Working Paper Series

FINANCING WATER RESOURCE INFRASTRUCTURE

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WP090187

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The contents of this paper were drafted from a workgroup report to an Engineering Foundation Conference entitled "Financing and Amortizing Water Resources Infrastructure" held at Palm Coast, Florida, March 29-April 3, 1987. A slightly different version of this paper will appear in the forthcoming conference proceedings.

Water resource development often has been undertaken with a zeal unique in both ambition and accomplishment. The taming and settlement of the American West is largely a function of water resource projects providing irrigation as well as municipal water in an arid and semi-arid landscape. Rivers, harbors and flood control projects were equally impressive in scale and financial commitment. These monuments to U.S. engineering expertise generated a great deal of national pride and development stimulus. While the rate at which federal projects come on line has decreased in recent years, portions of the U.S. water resource inventory remain heavily capitalized.

At the same time, the professional community as well as the popular press recently have focused attention on the other side of the infrastructure picture. Water delivery systems in many of the nation's older cities are seriously outdated with corroding pipes and inadequate treatment facilities. It is estimated that New York City's leakage loss amounts to 9 percent.[1] Nationally, the cost to upgrade water delivery systems is estimated by various sources to be between $3.7 and $7.6 billion per year.[2] While significant progress has been made over the past two decades in expanding and upgrading sewerage treatment facilities, EPA estimates that it will require $76.2 billion to meet Clean Water standards by the year 2005.[3]

The paradox of water resource infrastructure in the U.S. is that at the same time that a significant overcapitalization of facilities appears to exist in some areas a significant undercapitalization of facilities and maintenance exists in still other areas. This disequilibrium suggests that capital markets with respect to water resources are not functioning well.

How did capital markets with respect to water resource inventory become so distorted, and what can be done about this situation? This paper will try to answer these questions. The first section provides an historical perspective on the institutional structure that has evolved to develop and administer water resource infrastructure in the U.S. With this background, the present predicament is examined to better understand the nature of the problem and its implications for U.S. water policy. Finally, policy options are considered and recommendations made to address this predicament.

INSTITUTIONAL FRAMEWORK

To better understand the present predicament with respect to water resource infrastructure, it is important to examine the historical context and institutional framework in which water resource policies have evolved. Principal actors in terms of water resource development include federal, state, and local government and private water companies.

Federal Role

The federal role with respect to water resource development began with the establishment of the U.S. Army Corps of Engineers in 1794. From its original missions to construct and maintain coastal fortifications and to promote inland navigation, the civilian component of the Corps eventually became more active than the military projects group.

Additional impetus for federal involvement grew out of the westward expansion of the late nineteenth century. The Desert Lands Act of 1877 and the Carey Act of 1894 offered low priced land to settlers that irrigated their land. By the turn of the century, the best, most easily irrigated lands had been claimed. Further development meant larger investments in resevoirs, dams, and diversion canals. Private irrigation companies were becoming financially strapped in trying to expand irrigation potential, and many had become bankrupt in the process (Frederick, 1986).

The Reclamation Act of 1902 provided an entree for the formal involvement of the federal government in "planning, constructing, operating, and maintaining facilities to store, regulate, and divert water for reclaiming the country's water short areas." An important policy initiative of the Theodore Roosevelt Presidency, the legislation created the Reclamation Service, later renamed the Bureau of Reclamation. With this new responsibility, the federal government embarked on a new era in U.S. water policy.

The mission of reclaiming the semi-arid west led to massive construction projects, a restructuring of economic opportunity, and political intrigue affecting project location and scale. Among the more noteworthy accomplishments of the early years was the construction of Hoover Dam on the Lower Colorado River completed in 1936. The project which took five years to complete and stood 726 feet tall was by far the largest construction project ever attempted. Principal beneficiaries of the project included the City of Los Angeles and the Imperial Valley.

The next great champion of federal water projects was another Roosevelt. Now, however, federal public works included the additional justification of economic stimulus during the depths of the Depression. Federal projects along the Columbia River dwarfed Hoover Dam in scale. The largest of these dams, the Grand Coulee, was twice the size of Hoover Dam. When planned in 1930, Grand Coulee was to generate ten times the electricity demanded of the entire Pacific Northwest. At full operation, the system generated 2.1 million kilowatts of electricity making it the single largest source of electricity in the world. This energy glut was closed considerably by the Second World War and the location of much of the U.S. aluminum and aircraft industry in the region. This tapped energy potential and consequent industrial capacity, it is speculated, may have been the single most important factor affecting the outcome of the war (Reisner,1986).

Development of the Upper Colorado River in the 1950's brought in the concept of River Basin Management to appropriate cumulative benefits within a river basin to justify still further irrigation benefits for Bureau projects. The Corps was active as well. Since flood control benefits were not subject to cost recovery, additional projects were justified. Competition between the two agencies culminated in the Pick-Sloan Project along the Missouri River.

In real dollar terms, federal outlays for construction projects peaked in 1965 at 3.7 billion dollars (1982=100). Real annual expenditures have continued to decline during the Carter and Reagan Administrations. Real operation and maintenance expenditures have continued to increase, doubling since the late 1950's (North,1987).

While water resource development efforts stabilized or in some cases declined, pollution control programs grew to more than fill this void. With the Environmental Protection Act and the Clean Water Act of 1972 and its amendments, federal expenditures for water quality increased more than tenfold between 1970 and 1977. Since 1973, water pollution programs have supplanted water resource development programs as the principal natural resource expenditure category.

Both water resource development and pollution control programs have been affected by the political philosophy of the Reagan Administration. In nominal terms, net outlays for natural resource programs peaked in 1980. Water resource development projects are likely to entail greater local cost sharing as mandated in the Water Resource Development Act of 1986 (PL99-662). In terms of pollution control, the Clean Water Act of 1987 established guidelines and funding for the establishment of state revolving funds to transfer greater responsibility to state government.

State Role

State water law provides the rubiric in which water allocation decisions are made. Yet, in terms of water resource finance, states traditionally have played an intermediary role interfacing between federal initiatives and local water providers. With a changing federal posture with respect to water policy, state government is likely to experience the most drastic role reversal among governmental units with regard to water resource policy and finance.

States of the eastern seaboard actively pursued inland navigation projects in the early nineteenth century in an attempt to open western territories to their ports. With the notable exception of the Erie Canal, most of these projects failed to generate expected trade at significant cost expenditures. That experience led many eastern states to shy away from water development activities. In the next century, western states would take the initiative in terms of water development, the most notable case being the Central Valley Project in California in the 1960's. Even in that case, state bond issue of $1.75 billion dollars in 1960 provided only half the promised water, and the Corps of Engineers and Bureau of Reclamation were called in to develop eight additional sites to meet projected deficits.

Beyond legal basis and occasional development activities, state water policy has evolved in two major time frames. In the early part of this century, public health concerns precipitated the formation of public health departments with water quality among the areas of focus. The second major thrust came in the 1960's with the formation of the Water Resources Council at the federal level. States were provided funding to develop a water planning framework. Out of this initiative, most states either have developed or are developing comprehensive water plans.

Still, in terms of relative importance, the New Federalism as evidenced in the Water Resource Development Act of 1986 and the Clean Water Act of 1987 may have far greater effects on the responsibility of states with respect to water finance than these earlier initiatives. Increased cost sharing by state and local participants in federal projects and state administration of revolving funds for waste treatment facilities will result. At the same time, separate infrastructure funds are being established at the state level for water and sewer construction and renovation.

Local Role

Local government has played a primary role as provider of water. Some 100,000 entities including municipalities, counties, and public service districts operate in the U.S. delivering three-fourths of domestic water supply. Financing at the local level incorporates a complex set of instruments including water and sewer receipts, local tax allocations, and elements from other institutional sources, such as federal and state grants and loans and private sector investment.

In general, water delivery systems have been self-sufficient and/or revenue-generating. Nevertheless, many public systems are inefficiently run and replacement funds are typically underfunded or nonexistent. Low interest Farmers Home Administration loans have been a principal source of capital for many small systems. A demise of this program will place hardships on many small systems unless an alternative funding mechanism is forthcoming.

Of far greater concern to local government is the future of federal support for waste treatment programs. EPA, EDA, and HUD programs have been the source of significant support over the past twenty years. A restructuring and/or elimination of these programs, as envisioned at this time, will have important implications on the way that local water systems operate in the future. Complete self-sufficiency, in terms of both water delivery and waste treatment, may force higher water rates and a significant adjustment process particularly for small rural systems.

Private Role

Of the nation's community water supply systems, 22 percent (some 33,000 systems) are privately or investor owned representing a rare case of defacto and long-standing private sector involvement. In the process, interrelationships with other institutional elements have been established including rate regulation at the state level and quality standards at the federal level.

A great deal of attention has been given in recent years to privatization as an alternative to public service provision. Among the options available are the outright sale of government assets (like Conrail and water and sewer systems) to more partnership-type schemes (like contracting out, sale-leaseback, and development fees or contributions in aid of construction.) Despite its recent popularity in some libertarian circles, not all publicly provided goods and services are equally amenable to privatization. Although water delivery is easily subject to efficiency tests, local governments may be, for that reason, less likely to return this responsibility once already established.

Private capital markets may have a great deal to say about financial arrangements particularly with respect to waste treatment facilities. Yet, recent changes in federal tax law may alter dramatically the landscape of privatization endeavors, as well as other private investment options. The institutional framework, especially elements related to the private sector, is, thus, in a transitional state with a great deal of fluidity at this time.

PROBLEMS AND CAUSES

As noted earlier, the principal problem in terms of water resource infrastructure appears to be a disequilibrium in capital markets. The section that follows examines the present predicament with respect to water resource infrastructure focusing in particular on this overinvestment/underinvestment paradox.

Overinvestment in Facilities

Water development activities often have been characterized by overkill, a problem not unique in the U.S. but prevalent worldwide as well. A part of the problem can be attributed to monument building or over-engineering to compensate for the shortcomings of natural processes. There is no doubt that these factors are important determinants in the scale of operations for water development projects. How is it that a little overzealousness has gotten out of hand?

Consistent with this structural bias in meeting water needs, specifications have often favored high-cost, high-technology solutions. The result often has been goldplated capital facilities. Some of the engineering marvels of the world have been built in this way. Yet, construction costs have been high, as have operation, maintenance, and repair costs (OM&R).

Another factor that has had significant influence on the level of overinvestment in facilities particularly at the federal level has been the authorization of multiple purpose projects. It seems only logical that projects providing multiple benefits be evaluated on a multiple purpose basis. Yet, the end result of this accounting precept was to allow considerably more latitude in the justification of projects. Independently, irrigation benefits were often overestimated particularly in light of nationwide surpluses in specific agricultural commodities, and estimates of hydroelectric benefits ignored, at times, supply and demand conditions in the service region. Collectively, pooled benefit streams made project justification more likely.

The advent of river basin planning allows still further leeway in project appraisal, as otherwise infeasible projects were combined for evaluation purposes with high benefit producing projects within the same basin. Productive hydroelectric projects were able in this way to carry a number of otherwise unjustifiable projects. Ultimately, flood control benefits played a large part in project evaluation. Difficult to quantify in the first place, flood control benefits did not have to be repaid, making cost recovery easier to realize.

Also contributing to overinvestment in facilities is the step-wise scaling of facilities. Often the choice is to under- or overbuild based on projected needs. Given a general growth bias reflected in the decision-making process, the tendency typically is to opt for the larger facility. At the water delivery system level, the large number of systems exacerbates this problem, resulting in over capacity at the system level and a cumulative excess capacity areawide.

Compounding this problem is the growth bias alluded to above. Optimistic chambers of commerce and local officials often project phenomena growth for their areas. Betting on the outcome, communities frequently build excess capacity, not wanting to lose potential industrial prospects or overestimating the locational advantages of water and sewer capacity relative to other locational deficiencies. More often than not in these circumstances, communities are saddled with excessive debt burden and less than expected repayment capacity.

Lastly, perhaps the most important factor contributing to overinvestment in facilities is the issue of who is paying for the project. When project beneficiaries pay less than the full cost, incentives sway toward overinvestment. Local interests are less likely to be cost-conscious when the federal government picks up the majority of the tab. At the federal level, no other appropriation category has been as susceptible to logrolling as water projects.

It can be argued rationally that some justification exists for investment in water projects on the basis of economic development and flood control benefits or for water treatment projects on the basis of public health benefits, all of which may accrue beyond local boundaries. Furthermore, access to capital may be necessary to allow projects to be built in the first place. Yet, the process seems somehow out of synct; projects are too often justified on a political, rather than an economic basis. Retrospective benefit/cost ratios too often fall short when large-scale water projects are subjected to critical evaluation.

Underinvestment in Water Facilities

At the same time that overinvestment in facilities is occurring, a variety of factors are contributing to an underinvestment in water facilities. Among the factors pulling in the opposite direction is the financing of facilities through appropriations. By subjecting project budgets to annual appropriations, projects invariably come on line too late, are in some cases undersized or otherwise compromised, or are susceptible to possible diversion of funds.

Unpredictable institutional behavior runs beyond the issue of annual appropriations. The present uncertainty of federal grant programs has slowed considerably water infrastructure investment. This uncertainty affects federal cost sharing arrangements (PL99-662) as well as federal grant programs. Project delays with bonded indebtedness often result in costs to local participants. With the Central Arizona Project, incentive clauses were attached to alleviate the tie-up of local funds. These incentives in turn, imposed an opportunity cost on the U.S. Treasury. Because there is a cost associated with uncertainty, the greater the degree of uncertainty, the more likely it is that suboptimal allocation decisions are made.

Although some of the positive spillover effects of projects may be incorporated into the decision-making process, negative spillover effects often have not been included. This point has been made dramatically in the case of the Kesterson Wildlife Refuge where environmental effects of the Central Valley Project in California were not fully conceived nor compensated. Drainage systems to remove salt accumulation from irrigation projects and oxygen injection systems for resevoirs, added later but not included in the original project design, have become more common. A critical shortcoming of water resource development efforts is that projects often have been underdesigned from an environmental systems perspective.

At the local level, inadequate fiscal capacity has been a significant problem for many communities. Among the factors most responsible for this situation are low user charges for water and sewer service often caused by political pressure and limited bonding potential particularly among small communities. The result may be that the community is forced to maintain undersized and/or outdated facilities.

A final point that may influence investment in water facilities in the future, although the outcomes are uncertain at this time, is the impact of federal tax reform. At the present time, it appears that the new law may restrict multiple use projects. Yet, it may help traditional water supply.

Underinvestment in Operation, Maintenance and Repair

Investment in operation, maintenance and repair (OM&R) is influenced by decisions made with respect to new facilities. Perhaps most important in this respect is the goldplated facilities syndrome referred to above. Highly engineered facilities entail expensive maintenance requirements. Yet, subsidies and low interest loans typically are earmarked for new facilities at the expense of OM&R, new facilities being more impressive than comparatively mundane maintenance and repair activity. As a result, financial incentives discourage OM&R expenditures allowing existing facilities to deteriorate while available funds are targeted for new construction.

A second factor at work is the out-of-sight-out-of-mind management style that characterizes water and sewer infrastructure. Psychologically, it seems easier to forego maintenance and repair work with equipment that is not visible--underground pipes being the extreme case. Tight maintenance budgets and the hidden nature of the system reinforce a "don't-fix-it-if-it-ain't-broke" way of doing business. The tendency then is to wait until something breaks before repairs are done, rather than to practice preventive maintenance.

Finally, OM&R activities fall victim to the whims of the political business cycle. Where infrastructure appropriations are made in a political setting those decisions are subject to the most relevent time horizons for elected officials, i.e., election periods of two, four, or six years. Project dedications generate a great deal more political capital back home than do OM&R appropriations. As such, short-term political payoffs are inconsistent with long-run efficiencies in capital facilities planning.

The end result of this situation is that water and sewer infrastructure in many U.S. cities is badly in need of repair, renovation, and replacement. It is estimated that the cost of repairing America's deteriorating water and sewer infrastrucure will be close to $200 billion by the year 2000.[4] Costs continue to escalate so that further delays will bring still higher costs in the future. It is imperative, therefore, that creative ways to maintain this aging infrastructure be developed before still further deterioration occurs.

OPTIONS FOR FINANCING WATER RESOURCE INFRASTRUCTURE

The paradox of over/underinvestment in water resource infrasructure has become serious with deteriorating facilities and insufficient capacity on the one hand and over capacity on the other hand. If this distortion is to be addressed, fundamental institutional changes will be required in the way that capital markets operate for water resource investments. The following chapter will try to sketch guidelines for doing so.

THE POLICY FRAMEWORK

It would be naive to ignore the fact that water resource allocations are made in the political arena where projects are often evaluated in terms of political, rather than financial, capital. As such, a quite different scrutiny is applied. Still, it can be argued that, for good or bad, this system allowed for the application of collective resources: to develop engineering marvels of the modern world, to open the West, and to tame many of the continent's great rivers.

Yet, the rules of the game may have changed. Significant federal deficits that have surfaced over the past decade are forcing a more critical review of federal expenditures. As noted earlier, real federal expenditures for natural resource programs peaked in 1965, while nominal expenditures peaked in 1980. Since that time, water development expenditures have fallen, and it seems unlikely that significantly larger shares of the federal budget will be diverted, save a national catastrophe.

In addition, as with any resource development endeavor, the best projects have been developed first as a rule. Changing demand and technology may influence the relative ranking of projects, but from an engineering and hydrologic standpoint at time of construction, the best projects are behind us. The projects that remain for future development generally will entail less favorable physical attributes, higher costs of delivery, lower benefit streams, or some combination of these characteristics relative to earlier projects. In a slightly different way, the same analogy holds for water quality projects as incremental pollution control projects become exponentially more costly.

If future water projects are to be cost effective, a different litmus test will need to be developed to evaluate the financial viability of proposed projects. Greater emphasis will need to be placed on full cost pricing of water resources and on the appropriation of project costs to more closely match project benefits.

Multiple Purpose Projects

Water resource projects are rarely one-dimensional. Instead, projects often involve some combination of benefits including, but not limited to, flood control, irrigation, hydropower, navigation, and municipal and industrial water supply. The appropriation of project benefits among water uses is difficult but necessary if resources are to be allocated effectively. Benefit-cost techniques evolved specifically to provide a more objective means of evaluating water resource projects.

Yet, despite this methodological framework, the decision-making process remains less than rational. In actuality, the calculus of water resource finance is less precise than its outward rigor and air of objectivity might suggest. Some project benefits are less tangible than others and thereby more susceptible to interpretation and honest debate among those of different philosophical leanings. The intangible nature of many project benefits allows for significant latitude in the allocation of benefit streams and creativity in terms of cost recovery schemes. Central to this issue is the question of who actually pays for the project.

Beneficiary Pay Principle

The beneficiary pay principle is premised on the assertion that costs are most appropriately borne by beneficaries. This principle is consistent in concept with highest and best use conditions where resources are allocated to activities offering the highest return. As costs are borne by beneficiaries, resources are committed only in cases where benefits are equal to or exceed costs. Where tangible benefits accrue, such as in the case of water supply and hydro projects, full cost recovery should be apportioned to project beneficiaries. Such benefits are consistent with market processes where individual users pay appropriate shares of project costs and make individual decisions as to their level of use.

Failure to capture full project costs leads ultimately to overutilization of the resource and, in terms of project planning, to overcapitalization of infrastructure. As such, full cost pricing is a critical element of water finance guidelines. Likewise, cost deferral to other project uses, especially where those costs are not recoverable, or pricing based upon less than the true opportunity cost of capital are likely to lead to unabated demand. Where subsidization results in hidden costs, resource allocations are more apt to be suboptimal.

Demand for subsidized irrigation water and hydropower remain high, while the lack of funding for maintenance and repair of municipal water lines discourages their upkeep. No cost recovery provisions encourage flood control projects while effects on downstream users go unaccounted. Important here is the proration of public and private benefits allocating private benefits to appropriate user groups and public benefits collectively among local beneficiaries and the larger national interest with respect to water resources.

Water Resource Development

In general, water resource development activities are more tangible and therefore more amenable to market forces than are water quality projects. Water supply and hydro delivery are typically metered, and compelling efficiency concerns argue for full cost recovery. In this context, cost recovery should be based on the opportunity cost of capital reflecting market interest rates and, particularly during inflationary times, valuing capital assets at current or replacement costs rather than at original purchase price.

Applying these yardsticks, most of the water development projects currently on the books are significantly undervalued. An immediate shift to full cost financing would send shock waves through water markets. This distortion effect, falling hardest on those that invested significant amounts of capital with the expectation of predetermined water rates, suggests that any change that may occur be done so gradually. These changes should be reflected in new projects or reauthorizations or phased in over an extended time period.

The other principal water development activities, flood control and navigation, are less able to isolate beneficiaries than are water supply and hydropower. In the case of flood control, localized benefits should be apportioned to assure local commitment and to assist with cost recovery. Ultimately, however, the solution is not to build in flood hazard areas or to let developers bear flood control costs where flood hazards can or should be anticipated. Existing development should be subjected to stringent benefit-cost analysis with relocation considered as an option before new projects are begun.

With navigation, it remains difficult to isolate economic development benefits for cost recovery purposes. Still, a greater reliance on user fees and local cost sharing seem likely with a favorable long-run effect from an efficiency standpoint.

One of the most promising philosophic shifts in this direction was the passage of the Water Resource Development Act of 1986 alluded to above. Although the legislation is project specific, it may reflect a new approach toward the authorization of federal projects with stricter project guidelines and more significant local cost-sharing provisions.

Water Quality

Water quality issues do not conform well to political boundaries and are, therefore, more difficult than water development projects to apportion. In that sense, there is an active role for government beyond the local level to assure water quality with technical assistance as well as subsidies and/or penalties. To the extent possible, internalization of negative impacts on water quality should be pursued through monitoring and charges on polluters.

Significant expansion, upgrading, and new construction of waste treatment facilities, for which access to capital markets will be necessary, will be required between now and the end of the century. The Clean Air Act of 1987 represents an important financial policy statement in this regard. By setting up revolving loan pools in each of the states, the federal government is forcing a greater state presence. This delegation of responsibility does not assume necessarily that states will be above political pressure in enacting their programs, but it acknowledges the need for greater state and local decision-making involvement. Perhaps even more importantly, the transition from a grant to a loan pool program will help to prioritize viable projects. Of critical concern will be the interest rates and loan guidelines to be established by states which will help to determine the long-term stability of state programs.

Related to water quality issues in some respects are environmental impacts of water development projects. Like water quality concerns, environmental spillovers must be assessed and accounted for as a project cost. At times, environmental impacts have been ignored and at other times not fully comprehended at the time of construction. Reduced oxygen levels, resevoir siltation, and sodium deposits in irrigated soils have and/or will result in significant costs. Although O&M funds exist to deal with such issues, it seems likely that those reserves may be seriously underfunded for some of these long-term costs. No provision exists for such catastrophic effects as the environmental damage inflicted at Kesterson. Cost recovery provisions should be dynamic to allow undervalued or unanticipated spillover effects to be absorbed as a project cost.

CONCLUSIONS AND RECOMMENDATIONS

Capital markets for water resource infrastructure often are out of synct. To better balance the commitment of financial resources in terms of water infrastructure, reassessment of these markets is necessary. In particular, the process will require the adherence to sound financial principles if outcomes are to be more optimal. Guidelines for promoting more effective resources allocations in terms of over- and underinvestment in water-related infrastructure are suggested below.

Overinvestment in Infrastructure

- Water infrastructure should be subject to full cost financing. Hidden costs invariably lead to to overinvestment in capital facilities.
- Costs should be borne by project beneficiaries and prorated among private and public interests. Subsidization should be employed only where public benefits exist and are not recoverable through private user fees.
- Higher cost sharing for public aspects of water projects should be borne by local entities as most benefits can be localized and to assure resource commitments only for financially sound projects.
- O&M and environmental effects should be included as project costs with adjustments made over the project life where funds are insufficient to meet project induced costs.
- Funding criteria must be rational and strictly adhered to if projects are to be prioritized on sound financial principles.

Underinvestment in Infrastructure

- Project costs should not be subject to annual appropriations that may alter project design after authorization and in turn lead to underinvestment in facilities.
- Public health and environmental side effect costs are often underappropriated. These effects should be absorbed by project beneficiaries.
- Private user fees are often too low relative to maintenance and replacement of capital stock. Depreciation funds should reflect current value of plant and equipment.
- Long-range infrastructure planning must supersede planning for political expediency.

General Recommendations

- The institutional environment must be predictable. Uncertainty bears a cost in capital markets and often leads to suboptimal outcomes.
- Regionalization of water facilities beyond political boundaries should be encouraged to account for economies-of-scale and to decrease the cumulative effect of the over/undercapitalization problem.
- Access to capital markets must be provided with capital costs reflecting true market rates.

FOOTNOTES

[1]William H. Lee, "Estimating New York Water Supply Needs," Engineering Foundation Conference on Financial and Amortizing Water Resource Infrastructure at Palm Coast, Florida, March 29 - April 3, 1987.

[2]The cost to upgrade water delivery systems has been estimated at $3.7 billion/year by the Joint Economic Committee, $4.4 billion/year by the American Water Works Association and $5.9 to $7.6 billion/year by the Congressional Budget Office. Figures compiled from the National Council on Public Works Improvement, Report to the President and Congress, 1986.

[3]Office of Municipal Pollution Control, U.S. Environmental Protection Agency. Current estimates on costs to meet clean water standards.

[4]A compilation of annual costs for water delivery systems and EPA estimates for waste treatment facilities from footnotes 2 and 3 above. Figures are in constant dollars.

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