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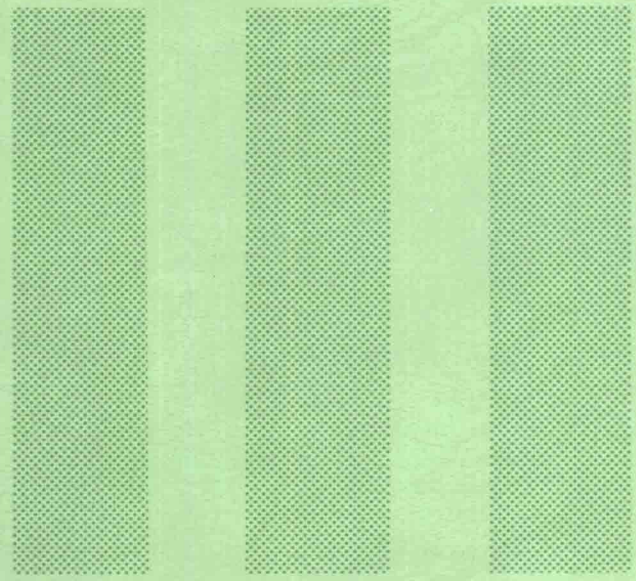
WATER RESOURCES MANAGEMENT IN DELAWARE



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INTRODUCTION

Objectives.

This publication, made up of three reports and related to a field that is highly complex, seeks to describe and analyze economic and public decisionmaking aspects of water management policies in Delaware. Hopefully it will be of some use to legislators, agency officials, and the general citizen, all of whose activities shape water management. Although economic concepts are stressed, in writing these reports it has been assumed that most readers are not familiar with economic analysis. In no way do the authors wish these reports to be viewed as the last word. Surely there is more to water management than either these reports or economics alone can handle.

The first report presents a general perspective of water resource conditions in Delaware from an economics viewpoint. The second and third reports review policy making by two major state water management agencies. Again, the bases for a review are economic criteria. Even in a small state like Delaware numerous separate agencies participate in water management. One agency whose policies are reviewed in this publication, is the Public Services Commission; the other is the Department of Natural Resources and Environmental Control. In these reports particular attention is given to the water use implications of various regulatory strategies such as supply service area limitations on water companies, pricing (structure and level) policies, water rights, and rate making criteria.

General Point of View.

Government enters the field of water management in two major ways. First, it participates in water management through agencies established by law which guide (chiefly through hearings and regulations) activities of water users and suppliers. Second, governments own and operate water services such as water supply systems or sewage treatment plants. Like all other institutions, including businesses and universities, governments are prone to institutional deficiencies such as information gaps, staffing inadequacies, managerial incompetence, or special group dominance which may cause them to fail or fall short of objectives.

Governmental failure in water management can mean, for example, that time and money of many persons are spent for regulations or hearings that simply do not improve water use conditions. In extreme cases poor government water management could conceivably be as costly as the environmental defects water management was designed to overcome. Government failure, more importantly perhaps, can mean the inability on the part of the people to enjoy levels of water resource well-being consistent with the claims of public officials, or consistent with budgeted outlays used to support governments in the water management field. The former inconsistency reduces respect for and trust in government; the latter inconsistency weakens the ability of government to tax.

As in other areas of public and private life, one hard question to be faced in water management is whether an expanded use of resources, along present lines, will tend to yield any positive results. Will more water management be worthwhile? Negative outcomes, of course, should be avoided; moreover, mere talk about the importance of the environment should not be confused with policy results. If positive results seem likely, are they great enough to warrant the spending, given other things that could be done with the resources? Such considerations are a version of the cost-benefit, trade-off viewpoint customarily used by economists.

A significant operational matter for agency decisionmakers and for the people they serve is how the results, called positive and negative above, get defined. This leads into output goals for water management policy and, if the train of thought runs far enough, it leads to the need for identification of the many persons and firms in a region affected by water management policy. In the final analysis, as with all government actions, water management gets positive results not through official claims, but only if people are made better off. Given some outlay for governmentally conducted water management activity, that policy set merits the label of being more effective which produces the larger increase in personal well being. Agency propaganda or advocate urgings about the importance of the environment and the "need to take positive steps" must not be confused with the outcomes of actual agency activity, and these outcomes must ultimately be measurable in qualitative and quantitative ways in terms of specific towns, firms, and individuals.

The State of Delaware controls and regulates directly and indirectly a significant portion of the economic activity carried on by citizens of the State. A large number of commissions and public agencies are engaged in activities which affect, in numberable direct and indirect ways, the allocation and distribution of resources. For example, Delaware governments can set price limits on water, on scotch, and on taxis. Such limits affect the lives of buyers, sellers, and workers. Local governments can encourage and discourage investment in particular industries, in particular locations, and in kinds of housing through regulations, or assessment policies, or even by the speed with which sewers are built.

Some controls and regulations are direct and explicit such as ad hoc declarations or case rulings of a regulatory commission. Other regulatory policies may not be as explicit.

An example in Delaware where direct and indirect regulations have come into play, and which figures to have substantial interpersonal and natural resource impacts, can be used to highlight the implications of regulation. In Delaware, county zoning laws may be utilized to limit and permit certain types of industrial locations. But at the state level of government, officials may refuse to cooperate and have in fact used their power of position or access to news media to block the location of so-called undesirable industries. At the county level of government new regulations and new control of building investments and location are being contemplated to reduce population growth in New Castle County. This limited growth or no-growth policy of state or county officials has not been given legislative sanction by the voters of Delaware. Furthermore, it may be argued that a larger consumption rate of public amenities, such as cleaner air and water, can only be attained in a no-growth economy by reducing the consumption of privately consumed goods and services. This implies a substantially smaller growth rate in wages and jobs in the New Castle County area. Delaware cannot increase its proportional consumption of public amenities without at the same time decreasing its proportional consumption of private goods and services. The costs of reducing environmental externalities, such as air and water pollution, will probably be paid for through higher prices and reduced output of those goods and services affected by pollution controls. The incidence of costs and benefits of all resource programs needs to be investigated further before concrete answers can be obtained on questions of who pays and who benefits.

It has been argued[1] that tastes for more public amenities (especially for higher quality water) are highly income elastic. Accordingly, policies which impose the costs of upgrading the environment probably more nearly satisfy the tastes of middle and upper income families in Delaware. Lower income families may lose opportunities for employment in those rejected industries declared undesirable. Secondly, these same families, as well as others, will have to pay more for goods and services whose prices have gone up due to higher production costs from meeting environmental quality standards. It is possible that the prospect of fewer job opportunities and higher prices for goods and services will reduce the welfare of lower income groups significantly. These welfare losses may, of course, be offset by a higher quality environment, but

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[1] See Martin Krieger, "Six Propositions on the Poor and Pollution" in Policy Sciences, fall 1970, pp. 311-324. Krieger's studies indicate the rich have been getting richer; and the poor, poorer, from environmental policies.

even then it appears higher income persons may be the larger beneficiaries since such outcomes as improved recreational opportunities are enjoyed to a greater degree by upper income boatsmen and second-homeowners.

Fewer job opportunities, higher prices, and smaller quantities of goods and services as costs of environmental policies may be viewed as excessive by many, even though they may be a minority of the population. When this happens, continued challenges to policies will persist.

Unfortunately, there has been little reported analysis of the economics of regulation and control at the state level. Even though the aggregate effects of state and local regulation may have a larger impact on economic welfare and efficiency, most all studies have been devoted to federal regulation and control. Lacking analysis in other states, it is quite difficult to fairly appraise the Public Service Commission (PSC) in Delaware, for example, on a comparative basis with public service commissions in other states. In addition, this task is more difficult because the regulation of privately owned water utilities is a small part of the total regulatory effort carried on by the PSC. Still another obstacle is that the reasons for, extent of, and hoped for results of water regulation are not spelled out in the Delaware Code or in the enabling legislation. If the goals of regulation are unknown or nonspecific, criteria must be surmised against which evaluations can be made.

A clear definition of the goals and purposes of state regulation and control of various kinds of economic activity does not exist; moreover, it is no easy matter to show that the actual effects on economic activity of regulation and control are compatible with the goals and purposes of regulation. Indeed the opposite is probably true. The actual effects of much federal control and regulation have been studied and found to be dysfunctional in relation to the expressed goals of such regulation. For example, the effects of the Interstate Commerce Commission on the allocation and distribution of resources in the transportation industry are held by many impartial observers to be the goal of maximum efficiency; which goal requires that the most valuable transportation services be produced and supplied by the least-cost modes of production.

Not all regulation and control is felt to generate such undesirable outcomes. But the current evaluation of regulatory behavior by professional economists and lawyers is substantially more critical than it was several decades ago. The recent volume edited by Paul MacAvoy entitled The Crisis.

of the Regulatory Commissions[1] details the systematic and often wide divergence between actual outcomes of regulation vis-a-vis the expected results. Some investigators report the general ineffectiveness of regulation and control. Others have estimated net social losses from regulatory policies that often result in highly inefficient resource misallocation.[2] Undesirable or at least highly arbitrary income and wealth transfers favoring firms in regulated industries have also been found.

While the technical stuff of water management is a weave from the many different threads of: (1) behaviors of level of government, (2) interagency responsibilities at each level of government, (3) legal interpretations, (4) regulatory practices, and (5) resource allocation impacts; it is not for its own complexity that water management merits attention in Delaware. Within a context of megalopolitan dynamics the resident population of Delaware has doubled in 30 years. When many more people with high resource-use standards of living, register increasing demands within a given physical environment, serious shortages, negative outcomes, and nagging inconveniences tend to result. In such increasing resource scarcity conditions, the ground rules under which water system and sewer system suppliers are allowed to behave in response to these long term and seasonal shifts in demand become more important. Ineffective water rules can now be much more harmful. The significance of what water managers do and don't do has risen, and water management policies that do not give a large measure of attention to changing supply-side costs and use-side benefits will probably lead to a lower quality of life than necessary.

For example, to put a sewer line down the east side of Kent County is a major resource decision that alters supply and demand conditions for many resources other than water. Such an investment requires serious attention not only in design and construction, but also in the achievement of sought after biological and chemical impacts to improve the quality of the Delaware River.

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[1] Paul MacAvoy (ed.), The Crises of the Regulatory Commissions (New York: W. W. Norton & Company, 1970). Several other volumes written along the lines of the MacAvoy volume are W. G. Shepherd and T. G. Gies (eds.), Utility Regulation (New York: Random House, 1966), and R. Turvey (ed.), Public Enterprise (Baltimore: Penquin Books, 1968).

[2] See for example Robert Harbeson, Journal of Law and Economics, XII (Oct., 1969), pp. 321-338; also see MacAvoy, "Federal Regulation of Field Prices of Natural Gas," in The Crises of the Regulatory Commissions; and J.J. Warford, "Water Supply," in Turvey, Public Enterprise, pp. 212-236.

Moreover, depending on the ways this investment is funded, costed out, priced, and made available to users, one can expect widely different land use implications. Sewer investments change the capital value of the land they serve. Pricing for sewer usage affects not only those using the sewer, but also the rate at which the sewer capacity is used, as well as the development rates of the land served by the sewer.

Growth in the resident population of the State and of surrounding states, growth in irrigation water use for agriculture, growth in industry due to the strategic import advantages of the Delaware River, and growth in recreation of many forms, each means future decisions of water managers will have heightened social and economic significance. These reports attempt to set forth some basic ideas, with emphasis on the nonengineering concepts, that relate to Delaware water management.

Some Fundamental Economic Issues of Delaware Water Management Policy

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The work upon which this publication is based was supported by funds provided by the United States Department of the Interior, Office of Water Resources Research, as authorized under the Water Resources Research Act of 1964.

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INTRODUCTION

Ecology, pollution, and natural resources are issue topics throughout the world, across the United States, and in Delaware. Political candidates, agency officials, national television commentators, and journalists have given wide coverage to the environment. The epic proportions reached by environmental issues are exemplified by CBS news telecasts strikingly titled: "Can the World be Saved?" where Walter Cronkite has crossed the ocean to discuss pollution with Prince Philip of England. Unfortunately, widespread verbal coverage, in itself, will not improve environmental outcomes. Moreover, one could easily begin to wonder whether in the sphere of physical ecology we may be getting ready to implement sets of programs larded over with high sounding intentions but which have little chance of making any positive ecological difference. The record of major public programs that began with fanfare, decked out with noble goals, but which have met with bewildering sets of unhappy outcomes, is numbered by such major "public policy issue solutions" as: public housing, rent controls, model cities, farm subsidies, and urban renewal.

The purpose of this paper is to review policies relating to one element of the natural resource environment, and that is water. Particular attention will be given to water management in Delaware, but elaboration of some general principles will also be emphasized.

At the outset it may be helpful to consider the term "water management." Within any river basin or politically bounded entity, like the State of Delaware or City of Newark, people exist. The activities people engage in take on a variety of forms. Major activity forms, significant to water management and use, are residential and commercial; both of these activities can be further classified as private. In contrast to these private activities there exist public activities that both use up, control rates of use, and actually supply water and waste water services.

Residential, business, and governmental activities require water supply and waste water removal. Either water supply or waste water removal can be provided privately as in the cases of homes or firms having individual wells and septic tanks, or through systems when privately or publicly owned water and sewer networks serve numbers of firms and residences. The demand for waste water removal is related to consumption and usage patterns of the water supplied.

Water management policy must make estimates of water demands and of pollution control demands both in the present and in the future. One basic water management goal would seem to be to find ways to establish what are the highest valued water uses. Because both water and the money needed to capture water or treat waste water are limited, not all water uses with any value can probably be met. The task for water management policy, through regulation of others or by direct facility operation, is to see that the highest valued uses are met through supply policies. In addition to providing water services the community values most, the conditions of water supply such as legal rules, control agency policies, operational activities of water and sewer plants, and investment activities should be conducted at low costs.

People seek both water and sewer system service to the households where they live. They can also seek these services to the business places where they produce, such as factories, offices, or farms. Finally, these water services are sought in support of public goods such as recreation, fire protection, hospitals, and schools.

WATER-SEWER DEMAND CONDITIONS

Some water demands of these three (household, business, government) customer groups are consumptive. Consumptive water is taken, used up, and not returned to either surface or underground streams. Other water demands are nonconsumptive. The water is used, normally changed in quality, and returned to the environment.

Some of these nonconsumptive uses cause water quality changes for which no expenditures to restore the water to higher or original quality are felt necessary. Other water quality changes, after waste water releases, cause people in the community to demand sewage treatment. In general, a community demands that some amounts of water resource restoration be accomplished following its water usage.

In the case of communities in downstate Delaware, located on estuarine tributaries of the Delaware River, waste water quality improvement expenditures may tend to yield large amounts of direct benefits to those communities that have caused the water quality deterioration. To say this another way, towns located on estuarine streams tend to impose large amounts of disbenefits on themselves through their pollution, poorly treated waste waters are released into local streams that do not flush effluent away from the locality.

Towns, industries, or households located on rapidly flowing streams, in the Eastern United States at least, have normally found the results of their own waste water release (or water quality reductive actions) not burdensome to themselves. Accordingly, they have not looked at the benefits of waste water quality restoration (sewage treatment) as directly worth much to themselves in expenditures. This phenomena is the key to constrained sewage treatment demands. Individual demands for treatment tend not to be great, and so, willingness to pay is low because benefits are largely indirect since they accrue outside the immediate area where the water quality reductive actions take place.

Whereas individuals, firms, or towns may receive many direct benefits as "customers" for water supply dollars spent, they enjoy much weaker direct benefit payoffs from waste water treatment dollars spent. Downstream locations are the major gainers from upstream waste treatment.

Demand Variations.

A second major feature of water and sewer service demand is variability or seasonality. Most households, firms, and public customers make use of these services discontinuously during the day. Household water use peaks are in early morning and evening hours. Many businesses cease operating at night. Accordingly, effective business demands on water and sewer systems are largely daytime oriented. Many households also tend to vary their use levels within the year as do many industries. Finally, over a series of years, it appears the steadiest block of customers is the household group with industrial use riding peaks and valleys depending upon sales behavior of products made by local companies.

Other industries have sewer and water service demands that fluctuate over the longer business cycle as their output demand tends to change, but have seasonal demand differences as well. In Delaware most agri-business firms and the tourist industry place extremely high summertime peak week requirements on water and sewer systems. These peak demands in recent years have sometimes coincided with drought impacted stream flows, placing even greater burdens on water and sewer systems. The general point being made here is that water resource policy must be conducted in an operational atmosphere of changing daily, seasonal, and cyclical demands even if there might happen to be no net increases in the size and numbers of businesses and residents.

Household Demands.

Water demands of households vary between winter and summer chiefly due to lawn watering. Availability of rain further affects the level of demand.

Apartment building residences show markedly lower water uses than single family neighborhoods. Fire service is a special form of water demand for which hydrants and excess capacity must be built into the water system.

Linaweaver's studies in the Baltimore area estimated annual residential water demand determinants to be: (1) the economic (income) level of the consumer, (2) climate, and (3) billing practices.[1] Others have argued household appliance characteristics also influence the quantities of water used. Annual water volumes demanded by homes with septic tanks tend to be 25 percent lower than those with sewer systems, indicating that the nature of sewer systems also influence the level of water demand by residences.

Residential demands for sewage treatment are related to water usage for nonconsumptive purposes. Such water is returned following use to the ground or through sewer systems to streams. Public health standards and stream quality standards are loose expressions of minimum community demand levels for sewer services. In a sense these standards represent collective demands for spillover disbenefit protection.[2]

Also important for the level of sewer service demands is clean stream propaganda being poured out by various private and public groups to change consumer tastes about water quality.

Population densities (houses per acre) and soil conditions (depth of underground water tables, percolation characteristics) affect whether sewer service demand can be satisfactorily met by either septic tanks or sewer systems, or whether sewer systems alone must be built.

The location of residential sewer system demands is related to household construction placements in any community. These placements depend on land quality and costs, as well as public amenity quality (including sewer system) and effective costs. By effective public amenity costs are meant the actual costs to new housing developments of new public service extensions. Costs to

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[1] F. Linaweaver, Jr., J. Geyer, and J. Wolff, Study of Residential Water Use, Johns Hopkins University and HUD Technical Studies Program Report, pp. 28-31.

[2] Like rent controls, standards for water quality (spending on pollution control) will probably not work effectively without federal subsidy if they do not represent local demand for water quality.

various developments may differ, but if incremental sewer system costs of service are not charged to particular developments then developers may be indifferent as to where they locate. Such average cost pricing for sewer systems to alternate new housing developments tends to lead to leapfrog developments. Developers who need not be concerned with public service extension costs because their site choice will not cause this cost to vary, can concentrate upon minimizing their land costs. Land unserved by public facilities will be very attractive to residential developers because this land normally has lower costs than land already served by sewer systems.

In summary, domestic waste water removal demands depend upon nonconsumptive water usage patterns, water use prices, health standards, stream quality standards, clean stream propaganda, population densities, rainfall, and soil conditions.

The location of sewer system demands in a residential area depends upon the manner in which sewer system pricing and the pricing for other spatially significant public goods (roads) causes the higher costs of more distant service to be levied against more distant communities.

Business Demands.

Water demands of office buildings tend to have daytime peaks and are probably extremely insensitive to water prices. By contrast, water use by industry for cooling, cleaning, or other purposes depends upon product mix and technology. Industry water demand is probably responsive to relatively high water prices in the long run. New production processes that consume less water or permit recirculation of water can permit reductions in the quantity demanded.

Sewer service demands of industry are directly related to water usage factors. Plant location decisions along the Delaware River by chemical and petrochemical firms take advantage of raw material in-shipment access provided by the river. These plant locations have used river water for cooling and cleaning purposes and some have placed added demands on the river by direct (treated or untreated) waste water release.

As has already been mentioned, the quantities and qualities of water demanded by industry in the Delaware River Basin will depend on the demands for the products manufactured by the basic industries. The availability of stream versus underground water along with the relative prices and certainty of quality supplies from each source will influence how much water is used from either source. These costs will also influence the water conserving technology of these industries, as will the legal rights which industries are allowed