorous action. See E. Murphy, *Water Purity* 95-130 (1961); Hines, *supra* note 196, at 205-06, 277-30; Stein, *Problems and Programs in Water Pollution*, 2 *Natural Resources J.* 388, 407-08 (1962).

²⁰⁷ Interview with Secretary Udall, 2 *Chemical* 26, No. 12 (Dec. 1966); *Industry Joins Battle To Stem Pollution Tide*, *Business Week* 76-77 (Dec. 31, 1966).

²⁰⁸ Hearing on S. 4, *supra* note 161, at 56; Hearings on H.R. 3988 and S. 4 Before the House Comm. on Public Works, 89th Cong., 1st Sess. 110, 132-33 (1965); Carmichael, *Forty Years of Water Pollution Control in Wisconsin: A Case Study*, 1967 *Wis. L. Rev.* 350, 402-03.

polluter along with the pollution, unless the enforcement is accompanied by some type of economic aid.

B. *Financial Assistance and Incentives*²⁰⁹

One of the things that has always bothered me is that when you talk tough, if that is the correct phrase, to a municipality, you can at the same time that you are waving the stick show the carrot. . . . There is not a comparable left hand/right hand arrangement that I would like to have as the administrator when dealing with industry. You can talk tough, but at the same time you cannot show that you are fully conscious and appreciative of their problem by saying we can also be helpful.²¹⁰

Former FWPCA Commissioner Quigley's concern is undoubtedly shared by many pollution control administrators. Enforcement is most likely to be successful in a context where both the enforcement agency and the polluter believe that compliance with the abatement order does not place an unmanageable burden on the polluter. Increased financial participation by the government in the costs of constructing and operating facilities for treatment of industrial wastes would be an obvious palliative to more enforcement. Different levels of government already absorb directly or indirectly a sizable share of the costs of industrial waste treatment.

1. *Existing Programs and the Delay Problem.*—At the federal level there are few direct financial assistance and incentive programs for pollution control. Since 1966, the Water Pollution Control Act has authorized the FWPCA to support industrial research and demonstration projects aimed at improving waste management.²¹¹ Two current federal programs can offer limited financial aid to industries with serious fiscal problems in meeting pollution control requirements. The Small Business Administration is authorized to give a priority in loans to firms faced with financial difficulty in making heavy capital invest-

²⁰⁹ A provision of the Clean Water Restoration Act of 1966, 33 U.S.C. § 466n (Supp. II 1965-66), required the Secretary of the Interior to conduct a full and complete study of methods for providing incentives to industry and report to Congress the results of the study along with his recommendations by Jan. 30, 1968. Responsibility for preparation of this report was contracted out to the ABT Associates, Inc. of Cambridge, Mass. The report was finally submitted to Congress in March 1968.

²¹⁰ 1967 House Hearings, *supra* note 17, at 80 (remarks of Commissioner Quigley).

²¹¹ 33 U.S.C. § 466c-1 (Supp. II 1965-66). See 1967 House Hearings, *supra* note 17, at 104, where 10 project grants to industries are reported totaling \$2,619,704; 1 CCH Water Control News, No. 50, at 2 (May 1, 1967) (describing the 10 industries). See also ABT Associates, Inc., *Incentives to Industry for Water Pollution Control: Policy Considerations* 24 (Dec. 1967) [hereinafter cited as *Incentives to Industry Report*]. As estimated, 5-10 million dollars has been expended to underwrite research and demonstration projects concerned with industrial pollution. *Id.*

ments for pollution control facilities.²¹² The newly created Economic Development Administration has limited authority, in assisting industry, to make grants and loans²¹³ which could be used for investment in pollution control measures.

The most significant direct assistance to industrial pollution abatement is currently provided by the federal income tax structure. Pollution control facilities may be depreciated for federal tax purposes. The depreciation writeoff means that 30-45 percent of the cost of pollution control facilities is borne by the Government in the form of reduced tax revenues from business firms.²¹⁴ Costs of maintaining and operating waste treatment facilities are also deductible as necessary business expenses. In addition, industry may claim the seven percent investment tax credit for construction of water pollution control facilities.²¹⁵ However, none of these tax breaks offers a meaningful incentive for an industry to choose waste treatment investment over other expenditures that offer a greater return.

The principal indirect federal assistance to industrial waste treatment is provided through the municipal construction grant program.²¹⁶ The federal program to support construction of municipal waste treatment works was funded at \$203 million for fiscal 1968²¹⁷ and is currently authorized at \$700 million for fiscal 1969,²¹⁸ but the actual appropriation will probably not approach that level.²¹⁹ Industries able to discharge their wastes into municipal sewers for treatment in municipal sewage plants can thereby avoid the expense of constructing and operating separate treatment facilities. Over one-quarter of the nation's industrial wastes are currently being treated in municipal plants.²²⁰ The economies of scale that can be achieved through joint, municipal-industrial waste treatment should recommend this approach

²¹² See 1 CCH Water Control News, No. 3, at 11 (June 6, 1966); *id.* No. 44, at 5 (March 20, 1967).

²¹³ 42 U.S.C.A. §§ 3121-226 (Supp. 1967).

²¹⁴ Of the 2.2 billion dollars invested by industry in pollution control facilities, it is estimated that 660-990 million dollars has been indirectly financed by the Government through tax reductions. Incentives to Industry Report, *supra* note 211, at 24.

²¹⁵ Int. Rev. Code of 1954, §§ 38, 46. During the brief period between October 10, 1966, and March 9, 1967, when the investment credit was suspended, water pollution control facilities were specifically exempted from the suspension if they met certain requirements. 26 U.S.C. § 48(h)(12)(B) (Supp. II 1965-66). One of the requirements was certification by the Secretary of the Interior.

²¹⁶ Clean Water Restoration Act of 1966, 33 U.S.C. § 466e (Supp. II 1965-66), amending 33 U.S.C. §§ 466e(b)-(d), (f), (g) (Supp. I 1965).

²¹⁷ Spending on construction grants was cut back 23.4 million dollars for fiscal 1968. 2 CCH Water Control News, No. 37, at 8 (Jan. 29, 1968).

²¹⁸ 33 U.S.C. § 466e(d) (Supp. II 1965-66).

²¹⁹ The Administration's budget asking for the construction grant program for fiscal 1969 was 225 million dollars. 2 CCH Water Control News, No. 38, at 6 (Feb. 5, 1968).

²²⁰ Incentives to Industry Report, *supra* note 211, at 24-25.

to many more industries whose wastes are acceptable by municipal plants.²²¹ Municipal-industrial cooperation in waste treatment is specifically encouraged under both the federal construction grant and the demonstration grant programs,²²² and the suggestion has been advanced that municipalities could directly assist industry within the framework of the existing federal program by building municipal works for the express purpose of treating industrial wastes.²²³

It should be noted that by indirectly benefiting industries able to obtain waste treatment services from a municipality, the federal construction grants covertly discriminate against industries which do not have that option available to them. In his Incentives to Industry Report recently submitted to Congress, Secretary Udall argued forcefully that the municipal grant program should not be utilized to provide indirect assistance to industries.²²⁴ The principal reasons advanced for this position are based on the premise that a municipality ordinarily will not charge an industry the full costs of treating its wastes because the contributions of state and federal construction funds will be disregarded. Therefore, because industry will not bear the true cost of purifying its wastes, it is contended that use of municipal facilities partially supported by federal grants operates as a disincentive to industries to manage their wastes effectively.

At the state level, a number of tax measures designed to encourage industrial waste treatment have recently been enacted. Many states exempt water pollution control facilities from state property taxes,²²⁵ while others grant special exemptions from or credits against corporate,²²⁶ income,²²⁷ and sales tax levies.²²⁸ Also, accelerated deprecia-

²²¹ This approach is not a solution for the many industries whose waters cannot be handled by conventional sewage treatment methods. For a discussion of the various problems in mixing industrial discharges with sanitary sewage, see N. Nemerow, *Theories and Practices of Industrial Waste Treatment* 13-14, 143-83 (1963).

²²² Clean Water Restoration Act of 1966, 33 U.S.C. § 446c-1 (Supp. II 1965-66).

²²³ See 1966 Senate Hearings, *supra* note 4, at 513.

²²⁴ "The current municipal grant program should be restricted to facilities for treating domestic wastes, and made conditional on demonstration that industrial wastes are treated for a service charge based on the full costs of such treatment." *Incentives to Industry Report*, *supra* note 211, at 55.

²²⁵ See, e.g., Conn. Gen. Stat. Ann. § 12-81(51) (Supp. 1966); Mass. Gen. Laws Ann. ch. 59, § 5 (Supp. 1968). See 2 CCH Water Control News, No. 24, at 41-44 (Oct. 30, 1967).

²²⁶ See, e.g., Mass. Gen. Laws Ann. ch. 59, § 5 (Supp. 1968); N.C. Gen. Stat. § 105-296 (Supp. 1967). See 2 CCH Water Control News, No. 24, at 41-44 (Oct. 30, 1967).

²²⁷ See, e.g., Okla. Stat. Ann. tit. 82, § 923 (Supp. 1967); Ore. Rev. Stat. § 314.250 (1967). See 2 CCH Water Control News, No. 24, at 41-44 (Oct. 30, 1967).

²²⁸ See, e.g., P.A. 57, § 28, 1967 Conn. Laws (Conn. Leg. Serv. No. 1, at 63 (1967)); Ill. Ann. Stat. ch. 120, § 439.102a (Smith-Hurd 1968). See 2 CCH Water Control News, No. 24, at 41-44 (Oct. 30, 1967).

tion of pollution control works is authorized in a few states.²²⁹ However, state tax incentives are generally conceded to have been a minor factor in encouraging industry to adopt water pollution control measures.²³⁰ No state has yet authorized direct construction grants to industry but at least one state has created a board to administer financial and technical assistance for water resources planning and development.²³¹

One reason for seriously considering direct financial assistance and incentive programs is that, without such aid, industry may effectively thwart the nation's water quality improvement timetable through delaying tactics. The tangible advantages derived from such tactics are manifold. Waste treatment maintenance and operating costs are saved and capital may be employed for more profitable purposes. By stalling its investment in waste treatment, the industry may be able to benefit from cost saving new technology or may be the recipient of benefits under some future government aid program. As was noted in the earlier enforcement discussion, neither the threat nor the commencement of enforcement proceedings is a compelling reason for a firm to alter its waste disposal practices immediately. A company wishing to postpone investment in waste treatment may not only gamble that the enforcement pressure will be minimal, but it may also capitalize on the time lags built into most enforcement procedures, and further defer the effect of an adverse determination by challenging the abatement order in court. In summary, an industry that elects a deliberate strategy of delay may be able to postpone for years the day when it must finally commit firm resources to pollution abatement. Therefore, any proposal designed to stimulate industry to attach a high priority to waste treatment investment must be evaluated against this background of potential delay.²³²

2. *Proposed Programs Reviewed.*—In appraising the various avenues for stimulating industrial investment in water pollution control, a certain tension must be recognized between the need to motivate construction of facilities, the objective of promoting economic efficiency in waste management and the desire to treat the various industries equitably. The Incentives to Industry Report suggests that it is useful to distinguish between programs for increased government *assistance* to industry in meeting pollution control costs and proposals designed to provide *incentives* to industry to improve their own pollution con-

²²⁹ See, e.g., Wis. Stat. Ann. § 71.04(2b) (Supp. 1967). See 2 CCH Water Control News, No. 24, at 41-44 (Oct. 30, 1967).

²³⁰ See Views of the Governors on Tax Incentives and Effluent Charges, Report of the House Comm. on Gov't Operations 11, H.R. 1330, 89th Cong., 2d Sess. (1966).

²³¹ Ill. Ann. Stat. ch. 19, § 1008.09 (Smith-Hurd Supp. 1967).

²³² For a more definitive discussion of the delay problem, see Incentives to Industry Report, *supra* note 211, at 9, 26.

trol performance.²³³ Both types of proposals must be evaluated on the basis of whether they promote efficient waste management; whether they are equitable; and whether they are politically and administratively feasible. Incentives proposals are subject to further scrutiny as to whether they are reasonably calculated to accomplish the desired change in waste management behavior. Three types of special programs are considered below: direct payments and grants, special tax treatment, and loans.

a. *Direct Payments and Grants.*—Strategically applied payments to industry for eliminating waste discharges could provide an incentive effect similar to the effluent charge detailed below.²³⁴ In theory, payment based on the extent to which the industry's waste load is reduced could supply the motivation to improve waste management now so clearly lacking. In practice, however, such a program contains so great a potential for inequities and waste of scarce public funds, that it seems beyond the pale of political feasibility.

Although no one has yet seriously advocated an industrial water quality program based on direct payments for pollution reduction, the industrial sector has long advocated a system of direct federal matching grants to industry for construction of waste treatment installations.²³⁵ Such a government program would clearly offer the maximum assistance to industry among the proposals currently being pressed. A sizable federal grant program also would have an incentive impact; however, it seems questionable whether even as vigorous a federal grant program as one patterned on the present municipal construction grants would provide the incentive for significantly hastening improvements in industrial waste management comparable to the recent gains in municipal construction. Unless the Government is willing to share a higher proportion of the cost of treatment plant construction than is offered in the municipal grant program, it is difficult to believe that industry would view the availability of a federal grant as sufficient inducement to commit a large part of its investment funds to facilities that return no income. Other difficulties lurking in the grant proposals are: that grants may bias industry to choose less efficient methods of waste disposal because the Government's sharing in the construction cost makes grant supported methods cost less to the firm; that they discriminate in favor of firms who have been dilatory in attacking their waste management problems; and that they are likely to involve rather high administrative costs.²³⁶

²³³ Id. at 3-4.

²³⁴ A. Kneese, *The Economics of Regional Water Quality Management* 57-58, 195-96, 203-06 (1964).

²³⁵ Such a proposal was deleted from the original 1948 Act before it was passed. S. 418, 80th Cong., 1st Sess. § 6 (1947).

²³⁶ *Incentives to Industry Report*, supra note 211, at 46-47.

To provide grants of sufficient size to attract industry to waste treatment investment would place substantial demands on the already limited governmental resources being applied to environmental quality problems. The fundamental question with the grant approach is whether a high assistance, low incentive program of this cost magnitude is justified in light of the other alternatives for dealing with industrial water pollution that place much less demand on the public weal and have a greater likelihood of inducing efficient waste management.

The Incentives to Industry Report rejects the idea of a direct grant program,²³⁷ but admits that it has certain advantages over other approaches. The Report suggests that if grants are used to assist industry, they be limited to existing firms, restricted in time, and be broad enough in scope to encourage employment of central treatment systems and land intensive treatment methods where appropriate.

b. *Special Tax Treatment.*—Two incentive proposals that enjoy considerable support both in industry and in Congress involve the creation of special tax incentives. One plan proposed in the 89th Congress called for authorization of accelerated amortization of the cost of pollution control facilities.²³⁸ The other proposal regularly introduced in Congress would create a bonus investment credit for pollution control measures.²³⁹ If, under the first plan, the write-off period was as short as a year or two, industry would gain a greater economic benefit through accelerated amortization than doubling or even tripling the investment credit.²⁴⁰ However, neither of these tax incentive proposals has been well received by the Internal Revenue.²⁴¹ The recent Incentives to Industry Report strongly rejects the special tax incentives approach, but suggests that if such a method is adopted, a large (30%) special investment credit would be the most likely to produce the desired water quality results.²⁴²

²³⁷ [I]t does not seem that direct cost sharing for the bulk of industrial firms is justified. Such a program would have the following disadvantageous effects on efficiency: high administrative costs, low probability of offering positive incentive, and the possibility of increasing a firm's incentive to delay while lowering its incentive either to engage in efficient process changes to abate pollution or to join in a government treatment system.

Id. at 47.

²³⁸ See S. Rep. No. 1367, 89th Cong., 2d Sess. 15 (1966).

²³⁹ See 1966 Senate Hearings, *supra* note 4, at 309, 532. FWPCA Commissioner Quigley announced his support for some type of tax incentive to industry in 1967. See 1967 House Hearings, *supra* note 17, at 80.

²⁴⁰ See 1966 Senate Hearings, *supra* note 4, at 517 Table A.

²⁴¹ Secretary Udall, in discussing tax incentives, has indicated his general approval of the idea but cautioned: "This is going to be, obviously, a considerable battle, because I am not so sure the Treasury Department will favor any tax incentives." Hearings on H.R. 13104 and H.R. 16076 Before the House Comm. on Public Works, 89th Cong., 2d Sess. 55 (1966); see also 1 CCH Water Control News, No. 42, at 1 (March 6, 1967).

²⁴² Incentives to Industry Report, *supra* note 211, at 42, 46.

Of the three types of programs examined herein, granting special tax benefits to industry for pollution control investment is at the same time the most feasible politically and the least defensible on the merits. Tax adjustments are unlikely to have significant incentive effect; they are likely to bias firms in favor of inefficient waste management methods; and they contain the potential for substantial inequities.

The incentive effect of special tax relief for investment in waste management is highly questionable. A special investment credit of seven percent amounts to a net benefit to the firm of three and one-half percent of the facility's costs. Thus, while the tax credit makes an unprofitable investment somewhat less unprofitable, the investment still represents a net loss. For industries about to be or already subject to enforcement orders to build new facilities, a tax relief of this type would no doubt be welcome; however, it is unlikely that industrial decision makers would undertake expensive pollution control projects to obtain the proposed level of tax relief.

The Incentives to Industry Report argued against using tax relief to increase pollution control investment.²⁴³ The report suggests that special tax relief will cause an industry to look for the type of acceptable treatment method whereby it can obtain the maximum tax advantage. No assurance exists that the treatment alternatively chosen will be the least cost pollution prevention option to the firm as well as the lowest total cost method from the governmental viewpoint. For example, under present tax proposals, acquisition of mechanical devices for waste treatment would result in a tax credit, but the acquisition of land or investment in new production methods would not. Land intensive methods of waste disposal or production method modification may be the most efficient means for handling the firm's waste problems, but they may be neglected in favor of mechanical treatment because the government's participation in the latter method makes it the least cost alternative to the firm.

The report also presents a more fundamental economic argument. Additional government aid undermines the operation of the free competitive market because it permits an industrial firm to shift a part of the pollution costs generated by its production to the community at large, and, therefore, to sell its products at a price lower than if the full cost of production had to be recovered from the consumer.

Superficially, it would appear that the way to assure equitable treatment under the tax relief approach would be to make the benefits available on an across-the-board basis. However, this "shotgun" approach will invariably create substantial inequities in that many recipients of the program's benefits do not merit the assistance offered, while others are not in a position to take full advantage of the incen-

²⁴³ *Id.* at 42-44.

tives. The granting of special economic concessions to those industries which have been dilatory in cleaning up their wastes actually works an inequity against industries which have already assumed their proper responsibility for waste management.²⁴⁴ Furthermore, the tax incentive proposals are of substantially greater value to efficient and prosperous businesses than they are to industries with low economic efficiency and large pollution problems,²⁴⁵ the group most needing government aid.

Another issue consistently raised regarding the use of tax laws to stimulate pollution control concerns the soundness of creating a further complication in the federal tax structure. A new special tax benefit would also create considerable budgetary uncertainty in respect to the amount of the tax revenues that would be lost. Because the effects of the tax relief program cannot be known in advance, the nation is committed to an uncertain amount of assistance in an area where it is difficult to measure at any point the full impact of the program on the public treasury.²⁴⁶

c. *Loans*.—Industry has advocated government loans for construction of pollution control facilities much less strenuously than it has urged either direct grants or tax relief. The obvious explanation for this cool attitude is that loans furnish significantly less benefit to industry than either of the other two proposals.²⁴⁷ To a large company with adequate access to the capital market, the only benefit that would flow from government loans for pollution control would be in the form of lower interest and more favorable loan terms. To hardship industries not able to obtain money in the capital market, however, government loans could spell the difference between continued operation and cessation of business.

Because loans ordinarily involve less distortion of the competitive market, they are the aid least subject to criticism on grounds of economic efficiency. Furthermore, since the use of the loan money involves a cost and loans must ultimately be repaid, loan programs offer the least opportunity for industry to shift pollution costs away from its consumers. To the extent that loans were made available to firms which could not otherwise raise money for pollution control investment, they would have the highest incentive potential of any of the

²⁴⁴ J. Merrel, *Federal Incentives for the Construction of Industrial Waste Water Treatment Facilities and Programs for Industrial Waste Water Treatment Research and Demonstration Grants*, Utah State Univ., Conference on Industrial Waste Water 5 (Aug. 10, 1967).

²⁴⁵ S. Rep. No. 1367, 89th Cong., 2d Sess. 15 (1966).

²⁴⁶ See *Incentives to Industry Report*, *supra* note 211, at 44-45.

²⁴⁷ Nevertheless, it is estimated that the value of a loan to a firm may run as high as 20% to 50% of the value of the loan, depending on the terms of the loan and the firm's discount rate. *Id.* at 48.

government aid proposals because a firm without any alternatives is most susceptible to the incentive features of the program.

On the other hand, loans would involve the highest administrative cost of any of the proposals and, unless the program was restricted to industries that could not otherwise raise capital, the incentive effect would be uncertain. In addition, a loan program is subject to the same general objection as other financial aid programs: it may induce industry to adopt a less efficient approach to waste management because financial aid is available to support that approach.

The Incentives to Industry Report recommends consideration of a federal loan program, the funds to be made available at or near the market interest rate.²⁴⁸ The theory behind the suggestion is that by pegging the cost of the loan funds at market, only firms who cannot obtain money in the regular capital market would apply for government aid. Thus, the loan program would operate principally for the benefit of industries facing hardship in securing the financing for pollution abatement facilities. The report suggests that the loan program be limited in duration and be restricted to existing firms for improvements that will bring their waste disposal practices within the water quality standards.²⁴⁹

d. *Conclusions.*—The difficulty in achieving fairness and efficiency in the operation of a broad gauge program of government assistance or incentives to industry, coupled with serious reservations in justifying the cost of such measures, explain the demonstrated reluctance to pursue this course of action in attacking the industrial pollution problem. Two basic ideas run through the proposals for government aid.

(1) Some of the proposals are advanced on incentive grounds. The theory that underlies these proposed programs apparently holds that many industry decision makers are in a state of equilibrium on the question of pollution control investment and that a small nudge in the form of government aid will move them to commit their firm to a pollution abatement program. This view of the business world does not seem to be supported by the hard economic facts of industrial pollution control.

(2) Most proposals can be justified only as a palliative to enforcement designed to hasten compliance in the construction of facilities already required. In the final analysis, evaluation of these proposals turn on resolution of an essential policy question: Whether, recognizing that the costs are high and the efficiency factors low, it is nevertheless in the public interest for government to participate substantially in industry's pollution abatement costs.

²⁴⁸ *Id.* at 49.

²⁴⁹ *Id.* at 50.

INDUSTRIAL WATER POLLUTION

In the long run, considerations of fairness and efficiency would seem to require each industry to absorb its own costs of installing and maintaining water pollution control facilities. If public enforcement measures can be relied upon to force the necessary expenditures, then private incentives, perhaps coupled with an efficient regional waste management system, will assure that each plant's waste problem is solved on a least cost basis.

It has been clear from the outset that if the nation's citizens seriously want clean water, inevitably the cost of gratifying that desire would be visited on the public in one form or another. In respect to the cost of abating industrial pollution, private industry undoubtedly has a greater ability than government efficiently to pass that cost along to the public through an increased price for goods and services. If the manufacturing of a good or the rendering of a service produces a polluting waste, the cost of managing that waste should be borne directly by the consumers in the price paid for the good or service. When pollution control is correctly viewed as an ordinary cost of production, this solution seems both reasonable and just. A growing segment of the business community is coming to endorse this "do it ourselves" approach.²⁵⁰

As a practical matter, not every industry will be in a position to finance needed pollution control improvements independently or have available a municipal system that can handle its wastes. For these industries some form of government assistance is essential if the nation's water quality objectives are to be achieved and the marginal industry is to remain viable. If local programs cannot or will not fill this breach, federal assistance through some form of loan program, perhaps similar to that administered by the Small Business Administration, would seem necessary. A selective loan program to deal with cases of economic hardship would not seem inconsistent with a policy of

²⁵⁰ See *Fortune*, March 1967, at 101; 1967 House Hearings, *supra* note 17, at 29; Moore, *The National Focus on Water Quality*, U.S. Dept. of the Interior News Release, May 27, 1968, at 5.

The extent to which industry can mobilize itself to deal with water quality problems, if adequate motivation exists, is illustrated by a recent development in "soft" detergents. In the early part of this decade the detergent industry was under attack on all fronts by pollution control forces because the foaming agents in its products continued to operate long after passing through normal sewage treatment processes, to the manifest consternation of downstream users of the frothy water. Extensive hearings were held on the detergent problem and at least one state threatened to ban the sale of the products. The detergent industry reported encouraging progress in research to create biodegradable detergents and so government action was delayed to an agreed deadline for producing an acceptable product substitute. By marshalling its research forces, the industry developed and introduced the "soft" detergent within the deadline and the case was effectively closed. 1965 Senate Hearings, *supra* note 34, pt. 1, at 158-210. However, detergents continue to present a few water quality problems. See 2 CCH *Water Control News*, No. 30, at 6 (Dec. 11, 1967). The most serious is probably that the phosphates they contain act as nutrients upon aquatic vegetation. See *id.* No. 36, at 2 (Jan. 22, 1968).

assigning to industry the primary responsibility for providing the needed investment in pollution control facilities—loans result in only a temporary deflection of the investment burden. Strategic responses to clearly identified problem situations seems to be the role for which the federal government is best suited in water quality management.²⁵¹

C. *Effluent Charges*

Probably no other suggested approach to water quality improvement has attracted more heated discussion in the past several years than the idea of imposing effluent charges on polluters.²⁵² This unconventional proposal, a German import,²⁵³ is founded on a fairly conventional economic theory: If market forces do not allocate resources efficiently, an optimizing system should be created to simulate the allocative processes of a viable market. As stated earlier, the economic core of the pollution problem is that waste dischargers were traditionally allowed cost-free use of the nation's waters at the expense of downstream uses. Therefore, the most direct means to redress the present imbalance in waste management costs is to impose a charge on the disposal of wastes into water. As a matter of economic theory, if the charge were equivalent to the total of all downstream damages resulting from the wastes discharged by the firm against whom the charge is assessed, the external diseconomies would be eliminated and

²⁵¹ The Incentives to Industry Report recommends the use of a low interest loan program for what it refers to as "hardship" cases. Also suggested is a short period of grace exempting such plants from the standards requirements. Incentives to Industry Report, *supra* note 211, at 119.

²⁵² See generally 1965 Senate Hearings, *supra* note 34, pt. 3, at 912-61; 1966 Senate Hearings, *supra* note 4, at 308, 321; Carmichael, Forty Years of Water Pollution Control in Wisconsin: A Case Study, 1967 Wis. L. Rev. 350, 415; Delogu, Effluent Charges: A Method of Enforcing Stream Standards, 19 Maine L. Rev. 29 (1967); Industrial Water Pollution Control, in Mill and Factory (Nov. 1966).

²⁵³ The concept of effluent charges is derived from the practices of the Genossen-shaften (Cooperative Water Associations) that have experienced substantial success in managing the quality of water in heavily industrialized river basins in Germany. The German associations operate much like an American drainage district or irrigation districts except that their purpose is to plan and operate a comprehensive program for managing the quality of waters in the basin.

The waste treatment and disposal systems of the entire river basin are integrated under one master plan to assure maintenance of an agreed level of quality in the basin's waters. The Association builds necessary waste treatment facilities, reservoirs, and dams and locates them strategically in the basin to achieve the maximum quality control efficiency from the installations. These pollution control works are financed by a charge assessed against every city and industry discharging wastes into the river system. The fee is based on the strength and volume of the effluent discharged. Through the Association, the costs of pollution are assigned directly to the polluter, rather than borne by downstream water users, as is too often the case in this country. Waste treatment by the Association offers substantial advantages to industries in that the charges are fully tax deductible and the Association's treatment works qualify for governmental assistance that private industry cannot obtain. See generally A. Kneese, *supra* note 234, at 121-87; Industrial Water Pollution Control, in Mill and Factory 54-57. (Nov. 1966); 1965 Senate Hearings, *supra* note 34, pt. 3, at 927-50.

approximated market forces would begin to function. In other words, if disposal into water was not the least cost method of handling its wastes, industry would develop other methods. In such a situation, private incentives would encourage the polluter to reduce waste loads by all relevant means—treatment, process adjustments, waste recovery and plant location—to the extent that the costs of these measures could be profitably traded off against reduced effluent charges. Thus, by providing a proper level of incentive for reducing waste discharge, the effluent charge promotes an optimal level of waste management that should minimize the social cost of pollution.²⁵⁴ Furthermore, because the charge is directly related to the costs occasioned by each individual polluter, it effects an equitable accommodation among polluters and between each polluter and the community.

A substantial portion of the disagreement concerning the merits of the effluent charge can be traced to lack of precision in articulating how the concept would be implemented to achieve specific water quality objectives.²⁵⁵ Of particular uncertainty are the bases on which the charges are to be assessed and the use to be made of the proceeds collected. Several water quality management systems based on effluent charges have been suggested.²⁵⁶

The boldest step proposed is the adoption of the effluent charge as a major tool in the national water quality improvement program.²⁵⁷ Under this proposal effluent charges would be directly related to water quality standards in a pollution control program administered by some form of regional agency. The notion is that quality standards would provide the regional resource management objectives and effluent charges would provide the funds with which the objectives would be pursued through a rationally organized management system.²⁵⁸ In the Administration's Clean River Restoration program submitted to

²⁵⁴ This economic theory is fully and articulately developed in A. Kneese, *supra* note 234.

²⁵⁵ The Incentives to Industry Report found the effluent charge concept to be worthy of "very serious consideration," but then more or less dismissed it as administratively and politically impractical. It is submitted that the report may have viewed the effluent charge concept too narrowly, as is demonstrated by the fact that the regional basin authority proposed by the report is based in great measure on the charge idea. Incentives to Industry Report, *supra* note 211, at 78-79.

²⁵⁶ The most elementary proposal is an enactment of a modest federal effluent tax, the proceeds of which would be applied to supporting existing federal and state pollution control programs. The tax would be based on some crude scale for measuring the quantity of an industry's wastes. This arrangement would rely on private incentive factors, heavily supplemented by ordinary control and enforcement techniques, to accomplish water quality goals, but it would also have the beneficial effect of shifting the cost of pollution control to the parties occasioning the cost.

²⁵⁷ 1965 Senate Hearings, *supra* note 34, pt. 3, at 912-26 (statement of Allen Kneese, Director, Water Resources Program, Resources for the Future, Inc.); Kneese, Scope and Challenge of the Water Pollution Situation, in *Water Pollution Control and Abatement* 8-12 (Willrich & Hines ed. 1967).

²⁵⁸ Delogu, *supra* note 252, at 29; A. Kneese, *supra* note 234.

Congress in 1966, effluent charges were expressly to be considered by the river basin planning agencies which the program would encourage.²⁵⁹ This provision drew substantial criticism from industry²⁶⁰ and was deleted along with most of the river basin planning machinery in final passage of the 1966 Act.²⁶¹

Nevertheless, using effluent charges to fund the development and operation of a water quality management system organized on a basin basis is promoted as the optimizing technique through which regional water quality objectives can be achieved at the lowest overall cost.²⁶² The charge supplies incentive to improve in-plant waste management procedures while simultaneously providing the necessary funds for the regional control agency to build and operate the off-site control facilities. The charge would relate directly to the costs each individual discharger creates and would be calculated either on the basis of the opportunity loss incurred downstream if the standards are not met or the actual cost to the regional agency in providing the waste management procedures necessary to comply with the standards.²⁶³

The relation of the effluent charge to off-site costs of waste management appears to represent both the most workable method of

²⁵⁹ S. 2987 § 104(b), 89th Cong., 2d Sess. (1966).

²⁶⁰ See, e.g., 1966 Senate Hearings, *supra* note 4, at 302, 321, 532.

²⁶¹ It appeared for a brief period that the federal government was flirting seriously with the idea of promoting the effluent charge system in the same way it had pushed the water quality standards program. In 1965 a Presidential advisory committee recommended that "careful study be given to tax-like systems in which all polluters would be subject to 'effluent charges' in proportion to their contribution to pollution." Report of the Environmental Pollution Panel, President's Science Advisory Comm., *Restoring the Quality of Our Environment* 17-18 (1965). In an unpublished paper prepared in April of 1966, sponsored by the President's Council of Economic Advisors, the proposition was advanced that "effluent charges should be seriously considered as a method of attaining water quality improvement." Quoted in Thursby, *Some Economic Implications of Water Quality Management*, in Symposium, *supra* note 83, at 60. The federal pressure for comprehensive information regarding industrial waste management practices was seen by some in industry as a harbinger of an effluent charge proposal. As already noted, § 104(b) of the original Clean Rivers Restoration proposal included a direction to consider effluent charges. After this legislation was drafted, Secretary Udall took a blue-ribbon team to Germany to view first hand the operation of the effluent charge system. Neither Secretary Udall nor Commissioner Quigley returned home very enthusiastic about the applicability of the German experience to American pollution problems. In a congressional hearing, Commissioner Quigley expressed doubts whether what he had seen in Germany was adaptable within the framework of our social and political institutions and Secretary Udall confessed his willingness to have the effluent charge language stricken from the administrative proposal. 1966 Senate Hearings, *supra* note 4, at 123, 138a; *Industrial Water Pollution Control, in Mill and Factory* (Nov. 1966). The effluent charge idea currently seems in limbo at the federal level, although apparently it is still being tossed around within the FWPCA. See E. Johnson, *A Study in the Economics of Water Quality Management*, 3 *Water Resources Research* No. 2 (2d Quarter 1967) (Johnson is an FWPCA economist).

²⁶² A. Kneese, *supra* note 234, at 54-85; E. Johnson, *supra* note 261; Kerri, *A Dynamic Model for Water Quality Control*, 39 *Water Pollution Control Fed'n J.* 772 (1967).

²⁶³ See 1965 Senate Hearings, *supra* note 34, pt. 5, at 921-22.

assessing the charges and the most reasonable application of the proceeds from the charges. The range of water quality management alternatives open to an agency which has planning, implementation and enforcement jurisdiction coextensive with the regional basin includes the realization of economies of scale in constructing and operating collective waste treatment facilities, the management of stream flow through storage reservoirs, direct improvement of the watercourse itself at intervals, waste diversion channels, specialization of streams, as well as regulation of on-site treatment procedures. Operating a basin-wide system, the regional agency could strategically plan and combine these measures to achieve the area's water quality standards at the lowest cost, while financing its waste management activity through assessment of a charge against polluters.²⁶⁴ Described in this fashion, the effluent charge appears less an alien incursion on American resource management and more a sensible extension of the ordinary sewage charge system long used by municipalities.²⁶⁵

The theoretical justification for the regional effluent charge system is difficult to fault; however, the theory is not self-executing and the practical obstacles to putting such a system into effect are substantial.²⁶⁶ In the first place, the current lack of reliable information about the quality and the use of the nation's waters at many locations as well as the identity and contribution of waste dischargers would pose a severe handicap to assessment of effluent charges based on any precise calculation relating to downstream damages.²⁶⁷ Steps are

²⁶⁴ The system described is approximately that recommended by the Incentives to Industry Report as providing the most efficient and workable solution to the problems of assisting industry to meet its water quality responsibilities. The principal difference is that the authority suggested in the report would have neither policy formulation nor enforcement powers. Incentives to Industry Report, *supra* note 211, at 78-91.

²⁶⁵ It would indeed be unfortunate if the deletion of the effluent charge provision from the 1966 federal act dissuades regional pollution control agencies from giving the effluent charge the consideration it deserves. Clearly, not all river basins are either geographically suited or highly enough industrialized to warrant experimentation with developing a closely integrated regional water quality control organization based on the levying of effluent charges, but enough American rivers would seem to be susceptible of this type of intensive water management to make relevant the Genossenschaft experience. Already 40% of America's urban population and a higher portion of our industries are located in only 4 of our 22 river basins. These basins contain huge megalopolitan complexes where the gains from intensive, systematic waste management would be high. For a discussion of the practicality of attempting to apply the Genossenschaft concept to various American river valleys, see 1965 Senate Hearings, *supra* note 34, pt. 3, at 919, 923-24.

²⁶⁶ Currently no state uses an effluent charge in its pollution control program, and the prospects for adoption of such a system do not appear bright. See Views of the Governors on Tax Incentives and Effluent Charges, Report by the House Comm. on Gov't Operations, 89th Cong., 2d Sess., H.R. No. 1330 (1966). Effluent charge systems have been proposed for at least two states. See Carmichael, *supra* note 252, at 415; Delogu, *supra* note 252, at 46.

²⁶⁷ A. Kneese, *Water Pollution, Economic Aspects and Research Needs* 57-85 (1962).

presently underway to narrow this information gap.²⁶⁸ Second, even if enough facts were known about water quality and waste discharge practices, the calculation of downstream damages based on all possible factors raises extremely difficult problems of measuring and quantifying such intangible social costs as injury to aesthetics and recreation.²⁶⁹ These problems are as yet unsolved in relation to water resource projects far less complicated than quantifying the social cost of pollution.²⁷⁰ The point should be made, however, that the effluent charge does not require exactness in calculation of damages to achieve its desired incentive effects at a relatively high level.²⁷¹

The alternative of basing the charge on the cost to the regional water control organization of managing the discharger's waste avoids these uncertainties, but it creates new problems. For example, if the incentive theory is sound, the region will require more waste management facilities at the commencement of the waste control program than it may subsequently need as individual production units improve their internal waste management procedures to cut costs. Careful planning will be required to avoid waste resulting from early obsolescence of waste management works. On the other hand, if a regional waste management program, such as collective treatment, provides relatively low cost waste disposal, some of the incentive for experimenting with in-plant improvement may be removed. Of course, both these situations only affect the realization of the economic goal of maximum efficiency; the water quality objectives will nevertheless be accomplished, although perhaps at a higher cost.

The most serious impediments to regional water quality management financed by effluent charges may be the political difficulties in creating an effective management agency. The theoretical soundness of employing regional organizations to handle problems that assume a regional configuration has long been recognized,²⁷² but successes have been rare in effecting the political adjustments necessary to make the regional arrangements work.²⁷³ Despite strong federal sup-

²⁶⁸ The FWPCA is currently conducting basin-wide water quality projects in relation to its responsibility to develop comprehensive pollution control plans and programs. Water Pollution Control Act, as amended, 33 U.S.C. § 466a(a) (Supp. II 1965-66). Projects covering 13 of the nation's 20 major basins are completed or underway. See Programs, *supra* note 5, at 17.

²⁶⁹ See A. Kneese, *supra* note 234, at 71-73.

²⁷⁰ See A. Kneese, *supra* note 267, at 57-85; M. Clawson & J. Knetsch, *Economics of Outdoor Recreation* 211-29 (1966).

²⁷¹ A. Kneese, *supra* note 234, at 82-83.

²⁷² "Our regions are realities. Political thinking must respond to these realities. Instead of leading to parochialism, it will bring a fresh ferment of political thought whereby national aims may be achieved through various forms of political adjustments." Frankfurter & Landis, *The Compact Clause of the Constitution—A Study In Interstate Adjustments*, 34 *Yale L.J.* 685, 729 (1925).

²⁷³ One cynic has put it thus: "The river basin plan is good river management but it is not logical politically." F. Graham, *Disaster by Default* 217 (1966).

port for the concept of regional water resource planning and management,²⁷⁴ no organizational vehicle has yet enjoyed sufficient success in carrying out regional programs so as to inspire emulation.²⁷⁵ The organization of the Delaware River Basin Commission is perhaps most worthy of serving as a blueprint for highly developed industrial areas.²⁷⁶

Considering the great diversity that exists among the nation's river basins, it is probably unreasonable to make uniformity an objective in river basin organization. A highly organized regional waste management program appropriate to the Delaware River Basin is probably not well suited to the upper Missouri River Valley. Ideally, each river basin should be organized in the manner most conducive to managing the water resource problems peculiar to that basin. For example, many institutional arrangements presently exist for organizing water quality management on a problemshed basis. These range from small intrastate watershed basin agencies, through interstate compacts and regional federal-state commissions, to federal regional subagencies. Imaginative new uses of existing institutions will be required and creation and experimentation with new institutional arrangements should be encouraged. This needed flexibility complicates the implementation of a national policy, but it seems essential if the program is to be successful in the long run.

If the national policy to enhance water quality is to be implemented through a regional approach to waste management, at the moment it appears politically impractical to rely on state and local initiative to create the necessary regional institutions. If local interests fail to act, the impetus for regional management will very likely come from above through a more deliberate federal program to force acceptance of the problemshed concept of organization. This step seems just around the corner.²⁷⁷

²⁷⁴ See 33 U.S.C. § 466b (1964); *id.* §§ 466a(c), 466e(f) (Supp. II 1965-66); 42 U.S.C. § 1962c (Supp. I 1965).

²⁷⁵ The Incentives to Industry Report, *supra* note 211, at 80-90, devotes substantial attention to the problems of organizing and operating a basin water quality management authority.

²⁷⁶ See Grad, *Federal-State Compact: A New Experiment in Co-operative Federalism*, 63 Colum. L. Rev. 825 (1963); see also Zimmerman & Wendell, *New Horizons on the Delaware*, 36 State Gov't 157 (1963).

²⁷⁷ Adoption of the river basin provisions of the Administration's Clean Rivers Restoration proposals in 1966 would have represented a major stride in the direction of the regional approach. Unless the states take more initiative in this area, it is unlikely the federal patience with uncoordinated local programs will long continue. See 1966 Senate Hearings, *supra* note 4, at 123: "We must devise our own [basin-wide] systems to meet our own needs." The basin authority recommendations of the recent Incentives to Industry Report is another manifestation of the federal interest in the problemshed approach to water quality.

VI. CONCLUSION

As America's population and industrial prowess continue to multiply, one issue emerges with increasing clarity: "What quality of life is to be afforded our citizens?" Wastes created by the good life, American style, are accumulating at so rapid a pace that ours has been dubbed the "effluent society." Pollution of the nation's lakes and streams is probably the most serious of the problems currently imperiling the quality of our physical environment.

Wastes discharged by industry constitute over one half of the pollution load carried by our waters. To control and eventually to eliminate the degradation of waterways by industrial wastes will require a massive investment in industrial waste management measures. Traditionally, industry has not been motivated to invest substantial sums in relatively unproductive processes like pollution control.

Strict enforcement of high water quality standards is one method of inducing industry to invest in pollution control. A significant quickening of enforcement activity is bound to occur under the new quality standards approach to water pollution control. Good reason seems to exist, however, for questioning whether total reliance on enforcement is the most effective means for attaining the nation's water quality objectives. Enforcement measures are no stronger than the resolve of the public officials who prosecute them. Such measures are likely to be most effective when both the enforcer and the person against whom they are enforced believe that compliance will not constitute an unreasonable burden. Some form of economic assistance or relief to industries making investments in pollution control would probably boost the efficiency of water quality enforcement very substantially.

The difficulty with government supplied assistance and incentives for investments in pollution control measures is that in gross they are wasteful and inequitable. Already, the federal construction grant program to municipalities discriminates in favor of industries located within easy access of a city sewer line. Increased tax relief measures favor dilatory firms over those which have already committed themselves to responsible pollution control. Tax incentives are frequently the least relief to the type of business most in need of assistance in mounting a pollution control program. Tax relief may in certain cases tend to subsidize inefficient waste treatment processes and discourage exploration for more efficient production changes or waste recovery methods. For these reasons, some form of limited government program that strategically provides assistance to dollar-short industrial polluters seems preferable to a broad-gauge incentives program. For industries that can fairly afford the necessary investments, it is suggested that they pay their own way in pollution control just as they do with other legitimate costs of production.

INDUSTRIAL WATER POLLUTION

An effluent charge system based on a river basin framework has much to commend it as a mechanism for generating funds for investment in pollution control works. Not the least of its advantages is the equity inherent in charging each waste discharger on the basis of his individual contribution to the region's water quality problem. The built-in incentives to each assessed firm to cut costs through improvement of waste management procedures is also an extremely attractive feature. Difficulties in establishing the charge at an appropriate level are probably not as severe as claimed by foes of the system.

The current lack of agencies efficiently organized to carry on a water quality management program on a problemshed basis is by far the biggest obstacle faced today in achieving the nation's water quality goals. Although the tradition of local regulation seems well founded in administrative practicality, the current practice of organizing the local control effort on the basis of political boundaries rather than on hydrological problem contours is unsound. Water responds to gravity, not to politics. Water quality management programs should be organized functionally on the basis of natural drainage basins, not on the arbitrary configurations of cities, counties and states. Unless local interests, both government and industry, assert the necessary leadership to create rational organizations to plan and operate regional water quality management programs, public pressure for results in water quality improvement will almost certainly cause the federal government to introduce its own brand of river basin management activity.

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