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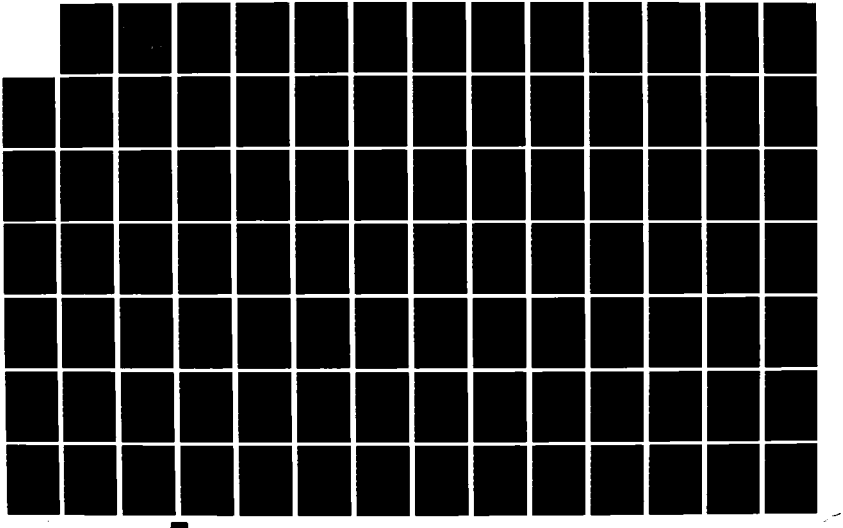

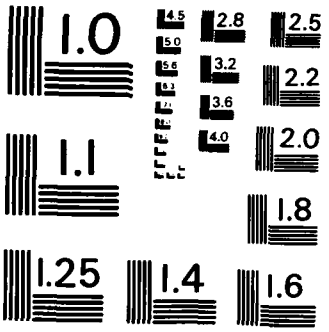

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Non-Federal Cost Recovery and Financing for Water Projects

March 1984

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Reviews non-Federal financing instruments and revenue sources for water resources projects. Assesses benefits of careful financial analysis and planning for water projects. Reviews financing and cost recovery techniques applicable to each water project purpose.

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NON-FEDERAL COST RECOVERY AND FINANCING FOR WATER PROJECTS

by

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Research Report 84-R-1 March 1984

PREFACE

This report was prepared as part of the Fiscal Year 1983 Research and Development Program by the U.S. Army Engineer Institute for Water Resources (WRSC-IWR) for the Office of Planning (DAEN-CWP), Office of the Chief of Engineers, U.S. Department of the Army. The plan of study was prepared as part of the fiscal year 1983 WRSC-IWR Policy Studies Program.

The report was written by Mr. Mark W. Mugler under the supervision of Mr. Michael R. Krouse, Chief, Research Branch, WRSC-IWR in coordination with the technical monitor, Mr. Robert Daniel, Chief of the Economic and Social Analysis Branch, DAEN-CWP. Additional assistance was provided by the following: Mr. Kyle E. Schilling, WRSC-IWR; Dr. Lloyd George Antle, WRSC-IWR; Mr. Robert Harrison, WRSC-IWR; Mr. John Burns, DAEN-CWP; Mr. Donald Duncan, DAEN-CWR; Mr. Curtis Clark, DAEN-CWR; and Mr. Thomas Kinchelow, SWD.

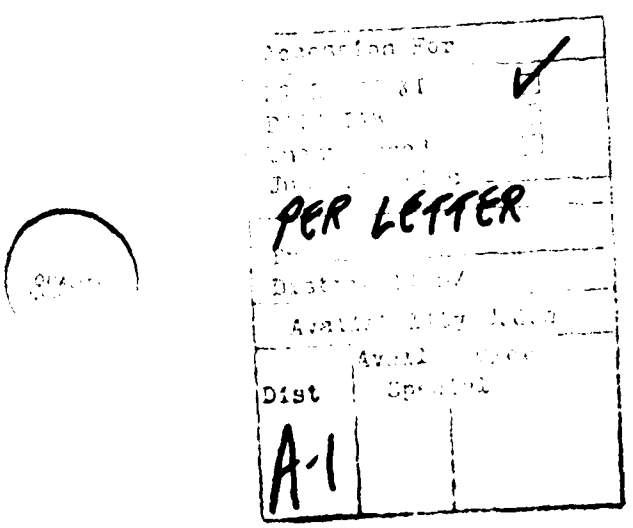

TABLE OF CONTENTS

LIST OF TABLES

List of Tables (Cont.) Page

LIST OF FIGURES

I

SUMMARY AND CONCLUSIONS

Until recently the principal source of funds for financing state and local public improvements has been the long-term, fixed-premium bond secured by general revenues, and the principal source of funds for investor-owned utilities has been investor equity. However, high interest rates and a variety of other factors have greatly altered the conditions under which water utilities and public improvements are financed. Today, a prospective water project sponsor should consider a variety of revenue sources and non-traditional financing techniques as means to pay for the project.

The careful selection of particular cost recovery and financing techniques may provide the following benefits to the sponsor:

1) increased reliance on direct beneficiaries for cost recovery;
2) diversified charging vehicles and revenue sources;
3) enhanced capture of the consumer surplus in revenues;
4) reduced risk to the sponsor of long-term revenue shortfalls;
5) avoidance of pricing limitations;
6) reduced revenue collection costs;
7) increased access to funding sources to improve capital mix;
8) reduced credit risk;
9) reduced market risk to creditors;
10) exploitation of tax and market niches;
11) preserved or enhanced credit rating;
12) enhanced financial flexibility;
13) reduced financing transaction costs; and
14) reduced risk of negative cash flow in critical years.

The cost recovery possibilities for a particular project are a function of both the project outputs and the sponsor's cost recovery powers and limitations. In turn, the financing possibilities associated with the project are a function of both the credit security provided by the project and the sponsor's financing powers and limitations. Although the choice of cost recovery vehicles may be limited, the sponsor often has available a variety of financing mechanisms which are consistent with each cost recovery method.

The sponsor must first determine the principal sources of revenue, which also provide the basic security for debt. The principal combinations of revenue source and bond security are as follows:

1) general obligation bonds
   a. general revenues, including general property and/or land taxes
   b. deferred property assessments
2) revenue bonds
   a. lease, sale or rental of goods jointly consumed with water outputs
   b. use or access fees to obtain use of common property resources
   c. user charges (commodity or per unit charges)

Table I-1

Financial Benefits and Applications of Cost Recovery and Financing Techniques

		FINANCIAL BENEFITS														APPLICABILITY TO PROJECT PURPOSE						
		EXTENT OF COST RECOVERY						ACCESS TO COST OF FUNDS														
		CHARGE BENEFICIARIES	DIVERSIFY FINANCIAL VEHICLES	CAPTURE CONSUMER SURPLUS	REDUCE REVENUE RISK	AVOID PRICING LIMITATIONS	REDUCE COLLECTION COST	IMPROVE CAPITAL FOR X ACCESS	REDUCE CREDIT RISK	REDUCE INVESTOR'S MARKET RISK	EXPLOIT TAX & MARKET RULES	MAINTAIN CREDIT RATING	PROVIDE FINANCIAL FLEXIBILITY	REDUCE TRANSACTION COST	MAINTAIN POSITIVE CASH FLOWS	FLOOD HAZARD REDUCTION	COMMERCIAL NAVIGATION	COMMERCIAL FISHERIES	EXTENSIVE RECREATION & FWL	INTENSIVE RECREATION	M&I WATER SUPPLY	HYDROELECTRIC POWER
GENERAL OBLIGATION BONDS	GENERAL PROP. TAX				X		X		X					X	X	X	X	X	X	X	X	X
	SPECIAL ASSESSMENT	X			X	X			X						X	X						
REVENUE BONDS	SUPPLEMENTARY TAX	X	X					X				X					X	X	X	X		
	USE TAX	X	X		X			X				X			X		X	X	X	X	X	X
	USER CHARGE	X	X				X	X				X					X			X	X	X
SPECIAL TAX	DEFERRED ASSESSMENT	X			X	X		X	X						X	X						
	SPECIAL SERVICE TAX	X				X		X	X					X	X		X	X	X			
	SEVERANCE TAX	X					X	X						X			X	X	X	X		
PRIVATE CAPITAL	SUBSIDY					X		X				X		X	X	X	X	X	X	X	X	X
	UP FRONT ASSESSMENT	X	X		X	X		X				X			X	X						
	SYSTEM DEVELOPMENT FEE	X	X		X	X		X							X						X	X
PRIVATE VEHICLES	LEASE						X	X			X	X	X		X						X	X
	CONDITIONAL SALE						X	X			X	X	X		X						X	X
	SALE LEASEBACK						X	X			X	X	X		X						X	X
	SERVICE CONTRACT						X	X			X	X	X		X						X	X
PRICING	USE PART PRICING	X					X										X		X	X	X	X
	TAX PART PRICING	X	X		X										X		X				X	X
	PRICE DISCRIMINATION	X			X										X		X		X	X	X	X
	PEAK PRICING	X			X										X		X		X	X	X	X
CREDIT ENHANCEMENT								X				X			X	X	X	X	X	X	X	X
RISK SHARING	SHORT MATURITY							X		X			X		X	X	X	X	X	X	X	X
	NON-COMPLIANCE OPTION										X				X	X	X	X	X	X	X	X
	TAPPER OPTION														X	X	X	X	X	X	X	X
	PAY PRICE VARIANCE									X					X	X	X	X	X	X	X	X
	ALL OPTION												X		X	X	X	X	X	X	X	X
	SOCIAL DISCRIMINATION										X				X	X	X	X	X	X	X	X
OTHER POWER CONTRACT					X	X			X						X		X			X	X	X

3) special tax bonds
   a. deferred assessments
   b. special service taxes
   c. dedicated excise taxes

The financial performance of the project under the preferred debt financing/revenue raising approach or approaches indicates the project's basic financial strengths and weaknesses. A variety of supplementary cost recovery and financing techniques are available to enhance a project's financial performance. The sponsor can alter the mix of debt and other capital sources to reduce overall cost; adopt pricing approaches which increase the extent of cost recovery; employ credit enhancements to protect it and its creditors; control the maturity, flow of payments and other features of its bonded indebtedness to increase its flexibility and reduce its cost; and employ third party contracts to control cash flow and improve credit security. Cost recovery and financing techniques are summarized in the list which follows:

1) up front capital
   a. surplus/subsidies
   b. up-front property assessments
   c. system development charges
2) leasing and contracts
   a. lease, finance lease and leveraged lease
   b. conditional sale
   c. sale-leaseback
   d. service contract
3) pricing
   a. one-part pricing
   b. two-part pricing
   c. price discrimination
   d. peak pricing
4) credit enhancements
   a. external credit supports
   b. state intermediation
   c. state technical assistance and supervision
5) bond structure
   a. short maturity instruments
   b. original issue discount or compound coupon bonds
   c. stepped coupon bonds
   d. tender option, warrants and variable interest rate bonds
   e. call option bonds
   f. small denomination bonds
6) third party contracts

Among the variety of financing and cost recovery techniques, certain techniques (general revenues, surpluses, credit enhancements and bond structuring techniques) are applicable to all project purposes. In addition, each project purpose is amenable to particular techniques, as described below.

Because most flood hazard reduction benefits accrue to property, up-front or deferred assessments are appropriate revenue sources and bond security, and are available to any unit of government with taxation or assessment powers.

For some general purpose governments, special service taxes may be used in lieu of assessments to provide greater ease of administration and the deductibility of tax payments from Federal taxes. Depth-damage frequency curves may provide the basis for computing assessments or special service taxes.

Landside facilities are the direct (facility-specific) source of revenues for sponsors of commercial navigation improvements. Direct revenues include the rental or lease of space and storage facilities, facility usage fees (dockage and wharfage) and service and equipment charges. In addition, general purpose sponsors may tax complementary goods such as motor fuel. Charging policy at port facilities may include two-part, discriminatory and peak pricing as methods to enhance revenues with minimal effect on use.

Commercial fisheries are problematic because use of the fishery is difficult to price or to control. Potential revenue sources include taxes on the catch, taxes on complementary goods and access charges.

Extensive recreation and fish and wildlife resources are also common property resources, and cost recovery is difficult. One-stop access fees and/or activity fees and land leases/outgrants are two methods to collect revenues and reduce debt service. General purpose sponsors may also rely on hunting and fishing licenses, taxes on complementary goods such as hunting equipment and gasoline, multi-facility use licenses, and assessments on properties to which windfall benefits accrue. Price discrimination offers some potential for revenue enhancement, as does peak pricing at heavily used facilities.

For recreation resources which feature intensive (user-oriented) facilities, additional revenues may be obtained from facility-specific use fees, sales and rentals and special service charges. The presence of intensively used facilities enhances the cost recovery prospects of a recreation project.

Municipal and industrial water supply is a market output and should be self-supporting in the long run. Within regulatory and legal limitations, rates may be structured to ensure cost recovery and remedy cash flow problems at minimum sacrifice of user benefits. Charging vehicles include variable charges for the commodity, customer service and special services, and fixed charges which recover sunk or current costs not related to use. Two-part pricing, price discrimination and peak pricing are common methods to allocate output and enhance revenues. Because M&I water is a market output, there is an opportunity for involvement of the private sector in financing and operation. Leasing, conditional sale and sale-leaseback are possible financing techniques; however, use of service contracts is the technique which maximizes private responsibility and financing latitude.

Hydroelectric power is a market output which presents financing and cost recovery possibilities comparable to those of M&I water. However, an elaborate institutional framework has evolved for the development, allocation and marketing of hydropower from Federal projects. Institutional, not financial, constraints are the chief impediments to a broadened role for non-Federal sponsors in hydropower financing and cost recovery.

The Federal water planner may constructively participate in the development of a project's cost recovery and financing approach. The planner may use financial analysis for the following purposes:

1) assessing the likely capability of the prospective sponsor to participate in plan implementation;

2) analyzing plans from a financial as well as an economic standpoint and understanding the investment preferences of the sponsor;

3) assisting an unsophisticated and financially constrained sponsor to develop a feasible financing and cost recovery approach; and

4) reducing obstacles to and inducing non-Federal support for a plan which approximates the preferred Federal plan, and resolving differences among the investment preferences of the Federal Government and prospective sponsors.

This report provides Corps of Engineers planners and economists with resource materials on water project financing and cost recovery by non-Federal sponsors. It is not intended to serve as an in-depth assessment of each cost recovery or financing technique as it applies to each project purpose. In fact, a number of areas of investigation would be fruitful in expanding the understanding of non-Federal financing and cost recovery:

1) preparation of a financial analysis manual which emphasizes the coordinated execution of engineering, economic and financial analyses;

2) research into the use of linear programming techniques in project planning methods to meet minimum physical, economic and financial requirements (constraints);

3) case studies of the innovative financing arrangements for recent new starts;

4) case studies of cost recovery which focus either on recent new starts, on particular project purposes, or on particular cost recovery techniques, with emphasis on the administrative advantages and disadvantages of each technique as used in a real-world context;

5) policy studies of administrative or legislative steps needed to implement the Administration's current hydropower financing policy;

6) investigations of financing for additions and modifications to existing projects as distinct from new projects;

7) additional investigation into the uses of leasing and contracting techniques, including case studies; and

8) study of administrative and planning measures needed to address the possibility of divergence between the unconstrained NED plan and the "affordable" plan which maybe preferred by a non-Federal sponsor.

II

INTRODUCTION

The Federal water development objective is to maximize net national economic development (NED; economic) benefits without unreasonable adverse environmental effects and subject to specific considerations such as human safety, completeness, and effectiveness. The tasks of the water resources planner in developing the "NED plan" subject to such constraints are to optimize the factor inputs (features) and to optimize the capacity and investment schedule of the plan.

On the other hand, the water investment objective of a non-Federal sponsor may be characterized as maximizing mission accomplishment subject to financial opportunities and constraints; more precisely, maximizing the pace and extent of water development subject to the sponsor's ability to obtain access to funds at reasonable cost, to recover investment costs and to maintain net positive cash flow.

Both as a matter of policy and as a matter of fiscal necessity, the Federal water development programs in future years will involve increased participation by non-Federal sponsors in the sharing of project costs and in the financing of those cost shares. First, non-Federal cost shares for some projects purposes such as flood control, navigation and fish and wildlife enhancement will be increased. Second, sponsors will be expected to provide their cost shares up front. For some project purposes such as water supply and hydroelectric power, the entire cost allocated to those purposes must be financed by the non-Federal interests. Table II-1 compares traditional cost sharing and financing to the Administration's proposed policy.

It has been argued that past direct and indirect capital subsidies to non-Federal sponsors have created incentives for non-Federal sponsors to seek premature investment and over-capacity in design, but enabled the Federal Government to play the major role in project formulation, selection and investment programming. Given a requirement for increased non-Federal financing and cost sharing contributions, such incentives will be reduced; in fact, in many instances non-Federal sponsors may seek to reduce capacity and/or defer or forego investment.

For a sponsor which is financially constrained from participating in an economically efficient plan, the key to assuring its participation in project development and implementation will often lie in developing a financing and cost recovery approach which meets its financial needs. The analysis of cost recovery and financing alternatives may play an important role in the development of acceptable and implementable plans. Each plan should contribute not only to the Federal objective but to non-Federal financial needs as well. First, project planning must address potential problems with the extent of cost recovery. Second, project planning must address potential financing difficulties: access to capital; the cost of funds; and cash flow.

This report is intended to provide the planners and economists in U.S. Army Corps of Engineers districts and divisions with resource materials on

TABLE II-1

TRADITIONAL AND PROPOSED NON-FEDERAL COST SHARES
FOR WATER RESOURCES PROJECTS

PROJECT PURPOSE	COMPONENT	ASSIGNED FIRST COSTS-TRADITIONAL SHARE	ASSIGNED FIRST COSTS-PROPOSED SHARE	O&M COST SHARE
Flood Hazard Reduction (including rural drainage and hurricane protection)	major reservoir	0	35% or, for projects covered by Sec. 3 of the Flood Control Act of 1936, as amended, the value of lands, easements, rights-of-way and relocations required for project construction, whichever is greater. Presumption of upfront financing of share in excess of the Flood Control Act of 1936 requirements may be modified upon consideration of users' ability to pay.	0
	local protection/ small reservoir --structural	L.E.R.R.[1]		100%
	local protection-- nonstructural	20%		100%
	major drainage	50%		100%
	hurricane protection	greater of 30% or L.E.R.R.		100%
Beach Erosion Control (initial construction and periodic nourishment)	public use shores	50%	50%	100%
	public shore parks	30%		100%
Commercial Navigation (general navigation facilities)	deep-draft harbors	0	sliding scale based on depth	0
	inland waterways	0	70%	0
Recreation	small harbors	50%	100%, with 75% upfront	0
	reservoirs	50% or separable costs	50% of joint and separable costs	100%
	non-reservoirs	50% of separable costs	50% of separable costs	100%
Commercial Fishing		0	100%	0
P & I Water Supply		100%, with 0 upfront	100%, with 100% upfront	100%
Hydroelectric Power		100%+, with 0 upfront	100% in return for receipt of power produced or for equivalent value of power to be provided by Federal power marketing system for a period of 30 years	100%

[1]Lands, easements, rights-of-way and relocations

SOURCE: DAEN-CWO-R, "Negotiation of Recreation Cost-Sharing Contracts," 27 Jun 83; U.S. Army Corps of Engineers, OCE, Digest of Water Resources Policies and Authorities, EP 1165-2-1, 30 Jun 83; DA, CE-Civil Works, "New Starts and Other Proposed New Work Memorandum, Fiscal Year 1985," September 15, 1983.

cost recovery and financing for water projects. Its intended applications are fourfold: in assessing the financing capabilities of a prospective sponsor; in understanding its investment preferences; in formulating plans which provide cost recovery opportunities; and in removing financial obstacles to the participation by a sponsor in an economically efficient plan.

This report presents findings in four areas of investigation: identification of the variables which define cost recovery and financing objectives and constraints; evaluation of cost recovery alternatives for each project output; evaluation of financing alternatives for each project output; and a brief description of financial analysis techniques.

III

OVERVIEW OF WATER PROJECT COST RECOVERY AND FINANCING BY NON-FEDERAL SPONSORS

INTRODUCTION

The cost recovery potential for a particular project is a function not only of the outputs of the project but also of the sponsor's cost recovery powers and limitations. In turn, the financing possibilities associated with the project are a function both of the credit security for the project and the sponsor's financing powers and limitations. Since the credit security for the project is some mix of project revenues, obligations on the part of the sponsor and credit enhancements, the financing possibilities for the project only indirectly depend on the nature of the project outputs, and the sponsor has much greater freedom of choice in the selection of financing mechanisms than in the choice of cost recovery vehicles.

This chapter discusses the range of opportunities and constraints associated with water project cost recovery and financing which may be faced by a prospective sponsor. In addition, this chapter discusses uses of financial analysis as a component of Federal or non-Federal project planning.

THE SPONSORS OF WATER PROJECTS

There are four basic types of non-Federal organization for financing and managing water projects:

1) General purpose units of government (and departments thereof). General purpose units may enter into agreements to conduct joint ventures or create special commissions which are delegated certain powers of the parties to the agreement;

2) Special districts, such as levee, drainage or soil conservation or sanitary districts, which are normally created by local referendum under procedures established by State law;

3) Independent (enterprise) authorities, districts and commissions created by special state legislation; and

4) Investor owned utilities or cooperatives which sell market outputs and which are usually regulated under State law.

Municipal departments and enterprise authorities which sell market outputs are together called "public utilities". There are two major differences between public utilities and investor owned utilities. First, investor-owned utilities rely principally on investor equity for capital, whereas public utilities usually rely on debt. Second, public utilities are usually not regulated by state commissions and are operated on a cash basis; investor owned utilities are usually regulated and are operated on a return-to-investment basis.

Compared to the water development activities of other sponsors, those of general purpose governments have relatively little financial independence. In recent years, hard-pressed general purpose governments have turned to the creation of enterprise authorities and special districts, to facility leasing and contracting for services, and to creation of municipally owned utilities or the dedication of revenues to semiautonomous "enterprise accounts" as methods to create new borrowing authority, to assure that sufficient revenues are obtained without adverse political results for elected officials, and to remedy jurisdictional problems.

FINANCIAL COSTS

The financial costs faced by the sponsor may differ substantially from the economic costs of the project as computed under the Principles and Guidelines.[1] There are three sets of costs which must be distinguished:

1) Project economic (NED) costs are computed for economic analysis, and include implementation outlays, associated costs and other direct (external) costs. Prices are held constant and the official discount rate is used to reduce costs to a common-time basis. NED costs are also known as investment costs.

2) Real "financial costs", as discussed in the Principles and Guidelines and the Planning Guidance Notebook[2], are really a subset of NED costs and are used for cost allocation computations among project purposes. Like NED costs, they are expressed in real terms and discounted using the official discount rate. Included in real "financial costs" are implementation outlays and transfer payments.

3) Nominal "financial costs", also known as project financing costs, are the subject of this discussion. Included in project financing costs are nominal implementation outlays by the sponsor (including nominal interest charges for debt) and transfer payments received or disbursed by the sponsor. Depending on the financial practices of the sponsor, either the sunk cost, the market value or foregone revenues from in-kind contributions are also included. Financing costs have traditionally received little attention in Civil Works project planning.

Financing costs differ from economic costs in two ways. First, financing costs include only the direct net outlays by the sponsor. Associated and external costs are not considered. Grants, Federal cost shares and other transfers (e.g. subsidies, tax exemptions) reduce net outlays and are considered "free" by the sponsor. The sponsor may also consider as "free" capital from surplus revenues or dedicated tax sources such as a severance

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[1]U.S. Water Resources Council, Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, March 10, 1983.

[2]U.S. Army Corps of Engineers, Planning, Economic Considerations, ER 1105-2-40, 8 January 1982; also, U.S. Army Corps of Engineers, Planning, Economic Considerations, EP 1105-2-45, 11 January 1982.

tax. Transaction costs associated with project development and administration are considered by the sponsor but not considered in NED optimization. Finally, a non-public sponsor faces the costs of taxes and insurance.

The second difference between financial and NED costs is the difference in interest rates. Economic analysis uses real prices discounted at a real discount rate; financial analysis uses nominal prices and converts one-time income or expenditures to annual flows using financial interest rates. Whereas the interest rate used in economic analysis should include only a real, risk-free charge for use of capital, the financial interest rate has four components:

1) a charge for the use of capital which is based on time preference, the opportunity cost of capital and tax treatment of income;

2) an inflation premium which preserves the value of the capital over time;

3) a premium for interest rate risk or market risk, i.e. the risk that market rates will rise and that, consequently, the value of a financial instrument bearing fixed interest will fall; and

4) a premium for credit risk. Credit risk is the risk that financial obligations will not be met and is determined by the security pledged for the obligations, i.e. the revenue-raising power of the project and/or the sponsor. The bond rating agencies attempt to evaluate prospective bond issues for credit risk.[1] The interest rate which the issuer needs to pay is closely related to the issue's rating, as is the subsequent price of the bonds in the market as the security for the issue improves or deteriorates. For instance, with market interest levels at 5 percent, the difference in yield between an "Aaa" (highest rated) bond and a "Baa" bond is .59 percent; with market interest at 8 percent, the difference is .95 percent.[2]

In the past few years dramatic changes in the municipal bond market have caused a significant rise in the interest cost of municipal debt. The before-tax interest paid on quality municipal bonds has risen to nearly 85 percent of that paid on quality corporate bonds, from a historical 65 to 70 percent. There are five trends or factors in the bond market which have made credit so expensive to non-Federal pubilc borrowers: market inefficiencies affecting small issues; reduced tax advantages of public bonds; crowding out by Federal and corporate debt; greater perceived and actual credit risk to the investor; and increased inflation and interest rate risk.

Large projects, projects which are not self-liquidating due to the nature of the outputs and the sponsor's pricing policy, projects financed largely by

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[1]For a discussion of rating factors see Petersen (1974), Petersen et al, (date unknown) and Calvert.

[2]Petersen, John E. et al, Debt Financing of the State and Local Share of Constructing Municipal Wastewater Treatment Facilities, Government Finance Research Center, Municipal Finance Officers Association, date unknown.

debt or sponsored by institutions already heavily in debt, and projects sponsored by small sponsors with little "debt capacity" or "tax effort" are particularly likely to encounter high interest costs. A sponsor with a poor credit rating will have difficulty issuing general obligation bonds to finance non-market outputs. Even the interest rate on revenue bonds for market outputs will be affected by the sponsor's poor credit rating. The greater the credit risk, the greater the risk premium on debt and the greater the divergence of the interest rate from a real, risk-free rate.

COST RECOVERY OBJECTIVES AND CONSTRAINTS

For each project output, the mission maximizing sponsor has an interest in implementing the greatest capacity, using the least-cost mix of inputs and adopting the earliest implementation schedule for which it can generate revenues sufficient to repay the sunk and operating financial costs. As a corollary, the sponsor wishes to identify the mix of outputs and the mix of cost recovery measures relating to those outputs which maximize the cost recovery potential of each combination of capacity, schedule and inputs.

In general, a sponsor may maximize its revenues from a water project by maximizing the charging of beneficiaries for separable water services, and by adopting pricing techniques which attempt to capture each beneficiary's willingness to pay. However, the extent to which benefits can be "captured" in the form of revenues is constrained by the nature of the water outputs and the powers of the sponsor.

Water Project Outputs

For purposes of analyzing financing and cost recovery alternatives, water project outputs may be broadly classified into three groups: collectively consumed goods, common property resources and market goods. Revenue and benefit characteristics of water outputs are summarized in Table III-1.

Collectively consumed goods, as in the case of flood hazard reduction and erosion protection, cannot be excluded from any prospective beneficiary. The traditional public role in the case of such outputs has been to provide them using tax and police powers.

Common property resources include land recreation resources, fish and wildlife resources and the surfaces of watercourses and impoundments for boating, recreation, fisheries and commercial navigation. Common property resources are individually consumed but difficult to price. The traditional public roles have been to manage such resources, to control access to and use of such resources in order to limit congestion costs and to expand capacity to alleviate congestion.

Market (divisible, excludible, vendible) goods include water supply, hydroelectric power, and goods and services complementary to (jointly consumed with) the use of common property resources. Water supply and hydropower have "natural monopoly" characteristics: falling average cost (at least at first) economies of scale and high entry cost. The traditional public roles for water supply and hydropower have been to regulate rates in order to prevent monopoly pricing and undersupply or to provide such outputs as a public utility. The public roles for goods complementary goods to common property

TABLE III-1

BENEFITS AND REVENUES FROM WATER PROJECT OUTPUTS

MARKET STRUCTURE	PRIMARY SOURCES OF REVENUE[1]	OUTPUTS	BENEFIT CATEGORIES
collective consumption	assessments; special service taxes	flood hazard reduction	damage reduction (urban/rural inundation and drainage, soil moisture, soil erosion, sediment); urban/rural land use intensification; urban location
common property resources	complementary goods sale/ rental/taxation; access/use fees; service charges	navigation	cost reduction; shift of origin and/or destination; shift of mode; induced movement
		commercial fisheries	changes in net commercial income
		recreation; fish and wildlife	willingness to pay
market goods	user charges; system develop-	M+I water supply; hydroelectric power	willingness to pay; alternative cost

[1]Other than general or property taxes

resources have been much more varied and include vending and taxation.

The nature of the water output directly affects the extent of cost recovery in two ways. First, it may be difficult and/or costly to identify and collect charges from beneficiaries. This problem may be acute for collectively consumed outputs and for common property resources which support extensive (resource-based) use.

Second, the structure of the demand for market outputs may not be conducive to full cost recovery. It is unlikely that a project can be self-supporting without a sacrifice in NED benefits when one-part (constant per unit) pricing is employed, short run marginal costs are scarcely rising, demand is relatively elastic and/or fixed costs are high compared to variable costs.

The Cost Recovery Powers of Sponsors

The cost recovery powers of the sponsor are major determinants of the extent of cost recovery for water project outputs. Three major constraints which can limit the effectiveness of cost recovery are the sponsor's revenue base, its geographic jurisdiction and its pricing latitude.

The sponsor's revenue base may be inadequate to capture a substantial portion of the project benefit. For example, if a sponsor is authorized to use only special assessments or sales of outputs as sources of revenue, the benefits of certain types of project output would not be subject to cost recovery because the outputs could not be sold or attributed to property. Lacking co-sponsorship, the sponsor would have to absorb the cost of the unpriced outputs. Furthermore, if the revenue base is adequate to capture benefits under most circumstances, it still may not provide the security to the sponsor's or project's creditors that revenues will be sufficient in the event that expected use does not develop. As an example, a self-supporting utility may not have adequate charging or assessment powers to meet revenue shortfalls if the consumption of the utility's outputs is curtailed. The broader the revenue base of the sponsor, the greater its capabilities to charge beneficiaries. General purpose sponsors, which have general taxing powers, may be better positioned to finance water development because they may view cost recovery from the standpoint of indirect fiscal effects as well as direct revenues, and because their broader revenue base may be exploited to provide broader security to creditors.

For outputs which are not sold, the sponsor may lack geographic jurisdiction over all the beneficiaries. For instance, a flood control project may generate downstream benefits outside of the sponsor's jurisdiction. Unless the sponsor's financial cost is reduced sufficiently by the capital subsidies from the Federal Government or by the contributions of other governments whose constituents benefit from the project, revenues may fall short of the sponsor's costs as well as of overall benefits.

Sponsors also face institutional and administrative constraints to pricing latitude. For instance, the rates of most private utilities and some public utilities are regulated by public utility commissions; the rates and

prices of general and special purpose governments are effectively controlled through the election of rate-making officials. Furthermore, onsiderations of administrative acceptability limit the sponsor's latitude in charging policy. For instance, rate structure should be defensible and reasonably consistent over time, prices should be predictable in magnitude and vary within limits of acceptability, and pricing strategy should be neither burdensome, nor of high cost, nor difficult for users to comprehend.

FINANCING OBJECTIVES AND CONSTRAINTS

Implementation of a water project requires that a source of funds be obtained and that the funds be repaid according to a schedule. The mission-maximizing sponsor has an interest in structuring the financing of a water project in such a way as to provide it the greatest financing latitude, at least cost, consistent with maintaining positive cash flow. In other words, the sponsor has two financing objectives: optimizing capital structure and maintaining positive cash flow.

Capital Structure

Capital structure is the mix of funding sources and repayment obligations of the sponsor. An optimal capital structure is one which provides the sponsor access to least-cost funding sources, both before and after project implementation. For this reason, an ideal financing package for a particular project is one which not only minimizes the project's immediate financial cost but also maintains or enhances the sponsor's credit standing and minimizes the sponsor's exposure to financial risks if conditions change. Devising a financial approach for a water project involves trading off these sometimes conflicting requirements.

1. Cost of Funds. The first aspect of capital structure is the cost of funds. Financing cost is a function both of the mix of funding sources and of the cost of each source, and financing approaches can affect both variables.

Financing sources include up-front capital, debt, and leasing and contracts. Whereas debt is ordinarily the primary source of funds, leasing and contracts provide alternatives to debt which take advantage of variations in the U.S. tax code, and up-front capital may be used in conjunction with debt to lower overall cost. Marshall[1] shows that for additions to an existing system, the financially optimum level of debt can be determined by the cash flow requirements of the project. Net revenues after O&M must be sufficient to provide debt service coverage of 120 to 150 percent (i.e. to provide certain revenues 1.2 to 1.5 times the magnitude of debt service), and must also be sufficient for immediate cash needs for debt service, debt reserve and minor capital improvements. If the cash flow required for coverage exceeds that required for immediate cash needs, debt is overused. If cash flow required for coverage is less than current cash needs, debt is underused. By equating coverage and current cash needs, the sponsor can determine the least-cost level of borrowing. A corollary of the equation is that the greater is the construction time, the interest rate on debt and/or the

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[1]Marshall, W. N., "Funding Improvements with Debt Capital and Revenues," in Journal of the American Water Works Association, September 1982.

coverage ratio (i.e. the higher the credit risk of the project and the sponsor), the greater will be the cash flow requirements for coverage and the greater should be the sponsor's reliance on up-front capital for financing. A second corollary is that under conditions of high-cost debt it is appropriate for the sponsor to defer investment, either to await lower rates or to increase its cash surplus.

Two factors may constrain a prospective sponsor's ability to optimize the mix of financing sources. First, the sponsor may not be authorized to use all sources. For instance, an investor-owned utility may be prohibited under regulations from generating "excess" revenues or from levying up-front capital charges to recoup capital costs. As another example, a sponsor with a limited revenue base is restricted to financing instruments which use the revenue base as security.

The second factor is legal limits on borrowing. These requirements vary state-by-state. State departments, municipalities and special districts may each be subject to a different set of limitations; in most cases special districts are less encumbered than general purpose governments. Furthermore, tax or expenditure restraints effectively limit financing latitude by limiting revenue. Common limitations include:

1) voter approval of new debt;
2) debt ceilings;
3) interest rate ceilings;
4) tax limitations; and
5) expenditure limitations.

The distribution of these legal limitations among states is shown in Table III-2.

Whatever the sponsor's capital mix, overall financing cost can be lowered by minimizing the interest charge on debt. The premiums charged for credit risk and the interest rate (market) risk are susceptible to control through creative financing packages. The sponsor's own credit position is the principal constraint to reduction of interest charges: a sponsor with a poor credit rating and low debt capacity will find it difficult to provide added security for projects involving risky revenues and to absorb the interest rate risk for which creditors demand a premium.

2. Overall Credit Rating. The second aspect of capital structure is its impact on overall credit rating. In general, the greater the extent to which the sponsor's total financial resources are pledged as security for debt or contracts or committed as the up-front funding, the greater the adverse effect of the project on credit rating. The impact is minimized for large, fiscally stable sponsors, small projects with secure revenues and financing measures which limit the liability of the sponsor.

3. Flexibility and Financial Risk. The third aspect of capital structure is financial flexibility or latitude. The sponsor of a water project has an interest in adapting its cost structure to new conditions, in modifying repayment obligations to match the flow of revenues, in maintaining

TABLE III-2

CONSTITUTIONAL AND STATUTORY LIMITATIONS ON STATE AND LOCAL DEBT, TAXES AND EXPENDITURES

	LIMITS ON STATE GOVERNMENTS								LIMITS ON LOCAL GOVENMENTS								
STATE	Referendum required to create debt	Debt ceiling	Debt ceiling includes repayment contracts	Debt ceiling may be exceeded by referendum	Interest rate ceiling	Tax, revenue or expenditure limits	Ceiling on growth of revenues or expenditures	Limits on type of cost sharing	Referendum required for long term G.O. debt	Interest rate ceiling	Limit on property tax rate	Limit on property tax levy	Limit on general revenue	Limit on general expenditures	Limit on assessment increases	Limit on revenue or expenditure increases	Full disclosure prior to property tax increase
Alabama		X		X					X	X	X						
Alaska	X	X		X					X	X	X	X					
Arizona		X	X			X			X		X	X		X	X		X
Arkansas	X				X				X	X							
California		X		X	X		X		X	X	X			X	X	X	
Colorado		X					X		X		X	X					X
Connecticut																	
Delaware		X	X			X			X	X	X	X					
Florida					X				X	X	X	X					X
Georgia		X	X						X	X	X						X
Hawaii		X			X		X										X
Idaho		X		X	X	X			X	X	X	X			X		
Illinois	X				X	X			X	X	X						
Indiana		X									X	X					
Iowa		X	X		X			X	X	X	X	X		X	X		
Kansas		X	X	X				X	X	X	X	X		X			
Kentucky		X		X					X		X	X					X
Louisiana							X		X		X	X					
Maine		X		X	X				X								X
Maryland					X				X	X					X		X
Massachusetts								X			X	X		X		X	
Michigan		X			X		X	X	X	X	X	X					
Minnesota		X							X	X	X	X	X		X		
Mississippi		X			X				X	X	X	X					
Missouri		X		X		X		X	X	X	X		X				
Montana									X		X						X
Nebraska		X	X			X		X	X		X		X	X			
Nevada		X	X		X		X		X	X	X		X	X	X	X	
New Hampshire									X		X						
New Jersey		X		X			X					X		X			
New Mexico		X	X	X	X				X	X	X	X			X		

TABLE III-2 (Continued)

	LIMITS ON STATE GOVERNMENTS									LIMITS ON LOCAL GOVENMENTS								
STATE	Referendum required to create debt	Debt ceiling	Debt ceiling includes repayment contracts	Debt ceiling may be exceeded by referendum	Interest rate ceiling	Tax, revenue or expenditure limits	Ceiling on growth of revenues or expenditures	Limits on type of cost sharing	Referendum required for long term G.O. debt	Interest rate ceiling	Limit on property tax rate	Limit on property tax levy	Limit on general revenue	Limit on general expenditures	Limit on assessment increases	Limit on revenue or expenditure increases	Full disclosure prior to property tax increase	
New York	X									X	X							
North Carolina								X	X		X							
North Dakota		X							X			X						
Ohio		X							X	X	X	X						
Oklahoma					X			X	X	X	X							
Oregon		X	X		X	X		X	X			X			X			
Pennsylvania		X	X	X					X		X							
Rhode Island		X	X	X	X	X			X	X							X	
South Carolina		X			X	X			X	X		X						
South Dakota		X			X				X	X	X							
Tennessee					X	X	X			X							X	
Texas		X	X		X		X	X	X	X	X						X	
Utah		X				X		X	X		X	X				X		
Vermont					X				X									
Virginia	X							X	X								X	
Washington		X		X		X		X			X	X	X					
West Virginia		X			X				X	X	X							
Wisconsin		X	X						X		X	X		X				
Wyoming		X			X				X	X	X							

Sources: Advisory Commission, 1977; Advisory Commission, 1980; Hoggan; Vaughan, 1982; Petersen et al., 1977; Congressional Budget Office, 1983.

Note: In some states, restrictions apply only to certain types of governmental units. Sources should be consulted for full discussion and footnotes.

a degree of liquidity to meet unexpected shortfalls and in taking advantage of opportunities to refinance at lower cost or defer financing when market rates are high. A variety of financing techniques may be used to provide financing flexibility and to avoid the risk that the sponsor will be locked into a high-cost capital structure.

Cash Flow

Water projects are ordinarily capital-intensive, with benefits which grow gradually over time and short run marginal cost which is low throughout much of project life. For such projects per unit historical financial cost (average cost) is initially very high, and revenues are initially quite low. Even though the project may create a revenue surplus in the long run, in the short run negative cash flow may be a difficulty if price is set near marginal cost or if repayment obligations are based on fixed payments. Depending on the shape of the demand and cost curves, even monopolistic, average cost or multipart pricing may not bridge the gap. Furthermore, pricing above marginal cost is likely to suppress demand, further increasing the per unit historical cost and perpetuating the revenue gap.

Positive cash flow is required at all points in time to satisfy cash requirements for operating expenses, debt reserves, sinking funds, debt service, minor capital improvements and other current obligations. The prospect of negative cash flow increases lender risk and financial interest rates. To the extent that cash flow is negative, a reallocation of revenues from other sources or costly short term borrowing is necessitated. General purpose sponsors may reallocate funds from other revenue sources and are more likely to take indirect fiscal benefits into account in computing revenues. However, special purpose governments, authorities and utilities are more likely to require a current surplus derived from current revenues, carried over surpluses and capital subsidies, unless they can treat the project as part of a larger system and support the project's financial obligations with revenues from the overall system.

A sponsor which faces cash flow difficulties may attempt to structure the time pattern of both obligations and revenues to create a surplus or minimize the deficit in the early years. Deferring financial repayment obligations reduces the risk of short-run difficulties in repaying creditors, but may enhance the long-run credit risk or interest rate risk of creditors. Creative structuring of payment obligations should be accompanied by other measures which reduce the creditors' risk.

THE ROLES OF FINANCIAL ANALYSIS

Financial analysis is a useful tool to help meet non-Federal financial needs in implementing water projects. Although the principal financing and cost recovery decisions are made by the sponsor, the Federal planner may use financial analysis for the following purposes:

1) assessing the likely capability of the prospective sponsor to participate in plan implementation;

TABLE III-3

TREATMENT OF ECONOMIC AND FINANCIAL EFFECTS

NED ANALYSIS	REGIONAL INCOME ANALYSIS	FISCAL IMPACT ANALYSIS	FINANCIAL ANALYSIS
+net increase in value of goods and services	+regional net increase in value of goods and services	+changes in sponsor revenue from increased goods and services	+changes in sponsor revenue from increased goods and services
+underemployed labor	+regional net income from implementation outlays	+changes in sponsor revenue from implementation outlays	-sponsor share of implementation outlays, associated costs (and other
-implementation outlays	+regional share of other direct benefits	-sponsor share of implementation outlays	
-associated costs	-regional share of implementation outlays, associated costs and other direct costs	+/-changes in sponsor revenue from associated costs, other direct costs and benefits and changes in transfer payments	
+/-other direct costs and benefits	+/-changes in transfer payments	+/-changes in sponsor revenue from transfers of economic activity, indirect effects and induced effects	
	+/-changes in regional net income from transfers of basic economic activity		
	+/-changes in regional net income from indirect effects		
	+/-changes in regional net income from induced effects		

2) analyzing plans from a financial as well as an economic standpoint and understanding the investment preferences of the sponsor;

3) assisting an unsophisticated and financially constrained sponsor to develop a feasible financing and cost recovery approach; and

4) reducing obstacles to and inducing non-Federal support for a plan which approximates the preferred Federal plan, and resolving differences among the investment preferences of the Federal government and prospective sponsors.

Financial analysis should be conducted in conjunction with traditional economic analysis and project planning. Since cost recovery is most directly a function of project outputs and provides the basis for project financing, financial analysis must focus first on the cost recovery aspects of a project, and second on financing aspects.

The two principal types of financial analysis referred to in this report are labeled fiscal impact analysis and cash flow analysis. They may be used as accounting tools to analyze, interpret and display plan alternatives from the financial perspective, much as two accounts (national economic development (NED) analysis, and regional income analysis--a component of regional economic development (RED) analysis) are used by Corps planners to conduct analysis of and display the economic effects of projects. Table III-3 compares the treatment of project effects by each technique for financial or economic analysis.

Fiscal impact analysis is the analysis of both direct and indirect fiscal effects of a project. Fiscal impact analysis is most appropriate for a sponsor with a broad revenue base. Fiscal impact analysis is closely related to regional income analysis. In general, by using RED techniques to estimate changes in income and population created by the project within the jurisdiction of the sponsor, the analyst provides the basis for estimating fiscal impacts. Figures III-1 and III-2 display conceptual models for estimating fiscal impacts.

Fiscal impact analysis can be used to determine the incidence of benefits among the constituencies of various prospective sponsors and to determine the direct and indirect fiscal effects of project alternatives on each prospective sponsor. In circumstances where the primary sponsor is significantly lacking in geographic jurisdiction or revenue base, multiple sponsors may be encouraged to participate in project financing, sharing costs approximately in accordance with fiscal benefits. Such broadened sponsorship may render an otherwise financially infeasible project feasible. In circumstances where the primary sponsor is not lacking in jurisdiction or revenue base but has difficulty meeting cost recovery obligations from direct revenues, fiscal impact analysis may provide the broader fiscal perspective which demonstrates invisible but real indirect effects and encourages financial participation by the sponsor.

Cash flow analysis focuses on direct revenues and expenditures. The differences among cash flow analysis for private corporations and the various types of public sponsor derive from their treatment under Federal, state and

FIGURE III–1

CONCEPTUAL MODEL FOR ESTIMATING SHORT TERM FISCAL BENEFITS AND COSTS

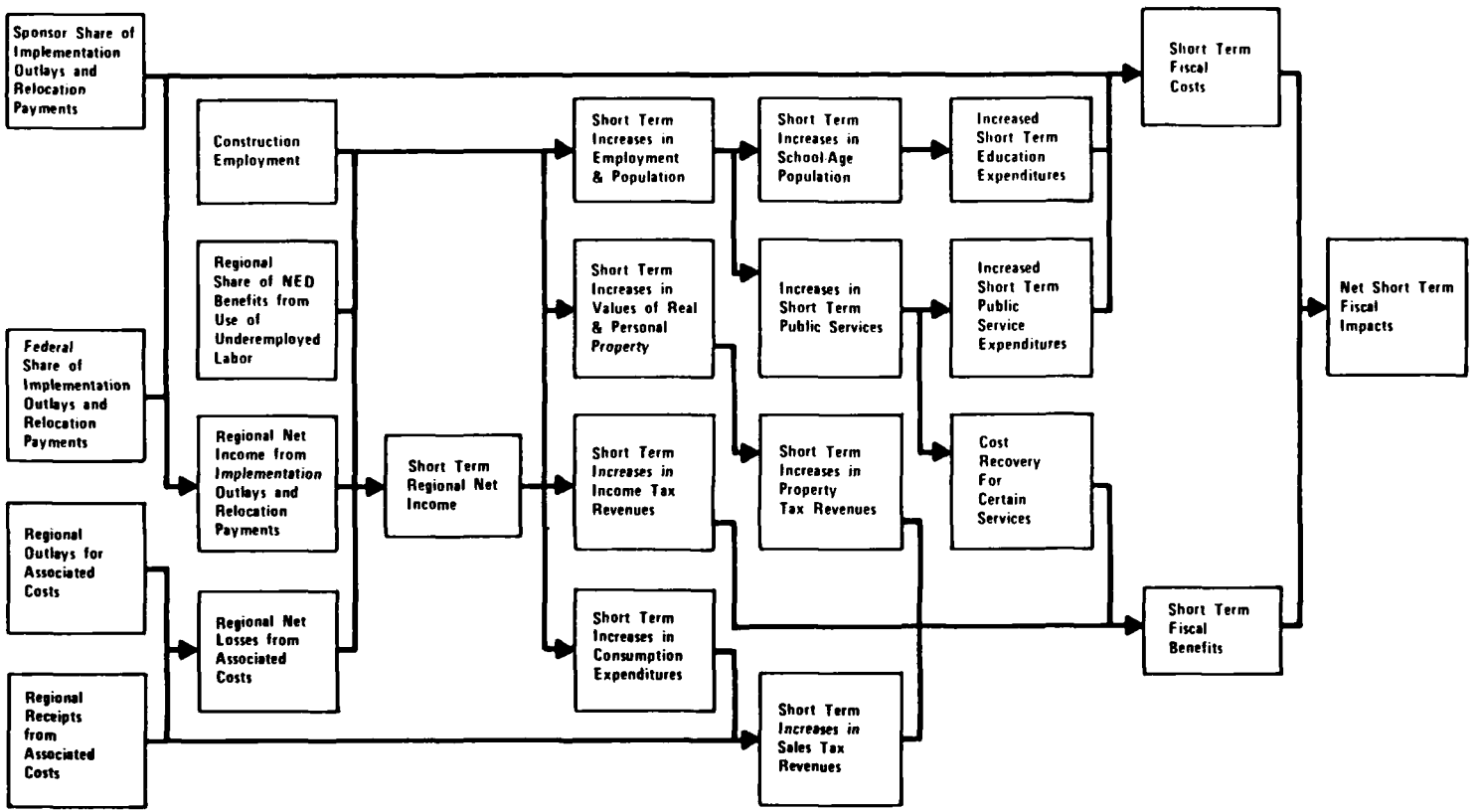
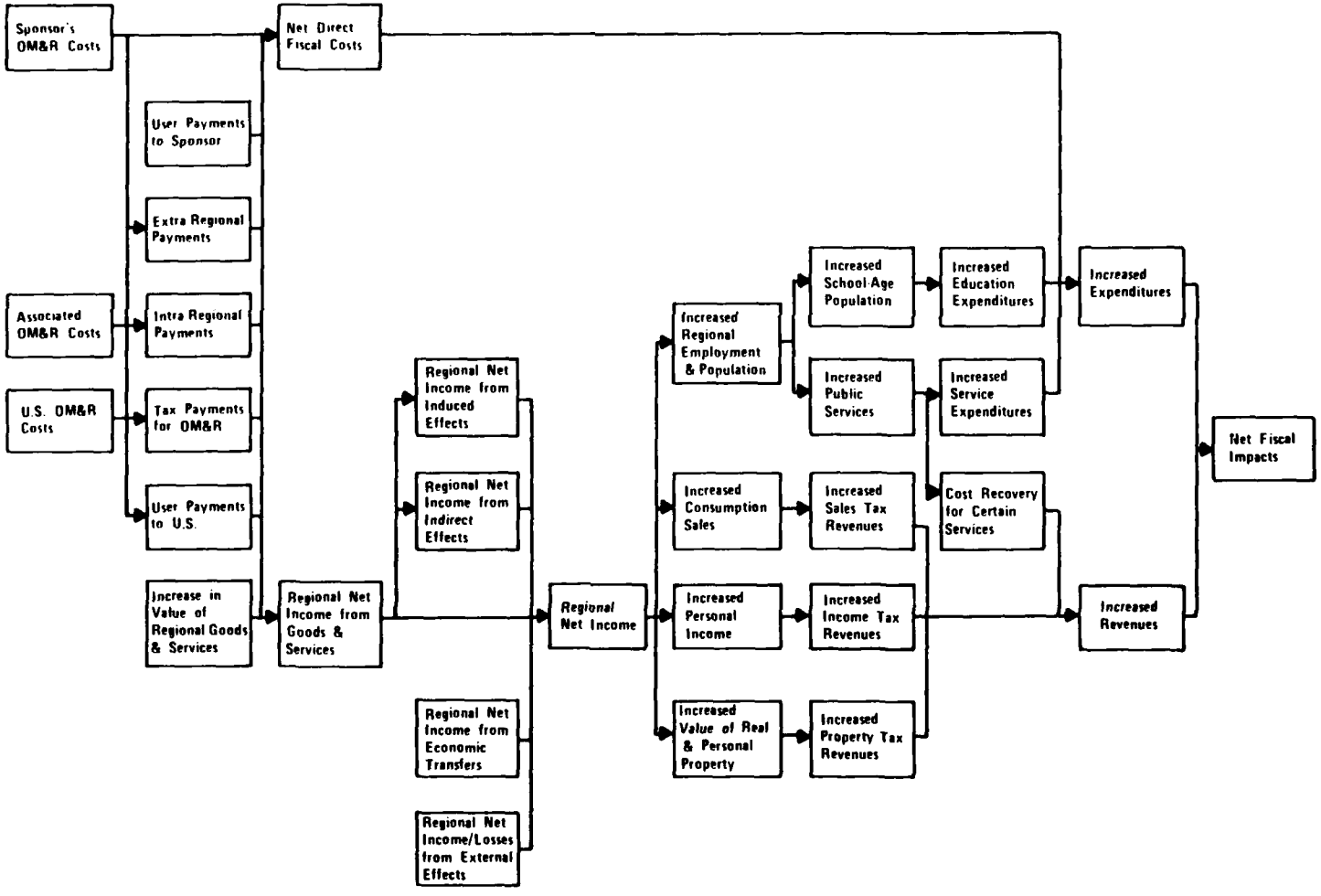


FIGURE III–2

CONCEPTUAL MODEL FOR ESTIMATING LONG–TERM FISCAL BENEFITS AND COSTS



local tax law, but the analytical principles are the same. For instance, private corporations may utilize the investment tax credit and accelerated cost recovery deductions, whereas the interest income to holders of public debt is exempt from Federal tax.

Cash flow analysis is the basic tool for selecting a pricing and direct cost recovery system for outputs or resources which can be priced, and consequently, contributes to maximizing the reliance on direct beneficiaries for cost recovery. First, a variety of "charging vehicles", or units which can be priced, is identified. Second, for each charging vehicle a variety of price structures (variations of price with class of user, time and quantity of use) is evaluated with respect to collection cost, revenues generated, acceptability and effects upon demand, among other factors.

Cash flow analysis is also the basic tool for selecting a financing approach for a water project. For each approach, the total costs and and the distribution of costs over time can be compared to revenues and revenue flow. Once the implications of the alternative for financing flexibility and risk and the sponsor's overall credit rating are understood, the preferred financing approach can be selected.

SUMMARY

Each sponsor must tailor its financing and cost recovery to the project's potential and the sponsor's own powers and preferences. The benefits which may be obtained through the careful selection of particular cost recovery and financing techniques are among the following:

1) increased reliance on direct beneficiaries for cost recovery;
2) diversified charging vehicles and revenue sources;
3) enhanced capture of the consumer surplus in revenues;
4) reduced risk to the sponsor of long-term revenue shortfalls;
5) avoidance of pricing limitations;
6) reduced revenue collection costs;
7) increased access to funding sources to improve capital mix;
8) reduced credit risk;
9) reduced market risk to creditors;
10) exploitation of tax and market niches;
11) preserved or enhanced credit rating;
12) enhanced financial flexibility;
13) reduced financing transaction costs; and
14) reduced risk of negative cash flow in critical years.

IV

COST RECOVERY AND FINANCING TECHNIQUES

INTRODUCTION

Until recently the principal source of funds for financing state and local public improvements has been the long-term, fixed-premium bond secured by general revenues, and the principal source of funds for investor-owned utilities has been investor equity. However, high interest rates, voter and taxpayer sentiment and a variety of other factors have greatly altered the conditions under which water utilities and public improvements are financed. Today, a prospective water project sponsor should consider a variety of revenue sources and non-traditional financing techniques as means to pay for the project.

A wide variety of cost recovery and financing techniques are available to address the financial concerns particular to a sponsor and project and to provide the financing and cost recovery advantages necessary to ensure project implementation.

This chapter discusses the overall advantages and disadvantages of particular techniques. Seven groups of techniques are discussed: revenue source and bond security; up-front capital; leasing and contracts; pricing; credit enhancements; bond structure, and third party contracts. The benefits of each technique are summarized in Table IV-1. The subsequent chapter reviews the applications of these cost recovery and financing techniques to particular water outputs (project purposes).

REVENUE SOURCES AND BOND SECURITY

The most common financing instruments for water projects are debt instruments. To the extent that water outputs are not treated as "merit goods" or "public goods", the fiscally constrained sponsor expects a project to provide the revenues to meet repayment obligations for project debt, at least with respect to overall fiscal effects if not direct revenues. The choice of cost recovery technique determines the manner and extent of cost recovery and, in turn, the security which can be pledged for bonded indebtedness. This discussion treats three general types of revenue source (general obligations, direct revenues and special taxes) and the related types of bonds.

General Obligation Bond

General obligation (G.O.) bonds pledge the full faith and credit of the bond issuer as security for the bonds. All of the revenue sources of the sponsor contribute to meeting G.O. bond repayment obligations. The creditworthiness of the sponsor, not the project, determines rating and interest yield. A sponsor with taxing powers is more likely to issue G.O. bonds than a sponsor without such powers. The advantages of G.O. bonds are low interest cost, low marketing cost and simple and well established

Table IV-1

Financial Benefits and Applications of Cost Recovery and Financing Techniques

	FINANCIAL BENEFITS														APPLICABILITY TO PROJECT PURPOSES							
	EXTENT OF COST RECOVERY							ACCESS TO COST OF FUNDS							CF							
	ENHANCE BENEFICIARIES	DIVERSIFY ENABLING VEHICLES	CAPTURE NONUSERS SURPLUS	REDUCE REVENUE RISK	AVOID PRICING LIMITATIONS	REDUCE COLLECTION COST	IMPROVE CAPITAL MIX & ACCESS	REDUCE CREDIT RISK	REDUCE LENDERS MARKET RISK	EXPLOIT TAX & MARKET NICHES	MAINTAIN CREDIT RATING	PROVIDE FINANCIAL FLEXIBILITY	REDUCE TRANSACTION COST	MAINTAIN POSITIVE CASH FLOW	FLOOD HAZARD REDUCTION	COMMERCIAL NAVIGATION	COMMERCIAL FISHERIES	EXTENSIVE RECREATION & FWI	INTENSIVE RECREATION	MUNI WATER SUPPLY	HYDROELECTRIC POWER
FEDERAL PROP LAND TAX				x		x		x					x	x	x	x	x	x	x	x	x
	x		x	x				x						x	x						
	x	x					x				x					x	x	x	x		
	x	x	x				x				x			x		x	x	x	x	x	x
	x	x				x	x				x					x			x	x	x
	x		x	x			x	x						x	x						
	x			x		x	x	x					x		x						
	x					x	x						x			x	x	x			
				x			x				x			x	x	x	x	x	x	x	x
	x	x	x	x			x				x			x	x						
	x	x	x	x			x							x						x	x
					x		x			x	x	x		x						x	x
					x		x			x	x	x		x						x	x
					x		x			x	x	x		x						x	x
					x		x			x	x	x		x							
	x					x										x		x	x	x	x
	x	x	x											x		x		x		x	x
	x													x		x	x	x	x	x	x
	x		x											x					x	x	x
								x			x			x	x	x	x	x	x	x	x
							x		x			x		x	x	x	x	x	x	x	x
							x			x				x	x	x	x	x	x	x	x
							x					x		x	x	x	x	x	x	x	x
												x			x	x	x	x	x	x	x
										x				x	x	x	x	x	x	x	x
				x	x			x			x			x		x			x	x	x

procedures. The disadvantages are that G.O. bonds are subject to debt ceilings and voter approval and may adversely affect overall borrowing capacity and creditworthiness.

The two major revenue sources for G.O. debt are general taxes and benefit-based special assessments. General tax revenues may derive from a variety of tax sources, depending on the sponsor's revenue base: property taxes; land taxes; sales taxes; income taxes and excise taxes, including excise taxes on goods complementary to (jointly consumed with) the use of common property resources. General taxes are often used by general purpose governments to finance and recover costs for collectively consumed outputs and common property resources and to meet cash shortfalls in the operation of municipal utilities. Some special purpose districts responsible for collective or common property outputs have property tax powers. The disadvantages of general taxes are that for outputs that can be priced the tax does not present the user with a price which restricts his consumption, and that for unpriced outputs the distibution of the tax burden may not correspond to the distribution of benefits. The extent of the latter disadvantage depends on the degree of correspondence between the tax base of the sponsor and the distribution of benefits. For instance, the disadvantage is reduced in the case of a sponsor of flood control who relies heavily on the land tax, since benefits are largely capitalized into land values, or in the case of the sponsor of a common property resource which relies heavily on excise taxes on goods complementary to use of the resource.

Special assessments are levies against property by general purpose or special purpose governments for the value of local improvements. Assessments are not taxes. By definition, local improvements in a general purpose unit of government benefit only a portion of the properties within the unit; special purpose governments, on the other hand, may rely entirely on assessments to obtain revenue. Bonds which are secured by general obligations but for which assessments are the primary revenue source are called "special-general" bonds. The advantages of special-general assessment bonds are as follows:

1) costs are distributed approximately in accordance with benefits; and

2) the bonds are readily marketable because they are a common form of debt.

Disadvantages include the following:

1) assessment payments by property owners are not tax deductible, since assessments are not taxes;

2) special assessment bonds may be used by general purpose units only for local improvements of limited benefit; and

3) the procedures involved in authorizing and administering a special assessment are costly and time consuming.

Revenue Bonds

Revenues bonds ordinarily provide a more restricted form of security for bonded indebtedness, namely the anticipated direct revenues from a facility or system. The three major types of facility-specific revenue source which provide debt security are complementary goods, use fees and user charges.

The sale, lease or rental of complementary (jointly consumed) goods is a revenue source for the services of common property resources. Any general purpose or special purpose sponsor of navigation, recreation or fish and wildlife outputs can operate sale, lease and rental programs. The principal difficulty with the use of complementary goods as a revenue source is that only sponsors with extensive jurisdiction can charge a price sufficient to support resource use without the risk that the purchase, rental or lease of those goods will transpire outside the sponsor's jurisdiction. The latter problem becomes acute for navigation facilities involving users from a multistate area substantially greater than the jurisdiction of the sponsor or sponsors.

Use fees are fees for access to or use of common property resources. The principal difficulty with use fees is that it is costly to identify and/or charge users.

A user charge is the price charged per unit output for market goods. The difficulties with user charges as a revenue source are incomplete capture of benefits under any price structure, and political, administrative, financial and regulatory constraints on prices (rates).

The volume of revenue-backed debt now exceeds the volume of general obligation debt. There are a number of reasons for this trend:

1) a widening definition of "public purposes". For many of the newer purposes, such as industrial development, housing and mortgage subsidies, revenue bonds are the only authorized financing method;

2) an increase in the number of districts and authorities with revenue bonding powers, including circumstances where the jurisdiction or authority of a general purpose unit is insufficient;

3) a decline (by volume of debt) in the approval rates for general obligation debt. By contrast, approvals are usually not required for revenue bonds;

4) the desire of officials to circumvent legal debt ceilings and voter approval requirements;

5) the desire of officials to preserve general credit ratings and protect the general taxpayer from liability;

6) the view that the user should pay and that the facility should be self-supporting; and

7) the possibility, for issuers with a poor credit rating, that revenue bonds provide stronger security than general credit.

However, revenue bonds also have a number of disadvantages. First, marketing costs are greater, largely because detailed information on the facility and its products is required for investors' use. Second, interest rates are usually higher than for G.O. bonds (e.g., 1/3 to 1/2 percent)[1] because of greater risk to the investor. For new facilities or systems which are not additions to existing systems, there is no "track record" of earnings and costs, and interest rate differentials are likely to be higher still. Third, investors typically require "coverage" of 120 to 150 percent. In other words, anticipated net revenues must exceed debt service by 20 to 50 percent to allow for unexpected shortfalls. Finally, a reserve fund is required to meet debt service and cash requirements. A typical reserve fund has a value of 6 to 10 percent of the debt obligation and is fully funded by the third to fifth year of operation.

There are a number of different ways in which revenues may be used to secure the debt. In the list below, the least risky to the investor are listed first and the riskiest last:

"1) A pledge of the entire gross revenue to bond interest and retirement;

2) A first lien upon gross revenue, the current expenses of operations and maintenance being paid from the balance remaining after debt service has been met;

3) A pledge of the entire net revenues to bond interest and retirement or a pledge of gross revenues, subject only to operating and maintenance expenses;

4) A first lien upon net revenue;

5) A pledge of a fixed percentage of the gross revenue;

6) A lien, not upon the revenues directly, but upon a special fund into which a specifically designated portion of the fund will be paid;

7) A lien upon revenues, either gross or net, but subordinate to previously authorized bonds secured under one of the foregoing patterns"[2]

A number of variants to the ordinary facility revenue bond have evolved in recent years. "Composite revenue bonds" use the revenues of an entire system, rather than a particular facility, as security. As a result, coverage requirements may be reduced. Composite bonds may pledge a facility's revenues and also pledge system revenues subordinate to pre-existing obligations. For systems such as hydroelectric grids and urban water systems, composite bonds

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[1]Randol, Robert E., Resource Recovery Plant: Guides for Municipal Officers, Financing, U.S. Environmental Protection Agency, 1975.

[2]Moody's Municipal and Government Manual, quoted in Billy P. Helms and Robert M. Clark, "Financing Municipal Water Supply," in American Water Works Association, Managing Water Rates and Finances, AWWA, 1979.

are the rule, not the exception. "Cross pledging" involves pledging the revenues from more than one system, e.g. sewer and water. The issuer of a composite bond involving cross-pledging must administer both systems and freely transfer funds between systems.

A second variant, "gross general obligation revenue bonds,"

> "includes the best features of both revenue and general obligation bonds. It incorporates the features of low interest rates and a low requirement for the amount of earnings as they relate to principal and interest charges; it is self-supporting so that the bonds issued will not be considered a part of the city's overall outstanding debt; and it eliminates the need for reserve funds. An issue can be designed to give the investor a first claim on gross revenues and guarantee that the city will make up the shortage if revenues fail to meet the debt service and the operating costs of the system"[1]

Special Tax Bonds

Special tax bonds are a type of debt instrument which pledges some designated portion of a sponsor's revenue as security for debt. Three types of special tax bonds will be discussed: special-special assessment bonds, special service area bonds, and dedicated tax bonds.

Special-special assessment bonds resemble special-general assessment bonds, except that only assessment revenues secure the debt. Consequently, the interest on special-special bonds is slightly higher, depending on procedures for enforcing collections, the status of the assessment lien relative to other property liens, and the financial penalty provisions against delinquent property owners. On the other hand, special-special bonds are usually exempt from statutory debt limits and voter approval requirements. Special-special bonds are appropriate for collectively consumed water outputs which enhance property values, namely flood and erosion hazard reduction.

Special service area (SSA) bonding resembles special-special assessment bonding and has similar applications to water projects. SSA bonding is available only to general purpose local governments and only in certain states such as Illinois. The general purpose unit may designate a special service area, levy special service taxes on the affected area benefited by the special "service", and use the anticipated tax revenues as security for the bonds. Special services may include the services provided by capital improvements. The special service area must not include the entire jurisdiction of the governmental unit.

Among the main advantages of SSA's are the following:

1) Issuance procedure is quick and inexpensive compared to special assessments; and

2) SSA payments, being taxes, are deductible from Federal tax.

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[1]Helms, Billy P. and Robert M. Clark, "Financing Municipal Water Supply," in American Water Works Association, Managing Water Rates and Finances, 1979.

Major disadvantages are as follows:

1) Lower than anticipated growth may saddle taxpayers in the SSA with heavy tax responsibilities; and

2) the bonds, because they are supported by taxes, count against debt limits.

Dedicated tax bonds use a designated tax revenue source as security for debt. Most dedicated taxes are in the form of an excise tax on goods complementary to the use of common property resources. Examples include motor fuel taxes and taxes on recreational equipment. Although technically the sponsor is shielded from general liability, in fact the sponsor's overall credit rating will be adversely affected should it fail to honor its repayment obligations. Because they are not general obligations, dedicated tax bonds command higher interest. Consequently, the advantage of dedicated tax bonds is not so much enhancing the sponsor's financing opportunities as it is the selection of a revenue source which relates to the distribution of benefits and the protection of that revenue source from other uses.

UP-FRONT CAPITAL

Many sponsors rely on both debt and up-front capital for project financing. In the case of up-front capital, the revenue source is the source of capital improvement financing, rather than or as well as the source of debt repayment. The use of up-front capital reduces debt service requirements and, consequently, the risk of revenue shortfall, default or negative cash flow, and offers the opportunity to improve capital mix, reduce financial cost and diversify charging vehicles. Forms of up-front capital include surpluses, assessments and system development charges.

Surpluses may be used as a financing source for projects which comprise part of a system of which the major revenue sources are taxes and/or user charges. Among other advantages, use of surpluses reduces overall transaction cost. Complete reliance on surpluses is known as "pay as you go" financing. In the case of non-market outputs sponsored by a general purpose government, the decision to use surpluses is a budgetary and political one involving budget priorities and the intergenerational distribution of costs. For market outputs sponsored by an authority or municipal utility, the sponsor may not be authorized or may face political resistance to "excess" revenues; such "excess" revenues may be justified as "rate stabilization funds." An investor-owned utility may not have the authority to collect "excess" revenues above those required for a "reasonable" return, taxes, O&M and depreciation reserves. Capital subsidies such as grants in effect increase the magnitude of the surplus available for investment. State grant programs are shown in Table IV-2.

State governments use surplus general revenues, as well as debt and special fees and taxes, to finance water projects. They rely for repayment on general revenues, special fees and taxes, and user charges. In addition, financing sources may be used to set up a revolving account; reimbursements to

TABLE IV-

STATE GRANT AND LOAN PROGRAMS FOR WATER DEVELOPMENT

STATE	GRANTS	LOANS	SOURCES OF FUNDS FOR GRANTS/LOANS					
			GENERAL REVENUES	G. O. BONDS	REVENUE BONDS	SPECIAL FEES & TAXES	USER CHARGES/ REVOLVING FUND	LOAN GUARANTEES
Alabama	M, I	C	X	X	X		X	
Alaska	M, N, C		X	X		X	X	N
Arizona		FC	X					
Arkansas	N, X	X	X			X		
California	X	X		X				
Colorado	M, I, WC	M, I, WC	X	X		X	X	
Connecticut	M, N, C	M	X	X				N
Delaware								
Florida	X		X			X		
Georgia	M,N	M	X	X			X	N
Hawaii								
Idaho	X	X	X	X			X	
Illinois	N		X					
Indiana		FC					X	
Iowa								
Kansas		FC		X				
Kentucky								
Louisiana	N,C	C	X	X		X		
Maine	R,N,C		X	X			X	
Maryland	FC,M,I,C	C,BEC		X		X	X	
Massachusetts	M,WC			X			X	
Michigan	R						X	N,C
Minnesota	FC		X					X
Mississippi								
Missouri	M		X					
Montana	X	X				X		X
Nebraska	X	X	X				X	
Nevada								
New Hampshire	N,C			X			X	
New Jersey		M		X			X	
New Mexico	M	M,I	X				X	
New York	N,C	C	X					
North Carolina	M	BEC		X			X	
North Dakota	X	X				X		
Ohio	M,N,C	X	X	X			X	M
Oklahoma	X	X			X	X		

TABLE IV-2 (Continued)

STATE	GRANTS	LOANS	SOURCES OF FUNDS FOR GRANTS/LOANS					LOAN GUARANTEES
			GENERAL REVENUES	G. O. BONDS	REVENUE BONDS	SPECIAL FEES & TAXES	USER CHARGES/ REVOLVING FUND	
Oregon		M,I,C		X				
Pennsylvania	X	X		X				
Rhode Island		M	X				X	
South Carolina	M							
South Dakoa	M	X	X				X	
Tennessee	C	M,C		X				
Texas		M,I	X	X			X	
Utah	M	X	X	X			X	
Vermont	M	M		X		X	X	
Virginia		FC					X	
Washington	M,N	M		X		X	X	
West Virginia	M,N,C	M,C	X					
Wisconsin	M,LR,N,C		X	X				
Wyoming	M,I	X				X	X	

KEY
X = Multiple uses, including water supply
M = Municipal water
I = Irrigation
FC = Flood control
LR = Lake restoration
WC = Water conservation
N = Navigation & harbors
C = Cargo terminals

Sources: Congressional Budget Office, 1983; U.S. Army Engineer Institute for Water Resources files; American Association of State Highway and Transportation Officials, 1981; Western States Water Council, 1981; Coelen, 1980.

the account from user charges are made available for new projects. Table IV-3 displays financing and cost recovery techniques utilized for water development by each state.

Up-front assessments are a non-debt source of funds for collectively consumed outputs which can supplement or replace special assessment bonds secured by deferred assessments. Since the security for assessment bonds is quite good and since large assessments create anger and financial hardship for the owners of assessed properties, one-time assessments are of limited value as the principal source of financing for large projects.

System development charges may be used by the sponsor of a market output if such charges are not prohibited to it. "Capital contributions" are refundable advances from applicants for service which resemble up-front assessments. "Connection charges" are levied at the time connections are made. While system development charges do not provide capital for major plants, they do provide a source of funds for annual improvements, thereby increasing the funds available for debt service.

LEASING AND CONTRACTS

Leasing and contracts are a group of alternatives to debt and up-front capital which involve private firms in project development financing. Whereas units of government receive a tax subsidy for investment in the form of the exemption of interest payments from Federal tax, private firms also receive investment inducements, but in the form of tax credits and depreciation deductions. In leasing or contract financing, a firm finances and owns a facility and either leases it to the public sponsor or enters into a contract to provide services to the sponsor. When properly structured, leasing and contracts enable the private firm to obtain a desirable after-tax return on investment while the sponsor obtains a source of capital. In addition, some general purpose governments, in order to bypass the restrictions which apply to general obligations, may enter into lease agreements with special districts or authorities which in turn float the revenue bonds and act as lessor.

The potential advantages of leasing and contracts to the sponsor are as follows:

1) Leasing and contracting usually avoid restrictions on indebtedness. However, their use by general purpose governments may be limited if restrictions against the obligation of future expenditures apply to long-term leases or contracts.

2) Because the spread between the interest cost of public debt and that of private debt has decreased, the tax advantages of private investment may be more favorable than the exemption from Federal tax of interest on non-Federal public debt. Consequently, the after-tax cost of the project may be reduced even though pre-tax interest on debt may be higher.

   Specifically, 10 percent of the cost of investment may be used as a tax credit (reduction in tax liability)--the Investment Tax Credit (ITC). Furthermore, depreciation is deductible from taxable income under the Acelerated Cost Recovery System (ACRS).

TABLE IV-1

STATE GOVERNMENT FINANCING OF WATER PROJECTS

STATE	GENERAL REVENUE	G. O. BONDS	REVENUE BONDS	SPECIAL FEES AND TAXES	USER CHARGES/ REVOLVING FUND
Alabama	N,C	N,C	X		N,C
Alaska	W,N,C	HP,N,C		N,C	N,C
Arizona	FC				
Arkansas	X	W			
California	FWL	X	HP	X	X
Colorado	X		X	X	
Connecticut	N,C				
Delaware	N	N,C		N	N
Florida					
Georgia	N,C	N,C	N,C		N,C
Hawaii		X	N,C		N,C
Idaho			X		
Illinois		FC,N,C			
Indiana	X		N,C	X	
Iowa					
Kansas					
Kentucky	DS,N,C		X		
Louisiana	X	X	N,C		
Maine	N,C	N,R,C		R	N,C
Maryland		BEC,N		N,C	N,C
Massachusetts	X	X			
Michigan	X		R		
Minnesota	FC,R,N,C	FC,N,C	N,C	X	FWL,N,C
Mississipp.		N,C			
Missouri		X			
Montana			WC	X	X
Nebraska	X				
Nevada		W,FC			FC
New Hampshire	X	WC,W,N,C,FC			N,C
New Jersey		M			X
New Mexico			W	X	X
New York	X				
North Carolina	X		N,C,	R	
North Dakota	X		W	W	W
Ohio		X			
Oklahoma		N	N		X

TABLE IV-3 (Continued)

STATE	GENERAL REVENUE	G. O. BONDS	REVENUE BONDS	SPECIAL FEES AND TAXES	USER CHARGES/ REVOLVING FUND
Oregon	N,C	W			
Pennsylvania	X	FC,W		FC,W	
Rhode Island		W,N,C	N,C		
South Carolina	X	N,C	N,C	N,C,FWL,R	N,C
South Dakoa			X		
Tennessee	C				
Texas					
Utah		X			X
Vermont	X			LR	
Virginia	N,C	N,C	N,C		
Washington		I			I
West Virginia	N				
Wisconsin		N,C			
Wyoming			X	X	X

KEY
X = All uses
W = Water
FC = Flood control
BEC = Beach erosion control
FWL = Fish and wildlife
DS = Dam safety
N = Navigation and harbors
C = Cargo terminals
HP = Hydropower
R = Recreation

Sources: Congressional Budget Office, 1983; American Association of State Highway and Transportation Officials, 1981; American Association of State Highway and Transportation Officials, 1982; Western States Water Council, 1981.

Table IV-4 shows the depreciation deductions allowable under the ACRS. Under the tax laws, most water projects may be classified as 5-year personal property, subject to depreciation over a 5-year period. However, a project owned by a regulated public utility is subject to 15-year depreciation.

3) Private financing of public facilities lowers the up-front cost of the facility to the sponsor. This may be particularly advantageous to sponsors with limited debt capacity, debt restrictions, or, as is the case for small units, limited access to the capital markets.

4) It is estimated that private firms can construct facilities at less cost than public agencies because they are subject to fewer restrictions on wage rates, contracting procedures and design standards.

5) For vendible outputs, leasing and contracts increase the revenue base without requiring up-front capital and consequently may create a net increase in debt capacity.

6) The expense and delay of referenda are avoided.

There are three basic types of leasing or privatization arrangement:

1) true lease (lease rental or operating lease) and its variants, the finance lease and the leveraged lease;

2) conditional sale lease (lease-purchase, interim privatization); and

3) service contract (privatization).

These alternatives are compared in Table IV-5 and the discussion which follows.

True Lease, Finance Lease and Leveraged Lease

In a true lease, the sponsor/lessee has no financial interest in the facility but pays the private owner/investor/lessor for use of the facility. Insurance and overhead expenses may be assumed by the lessor or the lessee.

The lessor may claim depreciation deductions for the facility. The lessor may also claim the 10 percent investment tax credit if the lessee is a profit-making utility but not if the lessee is a public, non-profit sponsor.

Care must be taken that the lease is properly designed and does not constitute a conditional sales contract. The IRS has developed the following guidelines for characterizing a transaction as a lease.

1) The lessor, at all times, must have a minimum "at risk" investment in the asset of at least 20 percent of its cost.

TABLE IV-4

RECOVERY PERCENTAGE UNDER ACCELERATED COST RECOVERY SYSTEM

Recovery Year	Recovery Percentage, 5-Year Property	Recovery Percentage, 15-Year Property
1	15	5
2	22	10
3	21	9
4	21	8
5	21	7
6	-	7
7	-	6
8	-	6
9	-	6
10	-	6
11	-	6
12	-	6
13	-	6
14	-	6
15	-	6

TABLE IV- 5

COMPARISON OF LEASING/CONTRACTING TECHNIQUES

	True Lease	Finance Lease	Conditional Sale Lease	Service Contract
Qualified Property	new & used personal property	new personal property excluding rehabilitated property or public utility property	new and used personal property	new and used personal property
Tax Benefits to Private Party	ACRS (10% ITC for utility lessee only)	ACRS	Lessee is treated as owner for tax purposes; "interest" portion of lease payment is tax exempt to private lessor	10% ITC ACRS
Maximum Lease Term	80% of asset's useful life including renewal options	80% of asset's useful life including renewal options	None	NA
Purchase Options/ Minimum Value at Termination of Lease	Fair market value, at least 20% of original cost	Any fixed price at least 10% of original cost	Purchase price included in lease payments; "bargain" purchase option possible	None
Minimum "At Risk" Investment of Lessor/Owner	20%	20%	NA	NA
Limitations on Lessee	Lessee may not provide financing or loan guarantee	Lessee may not provide financing or loan guarantee	NA	NA
Limitations on Lessor	Must show profit above tax benefits	Must show profit above tax benefits	NA	NA

Source: Ritter, 1983.

2) The lessor must be able to show that the transaction was entered into for profit apart from the transaction's tax benefits (i.e., without consideration of the tax deductions, allowances, credits, and other tax attributes arising from the transaction).

3) The lessee must not have a contractual right to purchase the property at less than its fair market value nor may the lessor have a contractual right to cause any party to purchase the asset.

4) The lessee may not have furnished any part of the purchase price of the asset nor have loaned or guaranteed any indebtedness created in connection with the acquisition of the property by the lessor.

5) The use of the property at the end of the lease term by a person other than the lessee must be commercially feasible to the lessor.

6) Remaining useful life at the end of the lease term must be one year or 20 percent of the original useful life, whichever is longer.

7) Lessee would not acquire title upon payment of a stated amount of rentals.

8) The total amount of rental paid for a relatively short period of use may not constitute an inordinately large proportion of the total sum required to purchase the asset, and the rental payments may not exceed the current rental value.

9) No portion of the lease payment may be designated or recognizable as interest.1

The finance lease is a hybrid created in the tax legislation of 1981 and 1982. Its purpose is to provide more latitude for leasing certain types of property without loss of the "lease" classification. The finance lease differs from an ordinary lease in two ways:

1) An option to purchase by the lessor at the termination of the lease need not be for fair market value, but must be for at least 10 percent of the original cost.

2) Rehabilitated property and public utility property may not be leased under a finance lease.

The leveraged lease is a variant of the true lease or finance lease. It is a lease in every way, but the facility is financed with both equity and debt. Depending on the relative costs of equity and debt, it may be advantageous to the lessor to borrow funds to finance the facility, using lease proceeds to retire the debt. Up to 80% of the facility's cost may be financed by debt without removing the lessor's tax status as owner; consequently, equity as low as 20 percent may be "leveraged" to derive 100 percent of the tax benefits.

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[1]See U.S. Senate, Finance Committee, The Economic Recovery Tax Act of 1981, Report; also Ritter, Henry D., "Tax Factors", in the Energy Bureau, Project Financing, Proceedings, 1983.

Any sponsor may benefit from leasing. The principal advantages to the sponsor of leasing and finance leasing are a deferral of major expenditures, a preservation of financing capability, a possible reduction in cost due to tax advantages, and avoidance of debt limitations. Leasing is applicable to vendible common property and natural monopoly outputs which provide the private owner a potential source of profit and, consequently, a basis for the lease defensible to the IRS. However, great care should be exercised to assure that the tax benefits are realized. As stated by a committee of the American Water Works Association:

> "Water properties generally are ineligible for favorable tax treatment in a ... leasing transaction. Nevertheless, if the property is capable of continued leasing or transfer to any party, this meets one of the conditions required for favorable tax treatment. However, most water utility properties, such as treatment plants, pumping stations, mains, are not, in a practical sense, transferable to any party, as there is no alternative use for it other than water service."[1]

Although a utility is itself eligible for ACRS and ITC, its rates are regulated according to the "rate base" of properties owned by the utility and generally can recover only limited depreciation through rates. Consequently, it has an incentive to lease facilities because it may then increase rates in a manner commensurate with the useful life of the asset rather than in accordance with rate regulation.

Because of restrictions on the commitment of future appropriations, many general purpose governments must insert in the lease a "finance contingency clause" (i.e. "non-appropriation" or "fiscal funding out" clause), stating that payments are conditional on future appropriations. In return, the lessor will insist on a "non-substitution" clause which ensures that the lessee has no alternative source for the outputs. The more vendible the output and more essential the facility to the community, the less financial risk to the lessor (and to the lessor's lenders) from a lease agreement with such a general purpose unit.

Conditional Sale

A conditional sale is also known as a conditional sale lease, a lease-purchase agreement or an interim privatization transaction. Lease payments are set at a level sufficient to amortize the lessor's debt, if any, provide a reasonable return to the lessor, cover the lessee's expenses and accumulate equity. At the termination of the lease, the facility reverts to the lessee for a nominal ("bargain") price. Like a true lease, a lease-purchase may be leveraged by the lessor. "Certificates of participation" are a variant of the conditional sale lease. Instead of one investor, a number of investors purchase the certificates which signify an undivided interest in the lease purchase payments. Funds are disbursed from lease revenues by an escrow agent.

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[1]Ad Hoc Committee on Financing of Water Industry Projects, "Government Aid May Be Necessary to Meet SDWA," in Willing Water, January 1980.

Because the purchase option is for a nominal price and the lease payments offset the lessor's financing and operating costs, the lease-purchase is not characterized as a lease by the IRS and the lessee/sponsor is treated as the owner for tax purposes, even though the lessor holds legal title to the facility. Consequently, there is no limit on financial participation by the lessor or on the economic substance of the transaction, and the lessee/sponsor may participate liberally in the financing. The lessor, although he loses the ACRS deductions, may claim the interest component of the lease payments as tax-free income if the lessee is a tax-exempt instrumentality.

The lease-purchase represents a method for a tax-exempt sponsor to lower first costs, lower overall cost and accumulate equity in a facility providing vendible water outputs. Because the principal tax advantage of a lease-purchase (the exemption of the interest component of lease payments from Federal tax) is available only for projects with a public sponsor, the lease purchase is not useful to a utility sponsor. As is true for leases, a general purpose sponsor may need to include fiscal funding out and nonsubstitutability clauses in its purchase contract.

Leveraged Leases Involving Tax-Exempt Debt

A leveraged lease may involve the use of tax-exempt debt, which has a lower interest cost than taxable debt. There are a number of variants. First, a third (tax-exempt) party may float industrial development bonds (IDB's) using a conditional sale agreement from the lessor as security. The facility is then leased by the lessor (purchaser) to the sponsor, the lease payments from the sponsor and purchase payments to the third party more or less offsetting each other. Alternatively, the new facility may be sold outright to the lessor, who leases it to the sponsor. Recently, cash-hungry governments seeking to use their "equity" in existing systems to finance expansion have entered into sale-leaseback agreements for the existing facilities. Existing facilities are sold to the private party, and the unit of government enters into a true lease or a conditional sale lease with the private party. In effect, the sale-leaseback of existing systems is a tax-subsidized mortgage.

Because the tax advantages (tax exempt debt financing; ACRS; tax-exempt income payments) are compounded with IDB-financed or tax-exempt leases, legislation has been introduced to curtail the uses of IDB's and to lengthen the ACRS recovery period if tax-exempt financing is used in a lease.

Service Contract

The use of service contracts to obtain water services is also known as privatization. Under a service contract with a private firm (the vendor), the sponsor purchases the services or outputs of the facility. The sponsor has no financial or possessory rights or interests in the facility and the vendor is entitled to both the ACRS and the ITC.

For new facilities, the service contract may be used as security for a loan to the vendor to finance construction. The vendor may obtain industrial

development financing from a third party without losing tax benefits. The security provided by the contract depends on its structure, either "take or pay" or "take and pay".

Service contracts are appropriate for facilities providing market outputs and which may be self-supporting even if the sponsor fails to meet its contractual obligations. Chief among the advantages of the privatization approach are the full use of private tax benefits and the opportunity for the vendor to achieve efficiencies in contracting and technology which are prohibited to a public sponsor.

PRICING

The pricing strategy selected for a water output affects not only the extent of cost recovery but also the economic benefits realized. As Hanke1 and others have shown, departures from marginal cost pricing cause benefits to differ from those estimated under the P&G, which assume marginal cost pricing in most cases. Charging methods designed to enhance cost recovery above the level associated with one-part (unit) pricing should do so at minimum cost to NED.

Many sponsors, particularly the sponsors of market outputs, set unit prices at a uniform level sufficient to recover historical costs; in other words, they use average-cost (AC) pricing. AC pricing has the disadvantages of discouraging demand in the early years of a project, thereby leading to underutilization, and of failing to ration output to the highest valued uses in its later years, thereby encouraging premature investment. Marginal cost pricing, on the other hand, is likely to create cash flow difficulties and result in a long term surplus or deficit -- results which are acceptable from the economic standpoint but not the financial standpoint.

There are three pricing strategies for excludible outputs which may be used to reduce debt service requirements and capture a portion of the consumer surplus, and which affect use less adversely than average cost pricing. The three strategies are two-part pricing, price discrimination and peak pricing. The cost and appropriateness of each strategy depends on the nature of the outputs in question. As might be expected, the three strategies may be combined as appropriate to improve the efficiency and/or extent of cost recovery.

Two-part pricing involves a variable charge, which varies with consumption or use, and a fixed charge. For common property resources the fixed charge represents the price of access or entry; for market goods it represents a capital charge, service charge, availability charge or a charge of similar designation which recovers some of the costs not associated with use.

Price discrimination involves varying the per unit (commodity) price among users at any one time. Price discrimination which varies the price with the amount of use over a period of time is called multipart pricing. For

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1 Hanke, Steve H., "On the Feasibility of Benefit Cost Analysis," in Public Policy, Spring, 1981.

instance, declining block rates charge a higher price for the first unit used than for the last (which should be priced at marginal cost.) (Note: sponsors which wish to avoid a cash surplus may adopt increasing block rate pricing.) Price discrimination may also vary the per unit charge by class of customer, based on differences in willingness to pay, elasticity of demand and magnitude of use. The latter form of price discrimination is common for water supply. Since in the latter form the price of the marginal unit is less likely to approximate marginal cost, the latter form is less efficient than multipart pricing.

Peak pricing (congestion tolls) involves charging the peak user for the marginal cost of his use above off-peak marginal costs. Peak pricing rations capacity to the highest-valued users and disperses use more evenly through time; it also increases revenue.

CREDIT ENHANCEMENTS

Borrowers in the municipal market may rely on three principal types of credit enhancement to increase access to capital and to lower net financing cost. External credit supports, such as letters of credit, lines of credit, bond insurance, state guarantees and loan-to-lender financing, reduce risk to the investor, thereby lowering interest rates. State intermediation through loans or bond banks may broaden market access and reduce transaction costs as well as reduce financing cost. State technical assistance and supervision have indirect but positive effects.

External Credit Supports

Overall, external credit supports offer great promise. Because individual investors are risk averse and because credit institutions pool risks, the reduction in interest cost due to reduction in perceived investor risk is likely to exceed the cost (a risk premium and administration cost) of the credit support.

A letter of credit (LOC) pledges a bank's credit to pay debt service on an issuer's debt, in effect acting as an unconditional guarantee. The issuer, in return for an annual fee of 1/2 to 1 1/2 percent, "purchases" the creditworthiness of the bank, which is usually rated Aa or Aaa. A letter of credit can help make a debt service load more acceptable to investors and can reduce coverage requirements. An LOC is worthwhile if the value of the risk premium in the market exceeds the premium (fee) demanded by the bank.

A line of credit is a more restricted type of support. It is basically a bank's pledge to lend to the issuer the funds necessary to meet cash flow requirements, i.e. a liquidity guarantee. A line of credit can be important to the investor in short-term debt instruments, who values liquidity, and to the issuer who is strongly averse to negative cash flow.

Municipal bond insurance may be purchased for a one-time fee from one of two carrier groups, the Municipal Bond Insurance Association (MBIA) or the American Municipal Bond Assurance Corporation (AMBAC). One problem with such insurance is that Moody's Investors Service does not recognize in it bond ratings, whereas Standard & Poor's Corporation does. Consequently, obtaining insurance may not result in the lowest interest rate.

A number of states provide guarantees for limited purposes, usually port development. Guarantees improve the creditworthiness of local issues but at the risk of a deterioration in the state's creditworthiness. Loan guarantee programs are listed in Table IV-6.

Despite the fact that there is now no directly authorized Federal water project guarantee program, a prospective sponsor can use Federally insured certificates of deposit as security for bonds. This type of financing is known as "loan-to-lender" financing:

> "To fund loans to lenders, a state or political subdivision will issue tax-exempt industrial revenue bonds. The funds raised from investors are then deposited in a bank or thrift institution in exchange for certificates of deposit, negotiated at same rate and term as the bonds sold to the public. The bank-or thrift-held CD's are guaranteed by the Federal Government and hence bring a triple-A credit rating to the bond. Since their proceeds act as collateral to guarantee bond repayment and interest.....the bank or savings and loan institution is contractually obligated to make mortgage loans to third party developers to finance the residential or other development that was the basis of the bond issue"[1]

State Intermediation

Loans and bond banks are the two methods used by States to intermediate between borrowers and the market. Loan and bond bank programs are shown in Tables IV-3 and IV-6.

Five states have established bond banks. These banks, in effect, pool risks and pool underwriting costs. A bank floats bonds and, in turn, buys the bonds of qualifying local governments. The security for the local bonds is pooled as security for the bank's bond issue. The bond bank may provide additional security for its own bonds (thereby lowering the cost to the local issuers) by establishing a reserve fund, and the state may provide security by a "moral obligation" to replenish deficiencies in the bank's reserve fund. Bond banks are best suited to states which contain a large number of small issuers with weak credit ratings and which themselves have a credit rating of Aaa or Aa.

Loan programs are designed to alleviate financial constraints on local project development by providing access to credit, and, in many cases, by lowering the cost of that credit. General revenues, dedicated revenues and bonds provide the capital for the loan programs; in some cases a revolving loan fund may be established which uses loan repayments to fund new loans. For instance, the proposed New Jersey Infrastructure Bank would be a revolving loan fund capitalized by existing debt authorizations, Federal grants and dedicated taxes. A loan program increases a state's outstanding debt.

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[1]Petersen, John E. and Wesley C. Hough, Creative Capital Financing for State and Local Governments, Government Finance Research Center, Municipal Finance Officers Association, 1983.

TABLE IV-6

STATE CREDIT ASSISTANCE ACTIVITIES APPLICABLE TO WATER PROJECTS

		AL	AK	AZ	AR	CA	CO	CT	DE	FL	GA	HI	ID	IL	IN	IA	KS	KY	LA	ME	MD	MA	MI	MN	MS	MO
State Supervises or Collects Data on Local Government Debt Issues	Collect and Disseminate Data		X			X				X		X				X		X	X	X	X	X				
	Maintain Data File		X		X											X	X	X	X	X	X	X	X			
	Prescribe Official Statement Contents																		X	X		X	X	X		
	Review Local Bond Issue	X		X										X		X		X	X				X	X	X	
	Approve Local Bond Issue																X	X	X				X			
	Help Market Local Bond Issue																		X	X	X				X	
State Provides Technical Assistance on Local Debt Management	Help With Official Statement		X													X			X	X			X		X	
	Provide Data to Issuers & Others		X			X									X	X		X	X	X	X	X	X		X	
	Help Evaluate Bids										X					X		X	X						X	
	Issue Bulletins, Pamphlets, Manuals		X												X	X							X			
	Conduct Seminars or Conferences					X					X				X	X								X		
Bond Bank			X																	X						

TABLE IV-6 (Continued)

		MT	NE	NV	NH	NJ	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY	Totals
State Supervises or Collects Data on Local Government Debt Issues	Collect and Disseminate Data	X	X	X	X	X		X	X	X			X					X	X			X			X	X	24
	Maintain Data File	X	X	X	X	X		X	X			X	X	X				X				X					22
	Prescribe Official Statement Contents				X			X				X	X	X	X	X		X				X					14
	Review Local Bond Issue				X	X		X				X		X		X		X			X	X				X	19
	Approve Local Bond Issue					X		X				X		X		X											9
	Help Market Local Bond Issue					X		X								X					X	X					9
State Provides Technical Assistance on Local Debt Management	Help With Official Statement					X		X				X	X	X		X					X				X		14
	Provide Data to Issuers & Others	X	X			X		X				X	X	X		X			X						X	X	22
	Help Evaluate Bids					X		X										X									7
	Issue Bulletins, Pamphlets, Manuals	X				X		X				X	X	X				X		X							12
	Conduct Seminars or Conferences		X					X				X	X	X				X							X		12
Bond Bank					X					X											X						5

Sources: Petersen et al., 1977; Watson, 1982; Congressional Budget Office, 1983; American Association of State Highway and Transportation Officials, 1981.

State Technical Assistance and Supervision

Technical assistance and supervision programs are designed to facilitate bond issuance, encourage responsible debt management and improve credit ratings. North Carolina has one of the most extensive assistance and supervision programs. Assistance and supervision programs are shown in Table V-6.

VARIANTS IN BOND STRUCTURE

The features, i.e., provisions, of any municipal bond, whether G.O., revenue or special tax bonds, may be structured by the issuer to achieve its particular financing objectives. Among the variants in bond provisions are maturity, the stream of payment obligations, redemption features, interest rate variability and denomination. These variants are employed to increase financing flexibility, structure cash flow, reduce interest risk to the investor and appeal to groups of investors with particular needs.

Maturity

Although the relationship between short-term and long-term interest rates varies with the supply and demand for credit, short term rates are generally less than long term rates because there is less interest risk. This difference in rates provides the opportunity for sponsors to improve capital mix, reduce lender's interest risk, increase financing flexibility and improve cash flow. Public borrowers gambling that longer-term rates will drop and seeking to minimize the interest on their debt have increasingly relied on short-term notes. Many borrowers have "rolled over" debt repeatedly in the short-run market, awaiting a better long-term market. Other sponsors have used short-term debt as a way to capitalize interest at low cost during construction; in other words, both short-term principal and the interest thereon are refinanced ("refunded") with long-term debt after the project is complete. Capitalizing interest both lowers overall interest cost and delays the day of reckoning with respect to debt service and cash flow. Among short-term instruments are BAN's, TAN's, TECP's and advance refunding.

Bond anticipation notes (BAN's) are debentures maturing in from one to three years which are payable solely from the proceeds of a long-term bond issue. BAN's carry some risk that future interest rates will be higher or that the features of the new debt will be unsatisfactory, as well as the normal credit risks. Investors must be certain that the borrower can refinance with bonds or refunding (re-financing) BAN's. BAN's may be secured by letters of credit.

Tax anticipation notes (TAN's) resemble BAN's except that the security is projected tax revenues. TAN's are used most often to meet short-term cash shortages during a fiscal year, not for interim project financing.

Tax exempt commercial paper (TECP) is a very short-term (15 to 45 days) debt instrument which has grown rapidly in usage as the market for such debt -- principally tax exempt money market mutual funds -- has grown. TECP is used by

issuers to defer long-term debt issues until a favorable (inexpensive) market develops for long-term debt, and by investors to maintain liquidity. Because TECP's are unsecured promissory notes, a letter of credit is required. Whereas the interest rate is relatively low, there are other flotation costs, namely for a letter of credit and underwriting fees. TECP's are prohibited in some states.

Advance refunding bonds are long-term instruments which allow the sponsor to take advantage of short-term opportunities in interest rates. Whereas refunding bonds are used by borrowers to refinance obligations much as homeowners refinance their houses when balloon payments are due, advance refunding bonds are used to retire debt prematurely. The proceeds from the issue are set aside to pay off outstanding obligations or may be used with a "call" to retire those obligations. Advance refunding is useful for positioning capital structure prior to a major new investment.

Stream of Payment Obligations

Sophisticated issuers now have a number of financing choices designed to improve cash flow, reduce market risk to the investor and appeal to the cash flow requirements of particular groups of investors. For most bond issues, interest (coupon) payments are made throughout the life of the bond. Bonds which are sold with a simple rate of interest and a single maturity are called "term bonds". Most bonds are sold as serial bonds, with each series having its own date of maturity. A serial bond issue in effect consists of a bundle of term issues. Even if interest payments are fixed, the issuer may to some extent design the serial issue so that principal payments (bond retirement) match the flow of net revenues--a critical consideration for long-lived, income-producing projects. Serial bonds also offer the advantages of regular debt retirement and a wide range of maturities to appeal to different investors.

"Original issue discount" (OID) bonds are sold at a discount from face value and with reduced coupon payments. Under Federal law, the investor's gain at maturity is not a capital gain but is the equivalent of a one-time interest payment. For tax-exempt issuers wishing to defer outlays, such as the sponsors of long-lived water projects the revenues of which grow slowly over time, the OID is a suitable financing tool because both principal and interest payments may be structured in time. The advantage to the investor is the "locking in" of the interest rate attributed to the discount. (In contrast, there is no guarantee that a periodic interest payment could be reinvested at the same rate of return.) The "zero coupon" bond ("zero") is the ultimate OID. There are no coupon payments, and the market price of the bond is fully discounted to reflect the implicit interest rate.

Whereas OID's can lower the interest cost of debt (due to the "lock in" aspect), reduce administrative cost and defer outlays, they also may create problems for general obligation debt because the amount of the obligation may far exceed the amount of the bond proceeds and may consequently exceed the debt ceiling. In addition, OID's are prohibited in some states. To overcome some of these disadvantages, issuers have created "compound coupon" bonds. The bonds are issued at par, but interest is deferred to maturity and compounded.

In terms of outlay, the compound coupon bond has identical characteristics to the OID. Because the stream of interest and principal payments can be structured to match revenues, serial compound coupon bonds are a creative financing tool with widespread applications in water development.

The "stepped coupon bond" is a long-term instrument which combines the advantages of short-term instruments and serial OID's or compound coupon bonds. The stepped coupon bond provides lower than normal interest payments in the early years and higher than normal interest payments in later years. Issuers may use this instrument to reduce outlays during the early years of project life, and/or to reduce total cost by using equal payments through time and accelerating the retirement of principal.

"The debt service of new bond issues can often be minimized through prudent scheduling of debt service payments. Deferring interest payments through period of construction by capitalizing interest during construction from bond proceeds, capitalizing required reserve fund payments for revenue bonds out of the bond proceeds, fitting new debt service payments around the principal and interest payments for existing bonds, deferral of principal payments through the initial years by means of balloon payments at the end of the maturity schedule when new customers will have been added to the system, and other similar debt-service scheduling mechanisms can reduce the impact on current customers and justifiably shift a portion of the burden to the future users of the system. Local policy, statutes, or outstanding bond indentures may, however, prohibit or at least limit the degree to which debt service patterning techniques can be utilized."[1]

Redemption and Interest Features

Redemption features include "tender", or "put", provisions, "warrants" and "call" provisions. Tender option bonds, or put bonds, allow the investor to redeem the bonds prior to maturity, in effect making available short-term debt at long-term interest rates. The option may be open-ended or available only on specific dates. Put option bonds increase the liquidity of investors but force the borrower to obtain backup credit and may be difficult to remarket.

"Warrants" are provisions attached to bonds which enable the investor to obtain additional bonds at a future time with the same maturity and interest rate. In effect, warrants provide a "reverse tender" option. Both warrants and tender options reduce investor's interest risk and, consequently, bond risk premiums.

Call features allow the borrower to redeem the bonds at his option (either open-ended or on specific dates), and are suitable if market rates are very high at the time of issue. Call provisions provide the opportunity for the borrower to lower interest rates and restructure obligations at some future time prior to the full maturity of the bond.

Variable (floating) rate securities are bonds with an interest rate which varies with the market rates. By reducing the interest rate risk to the

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[1] McKinley, J. Rowe, "Financing Water Utility Improvements," in Journal of the American Water Works Association, September 1983.

investor, the issuer may obtain a lower interest rate on the bonds. However, most floating rate bonds must have "put" provisions to attract the investor; the risk to the issuer is of having to issue refunding (refinancing) bonds with a higher interest rate. "Variable rate demand notes" are the short-term version of floating rate bonds with the put option.

Bond Denomination

So called "mini" general obligation bonds are bonds which are sold in denominations smaller that $5000, and are designed to appeal to local investors or investors with limited funds. These mini-bonds can be sold to investors "over-the-counter". For instance, Grand River Dam Authority series 1983A bonds were sold in $500 denominations, with a limit per investor of $2500.

THIRD PARTY CONTRACTS

Third party contracts are negotiated between the sponsor and a large end user or an intermediate supplier, such as a concessionaire at a recreation facility or an industrial user or distributor of water supply and hydropower outputs. Third party contracts are a hybrid because although they are principally a revenue source, the sponsor has some control over the flow of revenues and has a high degree of assurance that the revenues will be received. Consequently, the sponsor can use such contracts in lieu of creative financing techniques to reduce credit risk, alleviate cash flow problems and avoid pricing limitations.

The promise to pay included in the contract, in effect, pledges the credit of the third party as security. Contracts for vendibles may be of two types: "take or pay" ("hell or high water"), wherein the third party is obligated to pay under any circumstance, and "take and pay" ("throughput") wherein the third party is obligated to pay only for delivered outputs. A "take or pay" type contract is as effective as third party guarantees except in the cases of bankruptcy or damage suits and except insofar as the third party obligations are less than the sponsor's debt service obligations. Recently, however, attempts by gas pipeline companies to escape from "take or pay" contracts with suppliers by claiming that charged conditions constitute a "force majeur" (act of God) have called the sanctity of contracts into question and reduced the value of third-party contracts as security for debt for all types of project.

The "lease revenue bond" is a type of bond which uses the lease commitment of a facility lessee to secure debt for the facility. When the lessee is a private corporation, the lease revenue bond is called an "industrial development bond".

SUMMARY

The sponsor must first determine the principal sources of revenue which provide the basic security for debt. The principal combinations of revenue source and bond security are as follows:

1) general obligation bonds
   a. general revenues, including general, property and/or land taxes

b. deferred property assessments.

2) revenue bonds
   a. lease, sale or rental of goods jointly consumed with water outputs
   b. use or access fees to obtain use of common property resources
   c. user charges (commodity or per unit charges)

3) special tax bonds
   a. deferred assessments
   b. special service tax
   c. dedicated excise tax

The financial performance of the project under the preferred debt financing/revenue raising approach or approaches indicates the project's basic financial strengths and weaknesses. A variety of supplementary cost recovery and financing techniques are available to enhance a project's financial performance. The sponsor can alter the mix of debt and other capital sources to reduce overall cost; adopt pricing approaches which increase the extent of cost recovery; employ credit enhancements to protect the project and its creditors; control the maturity, flow of payments and other features of its bonded indebtedness to increase its flexibility and reduce its cost; and employ third party contracts to control cash flow and improve credit security. Cost recovery and financing techniques are summarized in the list which follows:

1) up-front capital
   a. surplus/subsidies
   b. up-front property assessments
   c. system development charges

2) leasing and contracts
   a. lease, finance lease and leveraged lease
   b. conditional sale
   c. sale leaseback
   d. service contract

3) pricing
   a. one-part pricing
   b. two-part pricing
   c. price discrimination
   d. peak pricing

4) credit enhancements
   a. external credit supports
   b. state intermediation
   c. state technical assistance and supervision

5) bond structure
   a. short maturity instruments
   b. original issue discount or compound coupon bonds
   c. stepped coupon bonds
   d. tender option, warrants and variable interest rate bonds
   e. call option bonds
   f. small denomination bonds

6) third party contracts

Table IV-1 summarizes the benefits of the various techniques.

V

DISTINCTIVE COST RECOVERY AND FINANCING FOR WATER OUTPUTS

INTRODUCTION

In many ways, the cost recovery and financing problems and opportunities posed by one project purpose resemble those of another. For instance, no matter what the project purpose, the sponsor may choose to rely to some extent on general revenues for income or on surpluses for financing. As another example, there is little limitation with respect to project purpose on the use of appropriate credit enhancements or on the structuring of bond maturity, flow of obligations, redemption or rate provisions, or denomination.

In many more ways, however, each project purpose presents unique financial opportunities which vary among projects only in degree. This chapter reviews the applicability of the distinctive cost cost recovery and financing techniques to seven types of water output: flood hazard reduction; commercial navigation; commercial fisheries; intensive recreation; extensive recreation and fish and wildlife enhancement; municipal and industrial water supply; and hydroelectric power. (The applicability of techniques to project purposes is summarized in Table V-1). The use of universally applicable general revenues, surpluses, credit enhancements and bond structuring techniques will not be discussed in this chapter.

FLOOD HAZARD REDUCTION

In general, the benefit of flood hazard reduction to property is equal to the sum of the damages, floodproofing costs and insurance payments foregone and any additional restoration or enhancement in the use of the property. The benefit is capitalized into the value of land and existing structures.

Property taxes, deferred or up-front assessments and special service taxes may be used to recover the costs of flood hazard reduction. The distribution of the property tax burden is not likely to reflect the distribution of benefits unless many properties are affected and they are affected to a comparable order of magnitude. The fewer the number of properties affected, the more appropriate and the less costly are assessments and special service taxes as cost recovery methods. However, it is possible to use property assessments on large scale; the Miami Conservancy District in Ohio[1] and various delta levee boards in the Mississippi Valley have done so.

In general, the elevation, area and use of lands and facilities determine the benefits accruing to each property. In computing flood hazard reduction benefits the Corps of Engineers develops depth-damage frequency curves for urban and for rural areas. Erosion and hurricane hazard reduction may be considered a variant of flood hazard reduction, with the principal differences being that foregone land losses are also benefits and damage frequency curves

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[1] "Appraisal of Flood Protection Benefits and Damage in the Miami Valley," in Engineering News-Record, November 16, 1922.

Table V-1

Financial Benefits and Applications of Cost Recovery and Financing Techniques

COST RECOVERY FINANCING BENEFITS AND APPLICATIONS	FINANCIAL BENEFITS																APPLICABILITY TO PROJECT PURPOSES						
	EXTENT OF COST RECOVERY							ACCESS TO COST OF FUNDS							CF								
	CHARGE BENEFICIARIES	DIVERSIFY CHARGING VEHICLES	CAPTURE CONSUMER SURPLUS	REDUCE REVENUE RISK	AVOID PRICING LIMITATIONS	REDUCE COLLECTION COST	IMPROVE CAPITAL MKT ACCESS	REDUCE CREDIT RISK	REDUCE CAPITAL MARKET RISK	EXPLOIT TAX & MARKET NICHES	MAINTAIN CREDIT RATING	PROVIDE FINANCIAL FLEXIBILITY	REDUCE TRANSACTION COST	MAINTAIN POSITIVE CASH FLOWS	FLOOD HAZARD REDUCTION	COMMERCIAL NAVIGATION	COMMERCIAL FISHERIES	EXTENSIVE RECREATION & FWL	INTENSIVE RECREATION	M&I WATER SUPPLY	HYDROELECTRIC POWER
GENERAL PROPERTY TAX				X		X		X					X	X	X	X	X	X	X	X	X
[illegible]	X			X				X						X	X						
[illegible]	X	X					X				X					X	X	X	X		
[illegible]	X	X		X			X				X			X		X	X	X	X	X	X
[illegible]	X	X				X	X				X			X		X			X	X	X
[illegible]	X			X	X		X	X						X	X						
[illegible]	X				X	X	X	X					X		X						
[illegible]	X					X	X						X			X	X	X	X		
[illegible]				X			X				X		X	X	X	X	X	X	X	X	X
[illegible]	X	X	X	X			X				X			X	X	X	X	X	X	X	X
[illegible]	X	X	X	X			X				X			X						X	X
[illegible]					X		X			X	X	X		X						X	X
[illegible]					X		X			X	X	X		X						X	X
[illegible]					X		X			X	X	X		X						X	X
[illegible]					X		X			X	X	X		X						X	X
[illegible]	X					X										X	X	X	X	X	X
[illegible]	X	X	X											X							
[illegible]	X		X											X							
[illegible]	X		X											X							
[illegible]	X		X											X							
[illegible]								X			X			X	X	X	X	X	X	X	X
[illegible]							X		X			X		X	X	X	X	X	X	X	X
[illegible]										X				X	X	X	X	X	X	X	X
[illegible]									X					X	X	X	X	X	X	X	X
[illegible]												X			X	X	X	X	X	X	X
[illegible]										X				X	X	X	X	X	X	X	X
[illegible]				X	X			X						X		X			X	X	X

must include the effects of waves. The damage curves may provide the basis for assessments and special taxes by a non-Federal sponsor with variation to allow for assessment procedures and financial accounting practices. Furthermore, the presence of a Federal cost share should enable some amount of benefit to be "forgiven" for each property; this will eliminate the administrative cost of assessing slightly benefited property while still capturing windfalls of a significant magnitude.

COMMERCIAL NAVIGATION

Traditional cost sharing for commercial navigation has involved 100% Federal financing of improvements, operation, maintenance and replacement for general navigation features. Ordinarily non-Federal interests pay for berthing areas and interior access channels thereto; lands, easements, rights-of-way and relocations; diked disposal areas; and land-side facilities. Land-side facilities are the principal source of non-Federal revenues.

Several current Administration and Congressional proposals would require non-Federal interests to bear a share of the costs of general navigation features. To meet their cost sharing responsibilities, sponsors will have to evaluate alternatives to obtain financing at acceptable terms and alternatives to generate revenues sufficient to cover debt service and operating expenses. Potential revenue sources depend on the cost recovery powers of the sponsor, but include the taxation of complementary goods (e.g. fuel taxes or cargo taxes), the sale or rental of complementary goods, usage or access fees, and service (user) charges. The following are the distinctive facility-specific revenue revenue sources (charging vehicles) for port facilities:

1) rental or lease of space and storage facilities
2) facility usage fees (dockage and wharfage)
   - dockage fees
   - first call on berth (preferential assignment) fees
   - wharfage (wharf use per unit of cargo)
   - wharf demurrage penalties
   - storage charge
   - sheddage (shed hire)
3) Service and equipment charges
   - tow charges
   - crane charges

The revenues of a particular port may be maximized, without undue loss of competitive status among ports or undue welfare losses, by pricing each separable output or service (charging vehicle) subject to administrative cost constraints, and by adopting an effective pricing policy for each charging vehicle. A multipart (sliding scale) pricing system may be used for most revenue sources. Because port equipment and facilities experience fluctuations in use, dockage and wharfage fees and service charges are amenable to peak pricing. A two-part tariff (entry fee and unit price) shows some promise for pricing usage of facilities.

General purpose port facility sponsors may use industrial development bonds as a financing technique. A third-party contract with a commercial port operator provides security for the bonds.

COMMERCIAL FISHERIES

As discussed in the Principles and Guidelines[1], commercial fisheries represent classic common property resources. Restriction of entry may be accomplished through regulation and through taxation of the catch or the sale of complementary goods. Taxation has two advantages:

1) it captures a portion of the "economic rent" (consumer and producer surplus), thus preventing it from being dissipated by harvesters through the overconsumption of inputs and the overharvesting of the fishery; and

2) it raises revenue.

Although the sponsor should consider the overall fiscal effects of the fishery enhancement irrespective of the particular tax structure, the sponsor may be encouraged to adopt such taxes if it has not already done so.

EXTENSIVE RECREATION AND FISH AND WILDLIFE ENHANCEMENT

Extensive recreation and fish and wildlife resources are defined as common property resources because their outputs are consumed by the individual but difficult or expensive to exclude from any potential consumer. Resource-based (extensive) recreation and fish and wildlife activities are nearly pure common property resources. A review of the rationales for public provision of extensive recreation and fish and wildlife enhancement leads to the conclusion that most of the reasons for public involvement in providing these resources are precisely the reasons why full cost recovery is difficult.

1) Nonexcludibility. Recreation and fish and wildlife resources are difficult or costly to exclude from potential users. For instance, according to the Federal Recreation Fee Program[2] report the collection cost alone at Federal facilities of recreation use fees, special permit fees, entrance fees and all fees combined is $.45, $.64, $.33 and $.42, respectively, per dollar collected.

2) Congestion. Private operators in competition with other recreation providers are likely to develop facilities for over-intensive use, to operate recreation facilities without regard to congestion costs and, consequently, to promote abuse of resources with attendant welfare losses.

3) Option value. The demand for the option to use a recreation resource at a future time is not priced in the market and may be met through public action.

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[1] Part 2.9.9 in U.S. Water Resources Council, Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies, March 10, 1983.

[2] U.S. Department of the Interior, Heritage Conservation and Recreation Service, Federal Recreation Fee Program, 1980, A Report to Congress, 1980

4) General benefit. Consumption of recreation outputs is seen as contributing to the general community welfare, i.e. recreation is a "merit good" and is undervalued by the individual.

5) Economies of scale. Recreation facilities may experience declining average cost and economies of scale; consequently a private provider pricing at marginal cost could not expect to reap a desirable return. The government may undertake such ventures and absorb the risk of shortfall.

6) External economies. Governments already provide the roads and services which may generate use of recreation facilities and can program recreation and other services to achieve economies.

Access fees, activity fees, land leases and outgrants are the principal on-site sources of revenue for extensively used facilities. Specific charging vehicles are as follows:

1) access fees
   entrance fees
   parking fees
   building admission fees
2) activity (license or permit) fees
   hunting, fishing and camping fees
   special permit fees for group activities and specialized uses
3) land leases and outgrants

One-stop charges offer an excellent prospect for inexpensive revenue generation. Entrance fees may be structured to discriminate among users. For congested facilities, peak prices may be charged, both to restrict use and to increase revenues. Bolle and Taber[1] have shown that lands with excellent hunting value bring attractive prices for private sale or lease.

For general purpose sponsors, there are additional sources of revenue beyond those generated on-site. First, hunting and fishing licenses and taxes on complementary goods may represent part of the revenue base; revenues will be enhanced by development of the project. For instance, Hanke[2] points out that gasoline is to some extent a complementary good. Second, Hanke recommends an annual license for the use of all resource-based facilities within the sponsor's jurisdiction, coupled with user fees to recover costs at congested (user-intensive) areas. Third, property assessments have potential as a cost recovery device. Since prospective users may wish to locate near a recreation facility, some of the net recreation benefit is capitalized into the values of lands near the facility (particularly adjacent to "open space".) An assessment may be difficult to levy because the facility may not qualify as a "local

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[1] Bolle, Arnold, W. and Richard D. Taber, "Economic Aspects of Wildlife Abundance on Private Lands," in Transactions of the Twenty-Seventh North American Wildlife Conference, Wildlife Management Institute, 1962.

[2] Hanke, Steve H., "Options for Financing Water Development Projects," in Transactions of the Forty-First North American Wildlife and Natural Resources Conference 1976.

improvement". A second-best way to recover the surplus capitalized into land values is to rely heavily on a land tax in the tax base.

INTENSIVE RECREATION

For user-oriented (intensively developed) recreation facilities. In comparison to resource-based recreation it is likely to be easier to control use, to charge individuals for their consumption, and to recover costs allocable to the intensive activity. Entry and access fees are appropriate at user-oriented facilities, as they are at extensively used facilities; in addition user-based fees and charges offer the prospect of generating significant revenues above the incremental costs of the intensive use facilities. Major types of fees and charges are as follows:

1) Use fees for developed facilities (e.g. campgrounds, skiing, docking, golf, bathhouses and swimming areas)
2) sales and rentals
   boat, duck blind and equipment rentals
   sales of complementary goods
   vehicle, trailer and boat storage lockers
3) special service charges
   utility hookups
   tours, classes and competitions
   launching and boat handling services
   reservation services

Note that many facilities and services may be provided by concessionaires as well as the public sponsor. The concessionaire may assume some responsibility for the financing of a facility as well as its operation, thereby reducing the front-end cost to the sponsor.

Peak pricing (congestion tolls) offers the opportunity not only to restrict use during peak periods but also to enhance cost recovery. Peak pricing may be applied not only to entry but also to use of developed facilities, to rentals and to special services.

MUNICIPAL AND INDUSTRIAL WATER SUPPLY

As of late 1982 the Corps of Engineers had 167 contracts with 172 wholesale purchasers of water at 101 multipurpose reservoirs. Great variety is evident among the non-Federal signatories to the contracts:

55	special districts or municipally created authorities
51	countries, cities, towns and villages
14	states or state agencies, boards or commissions
20	investor-owned utilities
19	state-created authorities
2	compact commissions
1	military base
162	total purchasers

Whether due to rate regulation, tradition or legislative authorization, water supply pricing by municipal and private utilities has emphasized recovery of historic cost, not efficient use of resources. Rates are usually set to meet "revenue requirements", which in turn are computed by municipal utilities

on a cash basis and by investor-owned utilities on a return-to-investment (utility) basis. On the cash basis, revenues must cover:

1) operation and maintenance;
2) debt service;
3) annual requirements for replacements, extensions and improvements;
4) payments in lieu of taxes, if any; and
5) surpluses to finance major improvements.

On the return-to-investment (utility) basis, revenues must cover:

1) operation and maintenance;
2) depreciation;
3) taxes; and
4) return on investor equity.

The design of most rate structures has three steps:

1) allocation of costs to functional cost components;
2) allocation of costs to customer classes; and
3) design of rates.

The allocation of costs to functional cost components is usually accomplished through one of two methods: the commodity-demand method or the base-extra capacity method. The commodity-demand method allocates capital costs among maximum day demand, maximum hour demand and customer service, and allocates O&M expenses among these three cost components and commodity (consumption-based) costs. The base-extra capacity method allocates both capital costs and O&M costs among a "base" (average) demand component, two extra-capacity demand components for maximum day demand and maximum hour demand, and customer service. The latter method is preferable from an economic standpoint because it enables the computation of the incremental commodity costs during both peak and non-peak periods.

The allocation of costs among customer classes virtually assures that rates will primarily be based on price discrimination among users. The total cost of each service component, however computed, is allocated among customer classes based on the contribution of each customer class to service component cost. Total costs per class are derived by adding the cost per class of each service component.

Rates are set to recover from each class the costs allocated to that class. Too often, average per unit cost forms the basis for the rates in each class. Although such a rate setting system is fair in that the cost burden is distributed among users according to their contribution to costs, neglected is the fact that the last increment of use by each customer contributes equally to marginal capital and operating costs, irrespective of overall cost contribution.

The following is a summary of the defects of most rate structures:

1) overreliance on average-cost pricing and the recovery of historic costs;

2) overreliance on price discrimination among customer classes rather than more efficient methods;

3) underuse of peak pricing, or use of peak pricing based on average, not marginal, contributions to cost in peak periods;

4) the persistence of declining block rates when marginal costs are rising; and

5) uniformity of rates across space despite changes in cost across space.

A number of pricing alternatives which utilize peak, two-part and sliding-scale pricing can contribute not only to meeting revenue needs but also to reducing or minimizing increases in the basic commodity charge, thereby minimizing deviations from marginal cost pricing. Among the pricing alternatives (revenue sources) which may be considered are the following:

1) variable charges to recover short run costs
   a. commodity charges
      - basic charge
      - peak pricing
      - zonal pricing (e.g. distance-based)
      - declining or increasing block rate (multipart) pricing
   b. customer service charges (for billing, metering, etc.)
   c. special service charges
2) fixed charges to finance current capital additions
   a. connection charges
   b. capital contribution charges
3) fixed charges to recover sunk costs
   a. fire protection charges
   b. minimum billing charges
   c. availability benefit assessments or charges
   d. readiness to serve (delivery capacity) charges

Since M&I water is a market output, leasing and contracts represent alternative financing devices. Furthermore, contracts with large users may provide security for debt and render cash flow more controllable.

HYDROELECTRIC POWER

Rate structures and rate-making considerations for hydropower are very similar to those for water supply and customarily involve computation of capacity, commodity and customer cost. James and Lee[1] divide rate structures into nine categories:

"1) Uniform rate per customer. Each customer, or each customer within a customer class (apartment dwellers or single-family residences, for example), is charged the same fixed fee. Severe overuse often results because the customer pays the same fee no matter how much he uses.

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1 James, F. Douglas and Robert R. Lee, Economics of Water Resources Planning, McGraw-Hill, 1971.

2) Uniform rate per energy unit. The charge is equal for each kilowatt-hour of energy. A high cost to the utility for providing peaking capacity often results because there is no penalty for using power during peak demand periods.

3) Uniform rate per unit of readiness to serve. The charge is equal for each kilowatt of connected load. The load in kilowatts is measured by summing the power rating of all connected electricity-using apparatus. The rate penalizes the customer even if he does not use all his additional electrical machinery during periods of peak demand.

4) Uniform rate per unit of maximum demand. The charge is equal for each kilowatt of metered maximum use. This rate structure provides no incentive for the customer to economize during off-peak periods and this may result in excessive commodity use.

5) Step rate. The unit charge per each kilowatt of energy depends on the number of kilowatts used. It is analogous to selling eggs for a nickel each and 50 cents a dozen. Step rates may be used to approximate and average commodity-cost curve, but they do not reflect capacity or consumer costs.

6) Block rate. The incremental charge per each kilowatt of energy depends on the number of kilowatts used. It is analogous to selling the first dozen eggs for 50 cents and all additional dozens for 30 cents. Block rates are widely used by many kinds of utilities for residential service. They may be used to approximate a marginal-cost curve.

7) Hopkinson type of demand rate. An equal charge for each kilowatt hour of energy is added to an equal charge for each kilowatt of metered peak demand.

8) Wright type of demand rate. Energy is paid for in blocks sized according to metered peak demand. A typical rate would be 8 cents per kilowatt-hour up to a monthly energy use in kilowatt-hours equal to 100 times the peak monthly demand in kilowatts and 5 cents per each additional kilowatt-hour.

9) Off-peak rate. A Hopkinson type of demand rate is used, but the energy charge is reduced if the metered peak occurs at specified off-peak times. On a daily basis, a 3:00 a.m. demand peak would be charged much less than a 6:00 p.m. demand peak. On a seasonal basis, a premium might be charged for water used in the summer."

Under existing institutional arrangements, the allocation and marketing of hydropower at new Federal projects is the responsibility of the Federal Power Marketing Administrations (PMA's). For privately financed additions to existing projects, allocation is the responsibility of the Federal Energy Regulatory Commission (FERC) and marketing is the responsibility of the FERC licensee.

Under Section 5 of the 1944 Flood Control Act and related legislation, the Corps of Engineers must provide surplus power at any project for which power is an authorized purpose to the appropriate PMA for distribution and marketing. The PMA wholesales the power, giving preference to public utilities and cooperatives over investor-owned utilities. Wholesale rates are based on average cost of the power within the particular PMA and represent the lowest price consistent with "sound business practices" (i.e. cost recovery). A project which is added to a system is "credited" within the PMA's account with revenues sufficient to amortize the costs allocated to the power.

For projects for which hydropower is not an authorized purpose but which have hydroelectric potential, the current Corps of Engineers policy is to install minimum facilities (e.g. penstocks) to provide for future hydroelectric development. Subsequent development of hydroelectric facilities at a project by non-Federal developers is regulated by FERC. FERC grants to public and private applicants first a study permit, then a development license, giving preference to public utilities and cooperatives as the marketing agencies do in the allocation of power. Prior to receiving a license, the developer must have a power purchase contract or other demonstration of commercial feasibility. FERC will not grant permits or licenses for sites for which Federal development is authorized. Any non-Federal developer who is licensed to develop hydropower at a Federal project is not required to sell the power to the PMA's but is free to sell in the open market.

The Corps, PMA's and FERC all give preference to public customers at new and existing facilities. A public sponsor which contributes to hydropower capital costs at a new facility faces a dilemma: there is no guarantee under existing procedures and arrangements that the sponsor, rather than another preferred customer, will be allocated the power by the power marketing agency. No sponsor is willing to tie up its capital and borrowing power in a project which benefits someone else. (Furthermore, the revenues "credited" to the project by the power marketing agency may be based on different interest rates and cost computations than those faced by the sponsor in its financial participation; in other words, the sponsor could take a loss.) The current Department of the Army (DA) cost-sharing policy is for the sponsor to receive the power or equivalent power values from the relevant Federal distribution system in return for financing power costs. There are a number of alternatives which offer the possibility of helping to implement the DA policy:

1) The Corps, the PMA and a "preference customer" sponsor could sign an agreement to provide for payments by the PMA to the sponsor for capital costs and to the Corps for operating costs, and also to allocate the power to the sponsor. This is possible because each PMA develops a marketing plan for available power, allocating the power among customers; development of the marketing plan would need to be brought forward in time and applied to not-yet-available power.

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[1]Bonneville Power Administration, Alaska Power Administration, Southwestern Power Administration, Southeastern Power Administration and Western Power Administration.

2) Legislation authorizing each project could specify the allocation of power outputs as well as the 100% cost share. For instance, the Department of the Interior (DOI) has proposed that the allottees who have already paid for and have contracted for sole use of existing hydroelectric facilities at Hoover Dam be authorized to enter into an agreement with DOI to receive the added power from uprating of the generating equipment.

3) Minimum facilities could be installed at the time of construction, and the preference customer sponsor could apply to FERC to develop hydro facilities post-facto. However, this is an inefficient and expensive alternative.

4) The project could be authorized for purposes other than hydro, but prior to construction an agreement could be reached with the sponsor to finance added hydropower costs. For instance, the City of Alexandria, Virginia has received a FERC permit to study hydropower at Red River Lock and Dam #2, an authorized but unconstructed navigation project, and is negotiating with the Corps regarding cost allocation, financing, operating responsibilities and other matters.

5) Section 5 of the FCA of 1944 could be revised to enable the Corps to allot power outputs to sponsors who finance the hydropower and who are certified by the PMA as preference customers.

Private firms are also interested in hydro development at new facilities, largely because of a recent tax law, the Crude Oil Windfall Profits Tax Act of 1978, which provides that hydro facilities of up to 125 MW are eligible for energy credits of up to 11% (11% for 25 MW or less, declining to 0% for 125 MW) in addition to the ITC. A private firm would finance the hydro facility, using revenue bonds secured by a power purchase agreement with the PMA. The Corps would also be reimbursed for operating expenses it incurred. After the investment had been amortized, title would be transferred to the Corps. The major impediment to such a proposal is FERC's mandate to give preference to public hydropower development. Legislation would be required to enable such private participation.

At existing sites both public and private interests may apply for a FERC permit and license. The attractiveness to private firms of post-facto development at Federal sites lies not only in the energy credits, ITC and depreciation deductions, but also in the provisions of the Public Utility Regulatory Policy Act (PURPA, Title II) which requires that utilities purchase at avoided (marginal) cost the outputs of hydro facilities of less than 80 MW. Nonetheless, private interests face the financial risk that they will be preempted by preferred customers in obtaining a study permit or that after substantial study expenditures a development license will not be received. Consequently, various proposals have been developed which remove FERC's jurisdiction over development, provide for PMA purchase of privately developed power and enable the PMA, Federal agency and developer to negotiate the terms of financing, power purchase and transfer of title.

SUMMARY

Among the variety of financing and cost recovery techniques, certain techniques (general revenues, surpluses, credit enhancements and bond structuring techniques) are applicable to all project purposes. In addition, each project purpose is amenable to particular techniques.

Because most flood hazard reduction benefits accrue to property, up-front or deferred assessments are appropriate revenue sources and bond security, and are available to any unit of government with taxation or assessment powers. For some general purpose governments, special service taxes may be used in lieu of assessments to provide greater ease of administration and the deductibility of tax payments from Federal taxes. Depth-damage frequency curves may provide the basis for computing assessments or special service taxes.

Landside facilities are the direct (facility-specific) source of revenues for sponsors of commercial navigation improvements. Direct revenues include the rental or lease of space and storage facilities, facility usage fees (dockage and wharfage), and service and equipment charges. In addition, general purpose sponsors only tax complementary goods such as motor fuel. Charging policy at port facilities may include two-part, discriminatory and peak pricing as methods to enhance revenues with minimal effect on use.

Commercial fisheries are problemmatic because use of the fishery is difficult to price or to control. Potential revenue sources include taxes on the catch, taxes on complementary goods and access charges.

Extensive recreation and fish and wildlife resources are also common property resources, and cost recovery is difficult. One-stop access fees and/or activity fees and land leases/outgrants are two methods to collect revenues and reduce debt service. General purpose sponsors may also rely on hunting and fishing licenses, taxes on complementary goods such as hunting equipment and gasoline, multi-facility use licenses, and assessments on properties to which windfall benefits accrue. Price discrimination offers some potential for revenue enhancement, as does peak pricing at heavily used facilities.

For recreation resources which feature intensive (user-oriented) facilities, additional revenues may be obtained from facility-specific use fees, sales and rentals and special source charges. The presence of intensively used facilities enhances the cost recovery prospects of a recreation project.

Municipal and industrial water supply is a market output and should be self-supporting in the long run. Within regulatory and legal limitations, rates may be structured to ensure cost recovery and remedy cash flow problems at minimum sacrifice of user benefits. Charging vehicles include variable charges for the commodity, customer service and special services, and fixed charges which recover sunk or current costs not related to use. Two-part pricing, price discrimination and peak pricing are common methods of allocating output and enhancing revenues. Because M&I water is a market

output, there is an opportunity for involvement of the private sector in financing and operation. Leasing, conditional sales, and sale-leaseback are possible financing techniques; however, use of service contracts is the technique which maximizes private responsibility and financing latitude.

Hydroelectric power is a market output which presents financing and cost recovery possibilities comparable to those of M&I water. However, an elaborate institutional framework has evolved for the development, allocation and marketing of hydropower from Federal projects. Institutional, not financial, constraints are the chief impediments to a broadened role for non-Federal sponsors in hydropower financing and cost recovery.

VI

PRO FORMA FINANCIAL ANALYSES

Tables VI-1 to VI-8 provide sample financial analyses. The tables are intended to show in part the effects of project purpose, of sponsor capabilities and objectives and of financing technique on the financial feasibility of projects.[1] The reader is referred to Chapter IV, particularly the discussions of "Revenue Sources and Bond Security" and of "Leasing and Contracts", for descriptions of the financing techniques discussed herein.

Table VI-1 presents the economic analysis for a flood control project with deferred special assessments as the revenue source. A sponsor evaluating the financial feasibility of a flood control project in an inflationary environment should regard the inflated benefit stream as the upper limit of potential revenues.

As shown in Table VI-2, the particular sponsor of this project can obtain 20-year special assessment bond financing. Wishing to reduce the debt load, the sponsor determines that a portion of the financing can be realized through up-front assessments. A bond anticipation note is to be used to finance construction, and interest is to be capitalized into the SA bond.

The objective of the sponsor in Table VI-2 is to minimize assessments each year, subject to the constraints that assessments increase at the rate of inflation (five percent), that cash flow be positive and that debt be paid off within 20 years.[2]

To achieve this objective the sponsor makes two decisions. First, it decides to use serial compound coupon SA bonds so that debt service may be matched to anticipated net revenues. (Compound coupon SSA bonds should also be considered if within the sponsor's authority.) Since the bonds in this example are special-special bonds--a form of limited obligation--a reserve balance is required to cover cash flow emergencies.

Second, the sponsor decides to set the level of debt such that the assessment in minimized. This level of debt may be found by successive approximations and is shown in Table VI-2. Were debt to be increased, assessments would need to be increased to cover out-year debt service. Were debt to be reduced, assessments would also need to be increased, in this case to assure an adequate reserve balance in the early years. (Of course, by adopting a different level of assessments during the construction period, the sponsor could affect later assessment levels.)

Many lenders cast a justifiably jaundiced eye on revenue projections of borrowers which are highly dependent on or sensitive to inflation. Also, the sponsor may have political difficulty adjusting assessments in increments to

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[1]The tables were prepared by the author using a Visicalc (R) program on the IBM personal computer. Details are available from the author.

[2]For all the examples in this section a 50-year financial planning horizon is most appropriate. However, for the sake of simplicity the 20-year criterion is used.

meet cash requirements. For these reasons, the sponsor may wish to establish an assessment and debt service schedule that is more or less constant (in nominal dollars) through time. This may be achieved through a number of techniques other than compound coupon bonds.

If the sponsor wishes to refund (refinance) the bonds after 20 years, debt service requirements and revenue requirements may be reduced and techniques other than compound coupon bonds are appropriate.

Tables VI-3 through VI-8 are concerned with various aspects of a water supply project. Table VI-3 displays undiscounted, discounted and inflated costs and benefits. The inflated benefits represent the upper limit on the revenues which can be obtained by the sponsor under optimal pricing involving fixed charges, multipart variable charges and peak use surcharges.

Table VI-4 displays financial analysis of the project from the standpoint of a public sponsor (general purpose, special purpose or authority). In this example, the sponsor's objective is to minimize the revenues required for debt service, subject to the constraints that rates rise at the rate of inflation (5 percent), that cash flow be positive and that debt be paid off within 20 years. The use of compound coupon bonds facilitates those objectives, and the sponsor decides to float serial compound coupon revenue bonds maturing within the 20-year period. As in the case of flood control, were the objectives and constraints to be modified, different approaches to financing would also be appropriate.

As shown in Table VI-4, water rates which average 63 percent of the benefit to the user are sufficient to pay recurrent expenses and debt service on the bonds and to maintain an adequate reserve balance. Were the bonds to be refunded, the "benefit capture rate" could be reduced. In Table VI-4 the level of debt is set to minimize average rates; heavier borrowing would increase out-year expenses while less borrowing would result in short-term shortfalls in the reserve.

As shown in Table VI-5, an unregulated water company needs only a 54 percent benefit capture rate to achieve a 12 percent internal rate of return, due largely to the 5-year ACRS deduction period and the ITC. (The benefit capture rate, of course, would be higher to achieve higher rates of return.)

Since the water company or its investors may have other income it wishes to shelter, it desires to bring forward in time deductions from income and to push back in time tax liabilities, even to the extent of incurring a negative cash flow for a number of years. For this reason the company decides to take out "mortgage-style" debt with high interest payments in the early years. Cash flow remains negative until the ninth year of operation, but after-tax return is very healthy the first five years due to the ACRS deductions. (The company may structure its debt in other ways to provide marginal improvements in its rate of return.)

The public sponsor in Table VI-4, seeing that the private company can charge less and still earn a reasonable return, decides to investigate various leasing and contracting options to determine whether its rates can be reduced under those options.

Under the terms of a finance lease option (Table VI-6), the sponsor would pay as lease payments a predetermined series of annual payments computed to equal the revenues net of OM&R. The private company, in turn, has a mortgage-style debenture. However, under this option, the company's rate of return is only 11 percent while the sponsor is unable to reduce its rates. This option is rejected.

Under the conditional sale option shown in Table VI-7, the sponsor loses the ACRS deductions but gains tax exemption for the income attributable to interest. Accordingly, the payments by the sponsor are increased in the early years to a level equal to the company's own debt obligations (the computed interest being equal to the company's explicit interest payment) and the shortfall is covered by a series of revenue anticipation notes. However, this option also yields insufficient return to the company with no reduction in rates.

The option which the public sponsor selects is to enter into a service contract with the company. Obligations for water delivery by the company are set at a level equal to anticipated use, and obligations for payment by the sponsor are set at a level equal to anticipated revenues from users. The rates may be set at some level in relation to benefits between 54 percent (the point at which it becomes worthwhile for the company--see Table VI-5) and 63 percent (the point at which it is no longer worthwhile to the sponsor--see Table VI-4.) This option eliminates the sponsor's borrowing requirements and reduces rates. Its disadvantages may be reduced through contractual provisions providing renewal options for the sponsor and a non-substitution clause for the company if a fiscal funding out clause is required.

Table VI-8 shows the same project from the standpoint of a utility. The utility's objectives in this example are to minimize rates subject to an annual five percent inflationary rate increase, positive cash flow and retirement of debt within 20 years. Because its accounting practices differ from those of the public sponsor and the project is part of a system, the utility decides to float term bonds with level coupon payments and to establish a sinking fund for debt retirement at the end of the 20-year period. Largely due to tax factors, the interest rate it pays on debt is greater than for the public sponsor, but its front-end borrowing requirements are less. As shown in Table VI-8, a 59 percent benefit capture rate is sufficient to cover expenses and provide a 12 percent return.

TABLE VI-1

ECONOMIC ANALYSIS OF FLOOD CONTROL PROJECT

	UNDISCOUNTED:		DISCOUNTED @ 8%:		INFLATED @5%:	
YEAR	COSTS	BENEFITS	COSTS	BENEFITS	COSTS	BENEFITS
-2	20.00		23.32		20.00	
-1	15.00		16.20		15.75	
0	15.00		15.00		16.55	
1	1.00	10.00	0.93	9.26	1.16	11.58
2	1.00	10.00	0.86	8.57	1.22	12.16
3	1.00	10.00	0.79	7.94	1.28	12.76
4	1.00	10.00	0.74	7.35	1.34	13.40
5	1.00	10.00	0.68	6.81	1.41	14.07
6	1.00	10.00	0.63	6.30	1.48	14.77
7	1.00	10.00	0.58	5.83	1.55	15.51
8	1.00	10.00	0.54	5.40	1.63	16.29
9	1.00	10.00	0.50	5.00	1.71	17.10
10	1.00	10.00	0.46	4.63	1.80	17.96
11	1.00	10.00	0.43	4.29	1.89	18.86
12	1.00	10.00	0.40	3.97	1.98	19.80
13	1.00	10.00	0.37	3.68	2.08	20.79
14	1.00	10.00	0.34	3.40	2.18	21.83
15	1.00	10.00	0.32	3.15	2.29	22.92
16	1.00	10.00	0.29	2.92	2.41	24.07
17	1.00	10.00	0.27	2.70	2.53	25.27
18	1.00	10.00	0.25	2.50	2.65	26.53
19	1.00	10.00	0.23	2.32	2.79	27.86
20	1.00	10.00	0.21	2.15	2.93	29.25
SUM:	70.00	200.00	64.34	98.18	90.57	382.78
BCR:		2.86		1.53		

TABLE VI-2

PUBLIC FINANCIAL ANALYSIS OF FLOOD CONTROL

YEAR	B.A.N.	C.C. BONDS	REVENUES	CONST&FIN COST	OM&R	PRNCPL RETIRED	COMPOUND COUPON	PRNCPL OUTSTDG	INITIAL BALANCE	INTEREST @10%	RESERVE BALANCE
-2	38.92		4.43	-20.50				38.92	22.85	2.28	25.13
-1			4.65	-15.75				38.92	14.03	1.40	15.43
0		51.80	4.88	-16.54		-38.92	-12.88	51.80	3.77	0.38	4.15
1			5.12		-1.16	-3.51	-0.35	48.29	4.25	0.42	4.67
2			5.38		-1.22	-3.74	-0.79	44.55	4.31	0.43	4.74
3			5.65		-1.28	-3.57	-1.18	40.98	4.36	0.44	4.80
4			5.93		-1.34	-3.41	-1.58	37.57	4.40	0.44	4.84
5			6.23		-1.41	-3.25	-1.99	34.32	4.42	0.44	4.86
6			6.54		-1.48	-3.11	-2.40	31.21	4.42	0.44	4.87
7			6.87		-1.55	-2.96	-2.81	28.25	4.40	0.44	4.84
8			7.21		-1.63	-2.83	-3.24	25.42	4.36	0.44	4.79
9			7.57		-1.71	-2.70	-3.67	22.71	4.28	0.43	4.71
10			7.95		-1.80	-2.58	-4.11	20.14	4.18	0.42	4.60
11			8.35		-1.89	-2.46	-4.56	17.68	4.03	0.40	4.44
12			8.76		-1.98	-2.35	-5.02	15.33	3.85	0.38	4.23
13			9.20		-2.08	-2.24	-5.50	13.08	3.61	0.36	3.97
14			9.66		-2.18	-2.14	-5.99	10.94	3.32	0.33	3.66
15			10.14		-2.29	-2.04	-6.49	8.90	2.97	0.30	3.27
16			10.65		-2.41	-1.95	-7.01	6.95	2.55	0.26	2.81
17			11.18		-2.53	-1.86	-7.55	5.09	2.06	0.21	2.26
18			11.74		-2.65	-1.78	-8.10	3.31	1.47	0.15	1.62
19			12.33		-2.79	-1.70	-8.68	1.61	0.79	0.08	0.87
20			12.95		-2.93	-1.62	-9.27	0.00	0.00	0.00	0.00

TABLE VI-3

ECONOMIC ANALYSIS OF WATER SUPPLY PROJECT

	UNDISCOUNTED:		DISCOUNTED @ 8%:		INFLATED @ 5%:	
YEAR	COSTS	BENEFITS	COSTS	BENEFITS	COSTS	BENEFITS
-2	20.00		23.32		20.00	
-1	15.00		16.20		15.75	
0	15.00		15.00		16.55	
1	3.00	10.00	2.78	9.26	3.47	11.58
2	3.10	10.50	2.66	9.00	3.77	12.77
3	3.20	11.00	2.54	8.73	4.08	14.04
4	3.30	11.50	2.43	8.45	4.42	15.41
5	3.40	12.00	2.31	8.17	4.78	16.88
6	3.50	12.50	2.21	7.88	5.17	18.46
7	3.60	13.00	2.10	7.59	5.58	20.16
8	3.70	13.50	2.00	7.29	6.03	21.99
9	3.80	14.00	1.90	7.00	6.50	23.94
10	3.90	14.50	1.81	6.72	7.00	26.04
11	4.00	15.00	1.72	6.43	7.54	28.29
12	4.10	15.10	1.63	6.00	8.12	29.90
13	4.20	15.20	1.54	5.59	8.73	31.60
14	4.30	15.30	1.46	5.21	9.39	33.40
15	4.40	15.40	1.39	4.85	10.08	35.30
16	4.50	15.50	1.31	4.52	10.83	37.31
17	4.60	15.60	1.24	4.22	11.62	39.42
18	4.70	15.70	1.18	3.93	12.47	41.65
19	4.80	15.80	1.11	3.66	13.37	44.02
20	4.90	15.90	1.05	3.41	14.33	46.51
SUM:	129.00	277.00	90.88	127.91	209.61	548.67
BCR:		2.15		1.41		

TABLE VI-4

PUBLIC FINANCIAL ANALYSIS OF WATER SUPPLY

YEAR	B.A.N.	C.C. BONDS	REVENUES	CONST&FIN COST	OM&R	PRNCPL RETIRED	COMPOUND COUPON	PRNCPL OUTSTDG	INITIAL BALANCE	INTEREST @10%	RESERVE BALANCE
-2	52.70			-20.50				52.70	32.20	3.22	35.42
-1				-15.75				52.70	19.67	1.97	21.64
0	-70.14	70.14		-16.54				70.14	5.10	0.51	5.61
1			7.31		-3.47	-3.24	-0.32	66.91	5.89	0.59	6.48
2			8.06		-3.77	-3.86	-0.81	63.05	6.10	0.61	6.71
3			8.87		-4.08	-3.91	-1.29	59.14	6.30	0.63	6.93
4			9.74		-4.42	-3.95	-1.83	55.19	6.46	0.65	7.11
5			10.67		-4.78	-3.97	-2.42	51.22	6.60	0.66	7.26
6			11.67		-5.17	-3.99	-3.08	47.23	6.69	0.67	7.36
7			12.74		-5.58	-3.99	-3.79	43.24	6.74	0.67	7.42
8			13.89		-6.03	-3.99	-4.56	39.25	6.73	0.67	7.40
9			15.13		-6.50	-3.98	-5.40	35.27	6.65	0.67	7.32
10			16.45		-7.00	-3.96	-6.31	31.31	6.50	0.65	7.15
11			17.87		-7.54	-3.94	-7.29	27.38	6.25	0.62	6.87
12			18.89		-8.12	-3.73	-7.98	23.65	5.94	0.59	6.53
13			19.97		-8.73	-3.54	-8.67	20.11	5.55	0.56	6.11
14			21.10		-9.39	-3.35	-9.38	16.75	5.09	0.51	5.60
15			22.30		-10.08	-3.18	-10.10	13.57	4.54	0.45	4.99
16			23.57		-10.83	-3.01	-10.83	10.56	3.88	0.39	4.27
17			24.91		-11.62	-2.86	-11.58	7.70	3.12	0.31	3.43
18			26.32		-12.47	-2.71	-12.35	5.00	2.22	0.22	2.44
19			27.81		-13.37	-2.57	-13.13	2.43	1.19	0.12	1.31
20			29.39		-14.33	-2.43	-13.93	0.00	0.00	0.00	0.00
			346.69			-70.15	-135.08				

(63% BENEFIT CAPTURE RATE)

TABLE VI-5

FINANCIAL ANALYSIS OF WATER SUPPLY FEATURES FOR AN UNREGULATED WATER COMPANY

YEAR	REVENUES	CNST&FIN COST	OM&R	PROP. TAX	INTEREST ON DEBT	PRNCPL PMTS	CASH FLOW	NEW DEBT	NET CASHFLOW	DEBT PRNCPL	A.C.R.S.	DEDUC-TIONS	TAXABLE INCOME	TAX CREDIT	TAX	AFTER TAX RETURN	P.V. A.T.R.
-2		-20.50					-20.50	-16.40	-4.10	-16.40		0.00	0.00	2.05	2.05	-2.05	-2.05
-1		-15.75		-0.21	-1.97		-17.93	-12.60	-5.33	-29.00		-2.18	-2.18	1.58	2.58	-2.75	-2.46
0		-16.54		-0.38	-3.48		-20.40	-13.23	-7.17	-42.23		-3.86	-3.86	1.65	3.43	-3.74	-2.98
1	6.26		-3.47	-0.53	-5.07	-0.59	-3.39		-3.39	-41.65	-7.92	-16.99	-10.73		4.93	1.54	1.10
2	6.91		-3.77	-0.53	-5.00	-0.66	-3.05		-3.05	-40.99	-11.61	-20.91	-14.00		6.44	3.40	2.16
3	7.59		-4.08	-0.53	-4.92	-0.74	-2.67		-2.67	-40.25	-11.09	-20.62	-13.02		5.99	3.32	1.88
4	8.34		-4.42	-0.53	-4.83	-0.82	-2.27		-2.27	-39.43	-11.09	-20.87	-12.53		5.76	3.50	1.77
5	9.13		-4.78	-0.53	-4.73	-0.92	-1.83		-1.83	-38.51	-11.09	-21.13	-12.00		5.52	3.69	1.67
6	9.99		-5.17	-0.53	-4.62	-1.03	-1.37		-1.37	-37.48		-10.32	-0.33		0.15	-1.21	-0.49
7	10.91		-5.58	-0.53	-4.50	-1.16	-0.86		-0.86	-36.32		-10.61	0.30		-0.14	-1.00	-0.36
8	11.90		-6.03	-0.53	-4.36	-1.30	-0.31		-0.31	-35.02		-10.92	0.98		-0.45	-0.77	-0.25
9	12.95		-6.50	-0.53	-4.20	-1.45	0.27		0.27	-33.57		-11.23	1.72		-0.79	-0.52	-0.15
10	14.09		-7.00	-0.53	-4.03	-1.63	0.90		0.90	-31.95		-11.56	2.53		-1.16	-0.26	-0.07
11	15.30		-7.54	-0.53	-3.83	-1.82	1.58		1.58	-30.12		-11.91	3.40		-1.56	0.01	0.00
12	16.17		-8.12	-0.53	-3.61	-2.04	1.87		1.87	-28.09		-12.26	3.91		-1.80	0.07	0.02
13	17.10		-8.73	-0.53	-3.37	-2.28	2.18		2.18	-25.80		-12.63	4.46		-2.05	0.13	0.02
14	18.07		-9.39	-0.53	-3.10	-2.56	2.50		2.50	-23.24		-13.01	5.06		-2.33	0.17	0.03
15	19.10		-10.08	-0.53	-2.79	-2.86	2.83		2.83	-20.38		-13.40	5.69		-2.62	0.21	0.03
16	20.18		-10.83	-0.53	-2.45	-3.21	3.17		3.17	-17.17		-13.81	6.38		-2.93	0.24	0.03
17	21.33		-11.62	-0.53	-2.06	-3.59	3.52		3.52	-13.58		-14.21	7.11		-3.27	0.25	0.03
18	22.53		-12.47	-0.53	-1.63	-4.02	3.88		3.88	-9.55		-14.63	7.91		-3.64	0.24	0.03
19	23.81		-13.37	-0.53	-1.15	-4.51	4.26		4.26	-5.04		-15.05	8.77		-4.03	0.23	0.02
20	25.16		-14.33	-0.53	-0.61	-5.05	4.64		4.64	0.00		-15.47	9.69		-4.46	0.19	0.02
SUM:	296.83 (54% BENEFIT CAPTURE RATE)				-76.29	-42.24								INTERNAL RATE OF RETURN:		0.12	

TABLE VI-6

FINANCIAL ANALYSIS OF WATER SUPPLY FEATURES FOR A FINANCE LEASE

	PUBLIC LESSEE:			PRIVATE LESSOR:													
YEAR	REVENUES	OM&R	LEASE & PURCHASE PMTS	LEASE & SALE REVENUES	CNST&FIN COST	PROPERTY TAX	INTEREST ON DEBT	PRNCPL PMTS	CASH FLOW	NEW DEBT	NET CASHFLOW	DEBT PRNCPL	A.C.R.S.	DEDUC-TIONS	TAXABLE INCOME	TAX	AFTER TAX RETURN	P.V. A.T.R.
-2					-20.50	-0.21			-20.71	-16.40	-4.31	-16.40		-0.21	-0.21	0.10	-4.21	-4.21
-1					-15.75	-0.38	-1.97		-18.10	-12.60	-5.50	-29.00		-2.35	-2.35	1.08	-4.42	-3.89
0					-16.54	-0.53	-3.48		-20.55	-13.23	-7.32	-42.23		-4.01	-4.01	1.84	-5.47	-4.25
1	7.31	-3.47	-3.84	3.84		-0.53	-5.07	-0.59	-2.34		-2.34	-41.65	-7.92	-13.52	-7.68	4.45	2.11	1.44
2	8.06	-3.77	-4.30	4.30		-0.53	-5.00	-0.66	-1.89		-1.89	-40.99	-11.61	-17.14	-12.85	5.91	4.02	2.42
3	8.87	-4.08	-4.79	4.79		-0.53	-4.92	-0.74	-1.40		-1.40	-40.25	-11.09	-16.53	-11.75	5.40	4.01	2.13
4	9.74	-4.42	-5.31	5.31		-0.53	-4.83	-0.82	-0.87		-0.87	-39.43	-11.09	-16.45	-11.13	5.12	4.25	1.99
5	10.67	-4.78	-5.88	5.88		-0.53	-4.73	-0.92	-0.30		-0.30	-38.51	-11.09	-16.35	-10.46	4.81	4.51	1.86
6	11.67	-5.17	-6.50	6.50		-0.53	-4.62	-1.03	0.31		0.31	-37.48		-5.15	1.35	-0.62	-0.31	-0.11
7	12.74	-5.58	-7.16	7.16		-0.53	-4.50	-1.16	0.97		0.97	-36.32		-5.03	2.13	-0.98	-0.01	0.00
8	13.89	-6.03	-7.87	7.87		-0.53	-4.36	-1.30	1.68		1.68	-35.02		-4.89	2.98	-1.37	0.31	0.09
9	15.13	-6.50	-8.63	8.63		-0.53	-4.20	-1.45	2.45		2.45	-33.57		-4.73	3.90	-1.79	0.65	0.16
10	16.45	-7.00	-9.45	9.45		-0.53	-4.03	-1.63	3.26		3.26	-31.95		-4.56	4.89	-2.25	1.02	0.22
11	17.87	-7.54	-10.33	10.33		-0.53	-3.83	-1.82	4.14		4.14	-30.12		-4.36	5.96	-2.74	1.40	0.27
12	18.89	-8.12	-10.77	10.77		-0.53	-3.61	-2.04	4.59		4.59	-28.09		-4.14	6.63	-3.05	1.54	0.26
13	19.97	-8.73	-11.23	11.23		-0.53	-3.37	-2.28	5.05		5.05	-25.80		-3.90	7.33	-3.37	1.68	0.25
14	21.10	-9.39	-11.71	11.71		-0.53	-3.10	-2.56	5.53		5.53	-23.24		-3.63	8.09	-3.72	1.81	0.24
15	22.30	-10.08	-12.22	12.22		-0.53	-2.79	-2.86	6.03		6.03	-20.38		-3.32	8.90	-4.09	1.94	0.23
16	23.57	-10.83	-12.74	12.74		-0.53	-2.45	-3.21	6.55		6.55	-17.17		-2.98	9.76	-4.49	2.06	0.21
17	24.91	-11.62	-13.28	13.28		-0.53	-2.06	-3.59	7.10		7.10	-13.58		-2.59	10.69	-4.92	2.18	0.20
18	26.32	-12.47	-13.85	13.85		-0.53	-1.63	-4.02	7.66		7.66	-9.55		-2.16	11.69	-5.38	2.29	0.18
19	27.81	-13.37	-14.44	14.44		-0.53	-1.15	-4.51	8.25		8.25	-5.04		-1.68	12.76	-5.87	2.38	0.17
20	29.39	-14.33	-15.05	15.05		-0.53	-0.61	-5.05	8.87		8.87	0.00		-1.14	13.92	-6.40	2.47	0.15

INTERNAL RATE OF RETURN: 0.11

TABLE VI-7

FINANCIAL ANALYSIS OF WATER SUPPLY FEATURES FOR A CONDITIONAL SALE LEASE

	PUBLIC LESSEE:					PRIVATE LESSOR:												
YEAR	INTEREST REVENUES		OM&R	LEASE & SALE PMTS	R.A.N. PRNCPL	NONTAXED REVENUES	TAXED REVENUES	CNST&FIN COST	PROPERTY TAX	INTEREST ON DEBT	PRNCPL PMTS	CASH FLOW	NEW DEBT	NET CASHFLOW	DEBT PRNCPL	DEDUC-TIONS	TAXABLE INCOME	TAX	AFTER TAX RETURN
-2								20.50	-0.21			-20.71	-16.40	-4.31	-16.40	-0.21	-0.21	0.10	-4.21
-1								-15.75	-0.38	-1.97		-18.10	-12.60	-5.50	-29.00	-2.35	-2.35	1.08	-4.42
0								-16.54	-0.53	-3.48		-20.55	-13.23	-7.32	-42.23	-4.01	-4.01	1.84	-5.47
1		7.31	-3.47	-5.07	-1.23	5.07	0.00		-0.53	-5.07	-0.59	-1.12		-1.12	-41.65	-5.60	-5.60	2.58	1.46
2	-0.12	8.06	-3.77	-5.00	-2.05	5.00	0.00		-0.53	-5.00	-0.66	-1.19		-1.19	-40.99	-5.53	-5.53	2.54	1.36
3	-0.21	8.87	-4.08	-4.92	-2.39	4.92	0.00		-0.53	-4.92	-0.74	-1.27		-1.27	-40.25	-5.45	-5.45	2.51	1.24
4	-0.24	9.74	-4.42	-4.83	-2.14	4.83	0.00		-0.53	-4.83	-0.82	-1.35		-1.35	-39.43	-5.36	-5.36	2.47	1.11
5	-0.21	10.67	-4.78	-4.73	-1.21	4.73	0.00		-0.53	-4.73	-0.92	-1.45		-1.45	-38.51	-5.26	-5.26	2.42	0.97
6	-0.12	11.67	-5.17	-5.17	0.00	4.62	0.55		-0.53	-4.62	-1.03	-1.01		-1.01	-37.48	-5.15	-4.60	2.12	1.10
7	0.00	12.74	-5.58	-7.16	0.00	4.50	2.66		-0.53	-4.50	-1.16	0.97		0.97	-36.32	-5.03	-2.37	1.09	2.06
8	0.00	13.89	-6.03	-7.87	0.00	4.36	3.51		-0.53	-4.36	-1.30	1.68		1.68	-35.02	-4.89	-1.38	0.63	2.32
9	0.00	15.13	-6.50	-8.63	0.00	4.20	4.43		-0.53	-4.20	-1.45	2.45		2.45	-33.57	-4.73	-0.31	0.14	2.59
10	0.00	16.45	-7.00	-9.45	0.00	4.03	5.42		-0.53	-4.03	-1.63	3.26		3.26	-31.95	-4.56	0.86	-0.40	2.87
11	0.00	17.87	-7.54	-10.33	0.00	3.83	6.49		-0.53	-3.83	-1.82	4.14		4.14	-30.12	-4.36	2.13	-0.98	3.16
12	0.00	18.89	-8.12	-10.77	0.00	3.61	7.16		-0.53	-3.61	-2.04	4.59		4.59	-28.09	-4.14	3.01	-1.39	3.20
13	0.00	19.97	-8.73	-11.23	0.00	3.37	7.86		-0.53	-3.37	-2.28	5.05		5.05	-25.80	-3.90	3.96	-1.82	3.23
14	0.00	21.10	-9.39	-11.71	0.00	3.10	8.62		-0.53	-3.10	-2.56	5.53		5.53	-23.24	-3.63	4.99	-2.30	3.23
15	0.00	22.30	-10.08	-12.22	0.00	2.79	9.43		-0.53	-2.79	-2.86	6.03		6.03	-20.38	-3.32	6.11	-2.81	3.22
16	0.00	23.57	-10.83	-12.74	0.00	2.45	10.29		-0.53	-2.45	-3.21	6.55		6.55	-17.17	-2.98	7.32	-3.37	3.19
17	0.00	24.91	-11.62	-13.28	0.00	2.06	11.22		-0.53	-2.06	-3.59	7.10		7.10	-13.58	-2.59	8.63	-3.97	3.13
18	0.00	26.32	-12.47	-13.85	0.00	1.63	12.22		-0.53	-1.63	-4.02	7.66		7.66	-9.55	-2.16	10.06	-4.63	3.04
19	0.00	27.81	-13.37	-14.44	0.00	1.15	13.29		-0.53	-1.15	-4.51	8.25		8.25	-5.04	-1.68	11.62	-5.34	2.91
20	0.00	29.39	-14.33	-15.05	0.00	0.61	14.45		-0.53	-0.61	-5.05	8.87		8.87	0.00	-1.14	13.31	-6.12	2.75

INTERNAL RATE OF RETURN: 0.11

TABLE VI-8

FINANCIAL ANALYSIS OF WATER SUPPLY FEATURES FOR A REGULATED UTILITY

YEAR	WATER REVENUES	INTEREST ON BAL.	CNST&FIN COST	B.A.N.	BONDS	INTEREST ON DEBT	O&M&R	CASH FLOW	A.C.R.S.	DEDUC-TIONS	TAXABLE INCOME	TAX CREDIT	TAX	BALANCE	DEBT RESERVE	SINKING FUND	FINAL BALANCE
-2			-20.50	46.35				25.85		0.00	0.00	2.05	2.05	27.90	3.71		24.19
-1		3.35	-15.75					-12.40		0.00	3.35	1.58	0.03	15.53	3.71		11.82
0		1.86	-16.54	-46.35	65.12	-18.77		-14.68		-18.77	-16.90	1.65	9.43	10.29	5.21	0.90	4.17
1	6.80	1.23				-7.81	-3.47	-3.25	-2.64	-13.93	-5.89		2.71	9.74	5.21	1.92	2.62
2	7.50	1.17				-7.81	-3.77	-2.92	-5.28	-16.86	-8.19		3.77	10.60	5.21	3.05	2.34
3	8.24	1.27				-7.81	-4.08	-2.38	-4.75	-16.65	-7.13		3.28	11.50	5.21	4.32	1.97
4	9.05	1.36				-7.81	-4.42	-1.81	-4.22	-16.46	-6.03		2.77	12.47	5.21	5.74	1.51
5	9.92	1.50				-7.81	-4.78	-1.19	-3.70	-16.29	-4.88		2.25	13.52	5.21	7.33	0.98
6	10.84	1.62				-7.81	-5.17	-0.52	-3.70	-16.68	-4.21		1.94	14.95	5.21	9.12	0.62
7	11.84	1.79				-7.81	-5.58	0.24	-3.17	-16.57	-2.93		1.35	16.53	5.21	11.12	0.20
8	12.92	1.98				-7.81	-6.03	1.06	-3.17	-17.01	-2.11		0.97	18.56	5.21	13.35	0.00
9	14.06	2.23				-7.81	-6.50	1.98	-3.17	-17.48	-1.19		0.55	21.08	5.21	15.86	0.01
10	15.29	2.53				-7.81	-7.00	3.01	-3.17	-17.99	-0.16		0.07	24.16	5.21	18.67	0.29
11	16.62	2.90				-7.81	-7.54	4.16	-3.17	-18.53	0.99		-0.46	27.86	5.21	21.81	0.84
12	17.56	3.34				-7.81	-8.12	4.97	-3.17	-19.10	1.80		-0.83	32.01	5.21	25.33	1.46
13	18.56	3.84				-7.81	-8.73	5.85	-3.17	-19.71	2.69		-1.24	36.62	5.21	29.28	2.14
14	19.62	4.39				-7.81	-9.39	6.81	-3.17	-20.37	3.64		-1.68	41.76	5.21	33.69	2.86
15	20.73	5.01				-7.81	-10.08	7.84	-3.17	-21.07	4.68		-2.15	47.45	5.21	38.64	3.60
16	21.91	5.69				-7.81	-10.83	8.96		-18.65	8.96		-4.12	52.29	5.21	44.18	2.90
17	23.15	6.27				-7.81	-11.62	9.99		-19.44	9.99		-4.60	57.68	5.21	50.39	2.09
18	24.46	6.92				-7.81	-12.47	11.10		-20.28	11.10		-5.11	63.68	5.21	57.34	1.13
19	25.85	7.64				-7.81	-13.37	12.31		-21.19	12.31		-5.66	70.33	5.21	65.12	0.00
20	27.31	8.44			-65.12	-7.81	-14.33	-51.51		-22.15	13.61		-6.26	12.55			12.55
SUM:	322.25 (59% BENEFIT CAPTURE RATE)				-65.12	-156.28											

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APPENDIX A

WORK UNIT DESCRIPTION

WATER PROJECT FINANCING AND COST RECOVERY BY NON-FEDERAL SPONSORS

OBJECTIVE: For each type of water project output identify and describe the financing and cost recovery techniques which minimize risk and cost, are specific to beneficiaries, and minimize the institutional constraints faced by each type of sponsor.

APPROACH:

1. Identify cost recovery techniques for each type of project output, with emphasis on fees, charges and taxes specific to beneficiaries. For each combination of techniques and outputs evaluate administrative cost and feasibility and the risk that anticipated revenues will not be recovered.

2. Identify financing techniques for each type of project output. Include general obligation bonds, limited liability bonds, leasing and privatization. For each financing technique, evaluate variations in debenture marketing method and maturity, time profile of coupon payments and other features which affect financing cost, and evaluate the impact of cost recovery risk on financial feasibility. Describe the mechanisms of non-Federal financing vis-a-vis Federal authorization, appropriations, construction and operation.

3. Evaluate the institutional and financial feasibility of financing techniques in relation to sponsor financing capability. Include consideration of sponsor size, bond rating, debt limits, referendum requirements, organization and authorities. Evaluate the availability, cost and effectiveness to each type of sponsor of measures to spread or insure against risk.

4. Identify and describe examples of innovative financing and beneficiary-specific cost recovery by non-Federal sponsors.

5. Describe evaluation techniques to ascertain financial feasibility of projects. Identify data and analysis needed to support the formulation of project financing strategies and the reasonable administration of cost recovery.

END