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Institutional Arrangements and Financing Alternatives for State and Local Water Programs

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Technical Completion Report Research Project G-893-06

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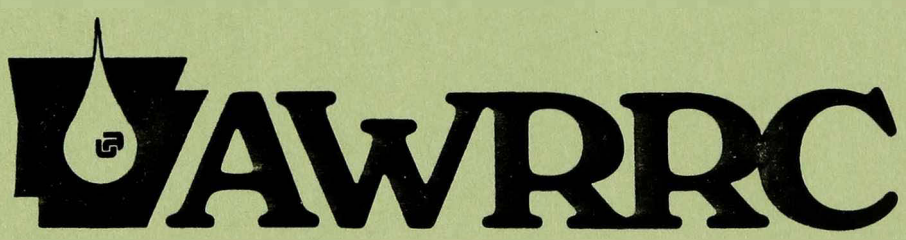

Arkansas Water Resources Research Center

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A B S T R A C T

INSTITUTIONAL ARRANGEMENTS AND FINANCING ALTERNATIVES FOR STATE AND LOCAL WATER PROGRAMS

This study analyzes alternative institutional arrangements and financing alternatives for water projects at the state and local levels with particular emphasis on Arkansas. Because most water projects are financed with debt it concentrates on alternatives which can reduce the cost of debt and/or result in more efficient use of existing facilities. Specific state options considered include grants, loans, revolving funds, debt guarantee, bond insurance, bond bank, statutory and regulatory reform of water laws and water-related institutions, and planning and technical assistance. Specific local options include use of taxes and bonds including creative financing, user fees, leasing, privitization, and financial planning.

Joseph A. Ziegler

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Keywords -- Financing/Cost Sharing/Water Costs/Economic Efficiency/ Bond Issues/User Charges

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INTRODUCTION

The administration of President Reagan has proposed a Water Resources Policy which places greater responsibilities on non-federal sources of financing to pay an increased share of the costs of project studies, construction, and operation and maintenance. In October 1983 Major John Wall of the U.S. Army Corps of Engineers proposed 100 percent non-federal financing of projects with fully vendible outputs (e.g., hydropower, municipal and industrial water supply), 50 percent of projects for recreation, and 35 percent for irrigation and flood control (Hydata, March 1984). The policy has been modified since October and might be considered flexible in light of the Congressional deadlock. However, the intent of President Reagan's administration to increase cost-sharing of non-federal sources of financing is clear.

Although the policy of increased cost-sharing has been justified on various grounds, it leaves unanswered the question of specifically how state and local governments can meet their additional responsibilities. Historically, the Federal government has financed substantial shares of state and local water project costs. Increased cost-sharing will impact not only the number and kinds of such projects undertaken, but also decisions relating to the more efficient use of existing facilities and resources. It places an additional financial burden on state and local governments and necessitates development of appropriate institutional arrangements and financial alternatives. Some states have already created new

water development programs in response to the continuing decline in federally funded water development projects. In Florida, for example, Water Management Districts are authorized to levy ad valorem taxes in order to finance local water projects. Local water supply capital funds have been created from a real estate transfer tax aimed at financing newly created demand for water resources services by incoming residents. Montana financed a water development fund created in 1981 from mineral royalties and portions of a coal severance tax. Pennsylvania, and more recently Arkansas, have sold bonds to establish similar funds. Approximately thirty states now have programs ranging from grants and loans to special taxes and user fees to support water development projects.

The ability of local governments to raise revenue is more limited than the ability of state governments. Within the state of Arkansas constitutional provisions limit revenue raising capability of local governments more so than in most other states. Additional constraints are faced by small and rural areas because of low tax bases. Given these constraints the ability of local areas to provide needed water projects is curtailed severely under the proposed policy of increased cost-sharing. The provision of these projects will depend on whether existing alternatives can be used more efficiently and appropriate new arrangements and alternatives can be found.

A. Purpose and Objectives

The purpose of this study is to analyze alternative institu-

tional arrangements and financing alternatives for water projects within the state of Arkansas. The specific objectives of the proposed study are to:

a. Identify existing institutional arrangements and financing alternatives for water projects within the state of Arkansas.
b. Identify present and proposed institutional arrangements and financing alternatives for water projects in other states.
c. Evaluate these arrangements and alternatives with respect to their efficiency and equity in funding water projects.
d. Identify and evaluate other arrangements and alternatives which are neither used presently nor proposed by other states, but which might be applied to water projects.

B. Related Research or Activities

This study identifies existing institutional arrangements and financing capabilities of Arkansas' state and local governments as well as other arrangements and alternatives to provide water projects. It analyzes them with respect to economic efficiency and equity and investigates the advantages of the various alternatives. Ideally, efficiency and equity are best attained when beneficiaries of the specific project pay its costs. While it is less difficult to identify beneficiaries for some types of water projects which generate marketable water resources benefits (e.g., municipal, agricultural, and industrial water supply and waste treatment), it is more difficult to identify beneficiaries of projects which generate benefits which are not easily marketed (e.g., fish and wildlife

enhancement, flood control, and area redevelopment).

This project compares and constrasts the efficiency and equity of various arrangements and alternatives. It includes an analysis of alternatives to defer major capital investments, e.g., reductions in demand through conservation, load management techniques, and improved sequencing of capital projects. In addition, rate structures and creative bond financing alternatives are analyzed. The latter include the establishment of a bond bank or the use of bonds such as tender-option bonds, zero-coupon bonds, floating-coupon bonds, etc., in place of the more traditional serial bonds. These relatively new bond financing alternatives are designed primarily to enhance the marketability of bonds, a factor which is particularly important for relatively small local areas which often have difficulty floating their bonds. Alternatives are not limited to those mentioned previously; others are identified within the course of study and analyzed with respect to efficiency and equity. Relative advantages of each are also noted.

METHODS AND PROCEDURES

The research procedures which were utilized in fulfilling the objectives of this study include:

a. Existing sources of published information were examined to determine present institutional arrangements and financing alternatives for water projects. In addition, agencies and organizations with significant responsibilities in water were contacted. These included Arkansas Soil and Water Conservation Commission,

Arkansas Waterways Commission, Arkansas Department of Pollution Control and Ecology, Arkansas Geological Commission, Arkansas Public Service Commission, Arkansas Department of Local Services, Water Resources Research Center, and the U.S. Army Corps of Engineers. The Governor's Office, Arkansas Legislative Council, and other agencies were contacted about information regarding existing financing alternatives.

b. Information regarding existing and proposed institutional arrangements and financing alternatives in other states were gathered from published information as well as surveys of appropriate state agencies. These agencies were identified with the help of Arkansas Water Resources Research Center.

c. Existing and proposed arrangements and alternatives were analyzed with respect to economic efficiency and equity. Economic efficiency requires that the dollar value of benefits to the economy flowing from the project be greater than the value of goods foregone by individuals in order to construct and operate the project. Alternatives were analyzed with respect to the extent they were likely to result in efficient funding of projects. This analysis included consideration of anticipated size, composition, and timing of various water projects since these factors can affect efficiency.

Alternatives also were analyzed with respect to equity, i.e., the extent to which the costs of the projects are borne by both present and future beneficiaries.

d. Additional arrangements and alternatives not identified in (a) and (b) were determined from a review of published literature and in consultation with experts in water resources management and state and local financing. Emphasis was placed on identifying arrangements and alternatives for capital improvement projects in addition to mechanisms which promote more efficient use of existing resources.

PRINCIPLE FINDINGS AND SIGNIFICANCE

General Framework of Analysis

Generally speaking, water and water-related projects are financed on either a pay-as-you go or pay-as-you use basis. Pay-as-you go financing means that the costs of the project are paid as the project is completed even though it may have a useful life of 30 years. It is equivalent to paying for a house on a cash basis. Pay-as-you use financing, on the other hand, means that costs are paid over the life of the project. It is equivalent to borrowing money and paying off the loan during the expected lifetime of the project.

Pay-as-you use, or debt finance, is preferred to pay-as-you use financing of water projects for several distinct reasons. The use of debt permits those who will benefit from water projects to pay for them, facilitating the acquisition of more capital than would be possible out of current revenue alone. Also, to the extent that expenditure needs vary annually, debt financing permits the impact on government budgets to be spread out more evenly by sche-

duling repayments so that they do not fluctuate radically from year to year.

Local governments in Arkansas generally shy away from issuing debt to finance their services. This situation reflects constitutional and statuatory limitation (including low interest rate ceilings on certain types of bonded indebtedness and millage restrictions), but is might also reflect conventional wisdom with respect to what is regarded as sound financial management, i.e., if borrowing is kept to a minimum it holds down interest costs, avoids leaving debt service costs to those living in the area in future years, and enhances the bond rating of the community in the eyes of the investors.

In many, if not most cases, however, debt financing of capital improvements is fully compatible with conservative management practices. The benefits associated with the construction or upgrading of a local water project, for example, will accrue over a long period of time. In fairness to the taxpayers, the total cost of the project should not be charged to those who happen to live in the area during the short time during which the project is being financed. The issuance of the debt permits the cost of the water project to be shared with those who will be using it in future years.

This report is based on the premise that issuance of debt is the most appropriate method to finance long term water projects and that state and local governments would prefer to avoid additional

financing costs completely or reduce them. Given this premise, the financing problem is seen as one that either reduces the cost of debt and/or results in more efficient use of existing facilities. As we shall see later these are not mutually exclusive points. Looking at the financing and institutional alternatives from this perspective, however, makes a very complex problem managable. In the remainder of this section we will examine the main factors that affect the cost of the debt issued by state and local governments. This understanding is necessary in order to evaluate the policy options of state and local governments. These options are the subject matter of the following two sections.

Types of Debt. Debt is issued by the state and local governments in the form of bonds. The two general types of bonds issued are general obligation and revenue bonds. These bonds differ primarily in what is pledged as security for repayment. The primary security for general obligation bonds is the full faith and credit of the issuing government. This includes their abilities to tax as well as charge rates for the output of the project which is financed with the debt. Historically, this has been the traditional method of financing small municipally-owned water systems throughout the United States. The primary security for revenue bonds is the stream of payments from the output of the water project financed with the proceeds of the bond.

In addition to general obligation and revenue bonds there has been increased reference in recent years to zero-coupon bonds,

stepped-coupon bonds, tender-option bonds and so on. These bonds are really specific types of either general obligation or revenue bonds that are meant to appeal to a diversified market of potential bond buyers. They are generally lumped under the term "creative finance" and will be discussed more extensively later.

The two primary factors that influence the cost of a bond are the bond rating and how the bond is marketed. It is instructive to examine how each of these factors are determined and how they affect the cost of a debt issue.

Bond Rating. A bond rating is an independent assessment of the creditworthiness of a proposed bond issue. It reflects how the marketplace perceives the risk of default associated with a particular issue. Bonds are rated by two major agencies, i.e., Moody's Investors Service, Inc. and Standard and Poors Corporation. Not all bonds are rated, particularly smaller issues, but bonds that are rated appeal to a wider national market. Because of the large number of bonds issued each year, investors rely on bond ratings to provide information about the creditworthiness of a particular issue. Then, too, some large investors in bonds, like retirement funds, cannot purchase bonds which have not been rated investment grade.

Before investigating the complex process by which bonds are rated, let us see how bond ratings affect bond yields and how these in turn affect the cost of the bond. Investment grade bonds are rated as follows: AAA-this is the highest rating and suggests that

the capacity of the issuing agency to pay interest and principal is extremely strong; AA-capacity to pay interest and principal is very strong; A-capacity to pay is strong but susceptible to a change in economic conditions; and finally BBB (Standard and Poors) or BAA (Moody's)-adequate capacity but even more susceptiable to changing economic conditions.

Table 1 shows how the bond rating affects the yield. Note that higher bond ratings mean lower yields. In 1981, for example,

TABLE 1

Yields on New Issues of 20-Year Municipal Bonds

Year and Type of Issue	Bond Rating			
	AAA	AA	A	BAA
Revenue bond				
1978	5.67	6.00	6.24	6.33
1979	6.04	6.42	6.47	6.62
1980	7.72	8.22	8.38	*
1981	10.67	11.25	11.86	11.93
General obligation				
1978	5.52	5.69	5.92	6.17
1979	6.02	6.05	6.27	6.53
1980	7.56	7.78	7.92	8.02
1981	10.67	10.93	10.97	11.47

*Not sufficient number of issues for source to compute a meaningful average.

Source: Smith, (1984), p. 61.

a municipality which issued an AAA revenue bond paid 58 basis points less to borrow a given amount of money than one that issued an AA rated bond (a basis point is equal to .01 of a percent). Although this difference may not seem like much because it is only a little

more than one-half percent difference, it turns out to be a significant difference in cost to the local government which must extend repayment over a long period of time.

This point is illustrated in Table 2 which show the economic value of saving basis points in terms of dollars per one thousand

TABLE 2

The Economic Value of Saving Basis Points
(Dollars per $1,000 Par Value)

Maturity	Basis Points*		
	10	40	70
10	6.71/5.65	26.84/22.60	46.87/39.55
15	8.56/6.81	34.23/27.24	59.92/47.68
20	9.82/7.47	39.27/29.88	68.73/52.29
25	10.67/7.84	42.70/31.37	74.72/54.90
30	11.26/8.06	45.03/32.22	78.80/56.39

*Entry above and below "/" indicates savings per $1,000 par value of bond at 8 percent and 12 percent market interest rates, respectively.

Source: Smith, (1984), p. 59.

dollars par value. The values in this table can be interpreted in the following way: a savings of 40 basis points on a 30 year bond enables an issuer to raise an additional 45.03 per $1,000 par value of its bonds at a prevailing interest rate of 8 percent. This means that in this situation the issuer would raise an additional $45,030 on a $1,000,000 par value bond. In other words, it would reduce its borrowing costs by 4.5 percent of the par value of the bond if it could save 40 basis points.

Of course, many other factors besides bond rating influence

yield and, hence, bond cost, but it has been shown that bond rating does affect yield. These other factors will be investigated later in this section but let us first examine how bond ratings are determined. As we shall see many of the factors which influence bond rating are controlled by state and local government and, hence, represent policy options in lowering the cost of debt to these governments.

Standard and Poors and Moodys do not state explicitly how they arrive at rating for a particular issue. Their criteria are general and, therefore, so will be our discussion of the rating process. Much of the material that follows is derived from Lamb and Rappaport (1980).

Rating of bonds involves analyzing the following questions:

1. What is the nature of the debt, i.e., what are the provisions of repayment and protection afforded by the relative positions of obligations in event of bankruptcy or reorganization?
2. What is the economic base of the jurisdiction?
3. What are the financial policies of the issuing government?
4. What are the administrative policies of the issuing government?

Nature of Debt. An analysis of the nature of debt involves an examination of debt policy (uses, purposes, and type of debt instrument, debt structures), plans for debt retirement (including the relation between the rate of its retirement and its purpose), debt

burden (gross and net debt, including the degree of overlapping debt, debt history and trend, including the community's intent to refund instead of retire its maturing bonds and/or fund operating deficits by issuing debt), and finally prospective borrowing (authorized but unissued debt as well as the future debt needs of the community issuing the debt). Generally, although all factors are important in determining a bond rating, the closer debt structure is to the useful life of the asset financed with debt and the less likely future debt will be issued that would impair repayment of existing debt, the higher the bond rating is likely to be.

Economic Base. According to Standard and Poors the most important aspects of a community's economic base which contribute to higher ratings are higher income levels and growth relative to the region and nation, diversified employment structure, higher educational levels, higher proportion of population in working years (18-65), higher rates of new construction activity, and finally more more maintained and younger housing stock.

The economic base is an important element in determining a bond rating because it helps assess a community's ability to pay its debt obligations. However, a community with a strong economic base doesn't necessarily receive a high bond rating. What is important here is the strength of the economic base relative to the nature of debt. In this respect the ratio of debt to assessed property values is used often to assess a community's ability to pay its debt. Generally, attractive communities from the standpoint of

public services and tax rates have high property tax assessments. Therefore, communities with a low ratio of debt to property values generally receive higher bond ratings because they possess a favorable combination of low future tax obligations to pay off their debt relative to a high tax base.

Financial Policies. Financial policies of communities are analyzed with respect to the following four questions (Smith, 1984):

1. How sensitive is the revenue structure to future changes in economic conditions?
2. Have revenue and expenditures been in balance over the years?
3. How much reliance is placed on federal or state aid?
4. Are revenue sources sufficiently diversified?

Generally, higher bond ratings are associated with community's that have diversified revenue structures that are relatively insensitive to economic downturns. Also, reliance on intergovernmental aid is viewed as a potential liability because it is not controlled by the issuing community and is more subject to unpredictable change.

Because revenue bonds are paid off from the proceeds of the project that they finance, their bond rating is based on additional information generally contained in a feasibility report which is included in the prospectus. Bond rating agencies will examine the estimated cost of the project, the nature of the technology used in the project, and the financial assumptions used, including the assumed borrowing cost, estimated cost of service for the project,

forecasted demand for the project output relative to historical demand, and the effect of price change on the demand for project output. They will examine such questions as the following: is the cost of the project reasonable relative to similar projects being financed, how much of the cost is under contract, what is the size of the contingency and reserve funds to cover unanticipated costs, is the assumed interest rate too low relative to market conditions, what effect will a change in interest rate have on the cost of the project output, and how will changes in project output pricing affect demand for output? This latter question is very important for water projects in light of what happened to the demand for energy during the preceding decade. In the early 1970's demand for electricity was thought to be inelastic, that is, relatively insensitive to price changes. Experience has shown, however, that while electricity demand is inelastic over the short term it is much more elastic over the long term. This is a particularly important point for water projects since most studies show water demand to be relatively inelastic. However, the price of water has not been subject to the rapid increases that the price of electricity was in the previous decade. There is reason to expect that over the long term, water demand may be more elastic than currently estimated, particularly if a water project necessitates raising prices in response to project costs. If water demand is elastic in the long term, raising prices will lower revenue collected and, thus, imperial the ability of the community to pay off its debt.

Administrative Policies. Sound administrative policies are those that result in a financial plan which clearly states the economic condition of the community and how it plans to retire its debt. Lack of such planning usually results in lower bond ratings because of suspected financial problems that may be masked by a poor plan. As we shall see in a later section, a sound financial plan not only helps to attain higher bond ratings but also is a critical step in assessing financing alternatives.

Marketing Bonds. One important consideration in marketing bonds is the state of the economy at the time the bond is issued. Economic conditions influence the bond market in two ways (Smith, 1984). First, economic downturns result in wider differentials between yield on U. S. government bonds and riskier bonds, and upturns result in narrower differentials. Second, apart from these business cycle effects, yields on municipal bonds relative to U. S. bonds increase as overall interest rates increase. The reason for these two relations is that economic downturns and high interest rates make it more difficult for municipalities to pay off their debt in the face of competing financial obligations (Yawitz, 1978).

Studies of municipal interest rates indicate that lower yields can be expected when the economy is growing rapidly and inflation rate is low than when the economy is growing slowly and inflation rate is high (Smith, 1984). Between 1955 and 1982, 90 percent of the variation in municipal bond yields can be explained by economic conditions and the interest rate. Obviously prudent financial plan-

ning which includes both an assessment of expected revenue needs relative to project outlays and an analysis of timing can result in substantial savings. Many local governments do not have the expertise to plan properly for the orderly and timely issue of debt. In this respect, states can provide technical assistance to help local governments. This is a topic which will be dealt with in greater detail in the next section.

Another source of help to local governments is the underwriters. Investment bankers and commercial banks act as underwriters to bond issues. That is, they generally help the issuer to sell its bonds by designing financing plans and matching buyers with sellers. Underwriters purchase the bonds from the issuer and resell them on the open market. In this sense the underwriter is a middleman who provides valuable services to the issuing government. Underwriters make their money by reselling the bonds at a higher price than they paid the issuer for them. Because state and local governments usually do not issue bonds on a regular basis they cannot market them as effectively as underwriters. Hence, for most state and local governments it is unlikely they could sell their bonds at the price underwriters can.

The difference between the price the underwriter pays for bonds and the price it sells the bonds is known as the spread. The spread is influenced by how large the bond issue is, the quality of the bond, number of underwriters bidding on the bond, and on the type of bond, i.e, whether revenue or general obligation (Smith, 1984).

Several generalizations can be made about the relationship between spread and the factors mentioned above. First, spread increases less than porportionately to issue size. In other words, there are economies of scale associated with the size of bond issues. Second, the spread on revenue bonds tends to be slightly greater than on general obligation bonds, other factors constant (Kessel, 1971). Third, spread increases as bond rating decreases for both revenue and general obligation bonds. Fourth, spread decreases as the number of bidders increases. That is, the greater the competition among underwriters to buy the bond the lower the spread and vice versa. Moreover, several authors have found that increasing the number of bidders can have a substantial effect on yield. If the number of bidders increases from one to two, 10 basis points can be saved. Increasing the number of bidders from two to four will save another 10 basis points (Kessel, 1971; Cagan, 1978; and Kidwell and Koch, 1982).

State Policy Options

The information presented in the previous section is a useful basis to develop policy options for both state and local governments. In this section we will analyze state options. Local options are the subject of the next section. We will analyze these options with respect to their efficiency and equity in either lowering the cost of credit to the issuing entity and/or using existing facilities more efficiently. In this section we will analyze the following state options: the use of general obligation and revenue

bonds to fund grants or loans to local governments, credit enhancements that include state guarantee of local debt, private bond insurance, letters of credit, lines of credit, and the establishment of bond banks, planning and technical assistance, and clarification of water rights. Finally, we will conclude this section with a survey of current state activities in these areas.

Grant and Loan Programs. Many states use the revenue collected from their bonds and general tax revenues to issue grants and loans to local governments for water projects of various kinds. The source, as well as the form, in which it is given to local governments affects both efficiency and equity. As discussed previously the use of current tax revenues to finance water projects tends to result in inequities with respect to both current vs. future beneficiaries and current beneficiaries vs. current taxpayers. Many water projects require substantial up-front capital, but generate benefits which accrue for many years after the project is completed. To finance these projects from tax revenue on a pay-as-you-go basis means that current taxpayers will pay substantially more relative to the benefits they receive than future taxpayers. This is equivalent to current taxpayers subsidizing future beneficiaries.

The use of tax revenue to finance water projects also results in subsidization of beneficiaries by current taxpayers who do not benefit from the project or benefit only marginally. For example, a flood control project that benefits only a portion of the community but yet is financed from taxes paid by all means that the

individuals that benefit from the project are being subsidized by those that do not. Of course, if this project were financed from special taxes that were paid only by the beneficiaries e.g., property taxes levied in an improvement district, this type of subsidization would not occur.

The use of tax revenue to finance projects which generate a vendible output is not very efficient. Projects which generate vendible outputs include water supply, sewer, irrigation, hydroelectricity, and navigation. These are projects where the primary beneficiary of the project is the user. To finance these projects from general tax revenues means that nonusers subsidize users. Besides being inequitable this arrangement lowers the price of the product to the user resulting in a use level which is inefficient. That is, because the user pays less than the cost of providing the service he uses more than if he had to pay the full cost. Put another way, the cost of providing the service is greater than the value of the benefit to the user. The use of user fees would mitigate the inequities and inefficiencies associated with this type of financing but because they are usually imposed at the local level they are discussed as a local option in the next section.

Bond financing of water projects tends to remove the inequities between current and future beneficiaries created when pay-as-you-use financing is used. The way this money is distributed, however, affects efficiency and equity. We will consider three ways in which a state can use the money derived from bond issues. These

include grants and loans to local governments and direct state control of projects.

The popularity of state loans and grants to local governments no doubt stems in part from the belief that local governments would not be able to afford expensive water projects, such as water supply or waste treatment plants, if they had to finance them from local revenue sources. This may very well be true, but states must realize that there are alternative ways to help localities fund these projects and the use of grants and loans may result in provision of unnecessarily expensive projects. Generally speaking, grant programs result in greater inefficiency than loan programs. The reason is that grants involve lower costs to the local government than loans and, consequently, tend to lead to larger scale projects than if the locality had to pay for a part or all of the financing costs (Hyman, 1981). Financing local water projects with state grants also tends to increase interest rate on bonds issued by local governments. The reason is that the local government becomes more dependent for its financial health on the actions and financial health of the state. This increases the perceived risk of default to the bond buyers and generally results in higher yields (Smith, 1984).

An idea which has become increasingly popular in recent years is the use of revolving funds to issue loans or grants to local governments. Revolving funds can be financed initially from a variety of sources, including bonds and general tax revenues. But no matter what their source of funding they do not tend to have the ad-

verse effects on bond yields that grants financed from other sources have. The reason for this difference is that revolving funds, once capitalized, tend to be insulated from political pressure. Thus, grants financed in this way are less subject to political whims. The position of the locality to repay its debt is not imperiled and the risk of default is not changed.

However, even though the use of revolving funds may not significantly affect a locality's cost of credit, to the extent it finances grants and low interest loans it can result in inefficient and inequitably financed projects as discussed previously. Indeed, evidence suggests that state grants and loans to local governments tend to result in increased spending for water projects unless these projects are financed with well designed user fees.

Another possible, but little used, option is for the state to undertake directly water projects. California used bonds to finance a water conveyance system which now covers much of the state. One issue which has been very controversial is the project's pricing policy which employs average historical cost instead of incremental replacement cost pricing. In an era of rising prices this means that prices are too low, i.e., the price users pay for water is less than the cost of providing it. This results in subsidization of new water development and, consequently, an increase in the yield necessary to obtain a given amount of credit. Put another way, it increases the financing costs of water projects (Hirschleifer, Dehaven, and Milliman, 1963).

California's pricing policy has been the subject of much debate and states that contemplate similar projects should learn from it. A pricing policy which subsidizes one group at the expense of another is likely to put the state in a serious, and politically divisive, debate about who should gain and who should lose from such a pricing policy. An alternative pricing scheme which more nearly correlates benefits with the costs to each user is less likely to be subject to such intense debate.

Credit Enhancements. One way the state can help localities directly reduce their costs of credit is through various types of credit enhancements. The credit enhancements we will discuss are state guarantee of local debt, purchase of private bond insurance, letters and lines of credit, and bond banks. Each of these are aimed at lowering credit costs but not all do so equally and some merely redistribute, rather than reduce, costs.

A state may choose to use its powers to guarantee the debt of its localities. In so doing, the credit rating of the state is generally substituted for that of the locality. As indicated earlier, higher bond ratings can mean a substantial saving in the cost of credit to the municipality. Localities whose bond ratings are as high or higher than the state's rating would not benefit from this arrangement. Moreover, although guarantees would improve the credit worthiness of some local issues it would do so at the risk of a deterioration in the state's rating (Peterson and Hough, 1983).

The state may also choose to use its resources to purchase

bond insurance for local issues. Bond insurance is purchased from a company such as the Municipal Bond Insurance Association (MBIA) or the American Municipal Bond Assurance Company (AMBAC) for a one-time fee that can range from 1 to 2 percent of the amount guaranteed depending on the creditworthiness of the issuer. The main advantage of a bond guarantee is that, unlike a state guarantee of debt which will change the bond rating of the locality to that of the state, bond insurance will result in an automatic AAA rating from Standard and Poors. Moody's does not upgrade their rating to reflect bond insurance.

The state may also consider as an option paying the fees of establishing a letter of credit for the bond issues of its localities. Letters of credit (LOC) pledge a bank's credit to pay debt service on an issuer's debt in return for an annual fee of ½ to 1 percent. In effect, the locality would purchase the bond rating of the bank which is usually rated at least AA. This arrangement doesn't make sense for every locality. In particular, it is not worthwhile if the annual fee exceeds the savings from lower yields. Although a locality that must pay for a LOC is unlikely to enter into this arrangement if its costs to obtain the LOC exceeds the savings in debt service, a locality that is financed from state funds is more likely to obtain a LOC even though it is uneconomic to do so. States which agree to purchase LOCs for its local governments must therefore put some safeguards to insure that costs do not exceed savings.

A line of credit is a more restricted type of support than a letter of credit. Whereas LOCs enhance an issuer's credit quality and liquidity, a line of credit merely enhances its liquidity. The basic difference stems from the fact that under a LOC the bank makes an irrevocable pledge to issue credit to the bond issuer should he need it to pay off the bond. If it becomes necessary to call upon the LOC because of insufficient cash flow a loan is created by the bank. This loan is generally made at a percent of prime but at a rate which generally exceeds the tax exempt rate. A line of credit, on the other hand, is not irrevocable. Banks do not have to extend credit if they deem the loan unacceptably risky. Although lines of credit are less expensive than LOC they don't enhance the credit rating (Peterson and Hough, 1983).

Some states have established bond banks to help localities reduce their cost of borrowing. In effect, these banks pool risks and underwriting costs, which theoretically is supposed to reduce borrowing costs. However, these banks have not worked this way in practice. At best, they appear to redistribute borrowing costs among municipalities. To understand why, we must understand the basic workings of a bond bank.

A bond bank floats bonds and, in turn, buys bonds of qualifying local governments. The security for the local bonds is pooled as security for the bank's bond issue. Usually, part of the sale of the bank's bond is used to establish a reserve fund and the remainder is distributed to the participating localities.

Bond banks diversify risks by pooling the bonds issued by local governments into a single portfolio. But this appears to be a relatively expensive way to achieve risk diversification (Kidwell and Rogoski, 1983). The reason bond banks do not diversity in an efficient manner is that they require all participating governments to receive the same interest rate even though they may face different capital costs. In other words, they do not allow the market to price the bonds issued by localities separately. This results in the cross-subsidization of localities with relatively low quality bonds by those with relatively high quality bonds. It has been estimated that bond banks reduce the borrowing costs of only low quality borrowers (BAA) and increase it for higher quality participants (Cole and Millar, 1982).

Planning and Technical Assistance. Many local governments are not equipped to undertake the necessary steps to efficiently plan and implement financing strategies to realize efficient and equitable funding of its water projects. This is an area where the state can provide invaluable assistance in helping the locality evaluate the economic and financial feasibility of planned projects in addition to helping it implement the plan. States currently engage in technical assistance and supervision programs designed to facilitate the issuance of bonds, to encourage responsible debt management, and to improve credit ratings. In addition, states can aid local governments that plan to "privitize" water projects, that is, they plan to transfer ownership or management to the private sec-

tor. This change is sufficiently complex at the local level to demand some assistance from the state. Whether a locality should pursue this as a means to provide low cost water facilities is a matter that will be discussed in the next section.

Statuatory and Regulatory Reform. States can examine their laws and regulations to see if they promote low cost financing of water projects. One important influence on the cost of credit is the specification of water rights within the state. It is important in determining the financial capacity of the local government to repay its outstanding debt obligations and, hence, is important in determining its bond rating.

Water rights are not often considered important determinant of financing costs but a secure and stable water supply, as defined by current water law, is necessary for low cost financing (Lamb and Rappaport, 1980). The material that follows discusses three current issues that can influence water costs, i.e., uncertainty of future water rights, definition and transferability of water rights, and voluntary water transfers. It relies heavily on the work of Smith (1984).

Many water projects have expected lifetimes of several decades, but uncertainty about who has the right to use the water can adversely affect financing costs that reflect the increased financial risks borne by the bond holders. An example of this uncertainty is the claim by Native Americans that their water use takes precedence over most others according to a 1908 Supreme Court case. Obviously

the uncertainty jeopardizes future water supply and with it, the capability of state and local governments to meet their financial obligations on projects involving this disputed water.

Two other aspects of water rights which are likely to reduce the cost of financing are the transferability of water rights and defining water rights in terms of consumptive use, rather than diversion. From an economic standpoint, permitting voluntary water transfers is likely to facilitate a more efficient allocation of water resources. If transfers are voluntary they will occur only when the value of the water to the prospective seller is less than the value of the water to the prospective buyer. Because water would be transferred from lower-valued to higher-valued uses, this transfer will result in increases in net benefits of the water project.

Flexibility to transfer water helps reduce financing costs in two ways. First, it helps to mitigate the financial risk from uncertainty. Like most other projections, the projections of water use over a long period of time are subject to error. For water projects this means that actual demand may not be equal to projected demand, i.e., the locality may find that it either has too much or too little water to satisfy its demands. If water transfers are permitted, however, this is less likely to happen because those jurisdictions with less demand than anticipated can sell to those with more demand.

Water transfers also improve the economic health of an area by

reducing the scale of water projects. They permit smaller scale water projects to satisfy the demands of prospective users by more efficiently allocating water among the users (DeHaven, 1963).

A serious concern about water transfers, and one that may impact on the communities ability to repay its debt, is that trade between two water users may adversely affect a third party that relies on return flow. If water transfers were permitted, and third parties were protected, financial risk of water investment would be lessened because localities would be assured that its water rights would not be diminished.

However, water law is not consistent in protecting return flows in a way that promotes economic efficiency (Meyers and Posner, 1971). It generally places responsibility on "upstream" users to maintain current water use if altering that use would reduce the water supply of another user. But this approach does not permit the gains from water transfer to be weighed against the gains from protecting the interests of third parties.

Defining water rights in terms of consumptive use rather than diversion alleviates this problem (Gisser and Johnson, 1981). The following example is extracted from Smith (1984). Suppose a small municipality diverts 1000 gallons per day from a river, 50 percent of which returns and becomes a 500 gallon water supply for an agricultural district. The municipality wishes to transfer 200 gallons a day to a new energy development with no return flow. If the transfer occurred, the agricultural district downstream would suffer a

loss of 100 gallons a day (200 gallons used by the energy development returns 100 gallons, while 200 gallons used by the energy development returns nothing). In this case, no portion of the municipality's diverted 1000 gallons per day could be resold without jeopardizing the rights of downstream users.

However, suppose that the municipality's rights were redefined in terms of consumptive use. The municipality would claim rights to consumptive use of 500 gallons per day. Now the water transactions involves the municipality transferring 100 gallons of consumptive use to the energy development - in place of the original 200 gallons of diversion, which represented a sacrifice of 100 gallons of consumptive use.

To protect the agricultural district's water rights, the municipality must reduce its water diversion by 100 gallons per day. The 100 gallons not diverted after the water transfer protects the agricultural district's 500 gallon daily water supply. The district would receive 400 gallons from return flows from the 800 gallons the municipality still diverts for satisfying its remaining rights to a consumptive use of 400 gallons per day. The district receives its remaining 100 gallons from the municipality's smaller diversions from the stream.

Water transfers become more expensive for the energy development project. Because it will have to purchase 200 gallons of consumptive use from the municipality if water rights are defined according to consumptive use. But this means that the transfer will

occur only if the value of water to the energy development project exceeds the value of the sacrificed water to the municipality and the cost of protecting the water rights of the agricultural district. Under this definition of water rights third party interests are protected but not at the expense of potential beneficial gains of water transfer.

Current State Activities. Previous material in this section discussed in general terms the options states face to reduce financing costs of water projects. We will now discuss what options states have exercised. Information was gathered from various public documents and a mail questionnaire.

The tables which follow show state grant and loan programs, the source of government financing for all water projects, and the extent of planning and technical assistance to local governments. A close examination of these exhibits reveals that states pursue a wide variety of programs in financing water projects. It is not the purpose of this report to evaluate the program of any state but rather to enumerate and evaluate the various options that states can pursue in financing water projects.

In summary, states can pursue a variety of options to finance water projects. These options include grants and loans, credit enhancements, planning and technical assistance, and reform of statutes defining water rights. Of these options, the most likely to reduce the cost of credit include credit enhancements, planning and technical assistance, and reform of statutes defining water rights.

TABLE 3

STATE AID TO LOCAL GOVERNMENTS FOR WATER DEVELOPMENT*

State	Sources of Funds for Grants/Loans					
	General Revenues	G. O. Bonds	Revenue Bonds	Bond Bank	Other**	Loan Guarantees
Alabama	X	X	X		X	
Alaska	X	X		X	X	X
Arizona	X					
Arkansas	X	X			X	
California		X				
Colorado	X	X			X	
Connecticut	X	X				X
Delaware						
Florida	X				X	
Georgia	X	X			X	X
Hawaii						
Idaho	X	X			X	
Illinois	X					
Indiana					X	
Iowa						
Kansas		X				
Kentucky						
Louisiana	X	X			X	
Maine	X	X		X	X	
Maryland		X			X	
Massachuetts		X			X	
Michigan					X	X
Minnesota	X					X
Mississippi						
Missouri	X					
Montana					X	X
Nebraska	X				X	
Nevada						
New Hampshire		X		X	X	
New Jersey		X			X	
New Mexico	X				X	
New York	X					
North Carolina		X			X	
North Dakota				X	X	
Ohio	X	X			X	X
Oklahoma			X		X	

TABLE 3 (Cont.)

State	Sources of Funds for Grants/Loans					
	General Revenues	G. O. Bonds	Revenue Bonds	Bond Bank	Other**	Loan Guarantees
Oregon		X				
Pennsylvania		X				
Rhode Island	X				X	
South Carolina						
South Dakota	X				X	
Tennessee		X				
Texas	X	X			X	
Utah	X	X			X	
Vermont		X		X	X	
Virginia					X	
Washington		X			X	
West Virginia	X					
Wisconsin	X	X				
Wyoming					X	

* This information may be incomplete becuase not all states responded to questionnaire.

**Includes special fees and taxes, user charges, and revolving fund.

Sources: U.S. Army Corps of Engineers (1984) and questionnaire.

TABLE 4

STATE CREDIT ASSISTANCE ACTIVITIES*

		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	MT	NE
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
	Maintain Data File		X		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		X			
	Provide Data to Issuers & Others		X		X	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					X
	Conduct Seminars or Conferences					X					X				X	X								X				

*

TABLE 4 (Cont.)

		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	24
	Maintain Data File	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		15
	Provide Data to Issuers & Others	X			X		X			X	X	X		X			X						X	X	23
	Help Evaluate Bids				X		X									X									8
	Issue Bulletins, Pamphlets, Manuals				X		X			X	X	X				X		X							12
	Conduct Seminars or Conferences	X					X			X	X	X				X							X		12

*This information may be incomplete because not all states responded to questionnare.

Source: U.S. Army Corps of Engineers (1984) and questionnaire.

Grants and loans, although very popular, are likely to increase the cost of financing and serve to redistribute costs among local governments particularly if they are financed with taxes. This is also true of state supported bond banks which are used to finance local water projects.

Local Policy Options

Most water projects are undertaken at the local level and in this section we analyze options that local governments might consider in funding these projects. In doing so we will address questions of both the economic and financial feasibility of funding particular projects. When the federal government played a more active role, it assumed the responsibility of determining the economic feasibility of a project, while state and local governments were primarily concerned with its financial feasibility. With the decline of federal support and the corresponding increase in state and local participation comes new responsibilities. In particular, state and local governments must now be concerned with the financial and economic feasibility of these projects. The suggested options that follow will address both of these questions. Options that will be considered include the use of bonds and creative financing, use of taxes, user fees, leasing, contracts, and financial planning. Not all options address both of these concerns and thus they should be viewed as parts of a plan to be determined by individual localities depending upon their particular circumstances and needs.

Bond Financing. Local governments can issue general obligation and revenue bonds just as the state can. And the same general comments about their effects apply also at the local level. That is, if these bonds are financed with taxes they tend to be inefficient and inequitable. They are inefficient because they tend to encourage the use of more resources than are necessary, i.e., they result in projects where the cost of providing the service exceeds the benefits. They are inequitable because the beneficiaries of the project pay less than its value to them while those who do not benefit pay more. The use of user fees to finance these bonds tends to lead to more efficiency and equity than the use of taxes. We will elaborate on this point later in this section when we discuss the appropriate use of these fees and their likely effects.

In recent years there has been increased interest and discussion of financing techniques that have come to be known as "creative financing". Generally, these techniques involve varying the structure of ordinary fixed payment general obligation and revenue serial bonds in order to make bonds more attractive to investors during periods of rising and high interest rates. We will discuss the following types of creative financing bonds: tender option, original issue discount, zero-coupon, stepped-coupon, and floating-coupon.

Ordinarily, bonds for water projects are issued at a fixed interest rate for a long period of time, such as twenty to thirty years. In periods of high interest rates, however, an issuer can usually lower financing costs and make the bond more desirable to

potential buyers by altering the payment schedule. Periods of high interest rates are usually accompanied by an upward sloping yield curve. This means that short term interest rates are lower than long term rates. Issuers can thus save financing costs if they are able to sell a series of short term securities rather than one long term bond. Some localities have effectively done just this by selling variable or floating rate securities. An issuer of variable rate securities absorbs the investor's market risk by adjusting the interest rate at regular intervals to keep the rate in line with other tax-exempts of similar short-term maturity. The stated maturity of variable rate bonds is the same as that of the fixed rate but the rate is adjusted according to market conditions. This type of bond is called the floating-coupon bond.

Another type of variable rate bond is called the stepped-coupon bond. It is similar to a floating-coupon bond in that the interest rate changes as the bond matures. However, the interest rate does not change in response to a change in market conditions. Rather, these bonds have specified interest rates that increase from the first year to the last. Thus, coupon payments rise as the bond matures. This type of bond may be attractive to issuers whose cash flow is expected to increase as the project develops. Many water projects involve substantial up-front construction costs with little or no revenue generated from the project until construction is completed which may be several years after the initial start-up.

Original issue discount (OID) bonds are similar to conven-

tional bonds except they are sold originally at a discount below par value and with reduced coupon payments. This type of bond is also suitable for most type of investments in water projects because it allows both principal and interest payments to be structured over time to reflect the cash flow from the project. A specific type of OID is the zero-coupon bond. There are no coupon payments, and the market price of the bond is fully discounted to reflect the implicit interest rate.

Tender option bonds allow the investor to redeem the bonds prior to maturity. The option may be open ended or available only at specified dates. Although this bond may be easy to sell because it protects the investor from increasing interest rates, it is not as suitable for financing most water projects as are the other options already mentioned. Moreover, the option feature may force the issuer to obtain backup credit, making the bond more difficult to remarket (Mugler, 1984).

Creative financing techniques discussed above are all meant to make local debt more marketable by transferring market risk (that is, the risk that interest rates will increase and bond prices fall) from the investors to the issuer. Although they tend to reduce financing costs, particularly up front in the early years of a project that may have little or no cash flow, they do so at the expense of increased risk. They are not a panacea, nor are they substitute for sound planning that emphasizes the basic economic and financial feasibility of a project.

The creative financing techniques reviewed here can be combined in a number of different ways to achieve the particular financing objectives of the issuer. No one, and perhaps none, of these techniques are suitable for all localities and all types of projects. Localities are advised to seek professional counsel to see how features of bonds may be structured to increase financing flexibility and meet the goals and objectives of planned projects.

Tax Financing. Localities generally rely on three sources of tax revenue, i.e., property, sales, and income. Property tax is by far the most important source of revenue but it is diminishing in importance. Whatever the source of local tax revenue, financing water projects with taxes, even designated or dedicated taxes, tends to be inefficient and inequitable. Further, it does not strengthen the economic base of the community and, therefore, it does not strengthen the credit rating on which borrowing costs are determined.

It should be obvious that the use of tax revenue to pay for water projects that have a long expected lifetime is costly, inefficient, and inequitable. It should also be obvious that this type of financing to repay debt is also inefficient and inequitable. The reasons were discussed thoroughly in the previous section. However, it is sometimes argued that taxation of a designated group of beneficiaries of a project is not subject to these shortcomings. For example, suppose a special service district was formed that purchased bonds to extend municipal water supply to it and levied a

property tax only on those individuals in the special district to pay off the debt. Is this not equitable? It is in the sense that only the users of the water are paying for it. However, this is true only in a general sense. With taxes of this type, individual users do not pay in proportion to the water they use. Some will pay more for their water and some will be less. In other words, some individuals will gain with this tax arrangement and others will lose. Besides being inequitable, it is also inefficient in the sense that the use of water is divorced from a payment for its use. That is, since a household pays the same tax no matter how much water it uses it will probably use more water than if it paid according to how much water it used. These problems can be mitigated with a well designed set of user fees. This is the topic to which we now turn.

User Fees. Properly designed user fees are both an efficient and equitable way to finance water projects for which there is a vendible output. They are efficient because they require users to evaluate the benefits with the costs; therefore, they are not likely to lead to situations where the cost of providing the service exceeds the gain. They are equitable because those who enjoy the benefits from the project pay for it; those who don't receive benefits don't pay for the project.

User fees are a way of increasing the efficient use of existing facilities. There is a great deal of evidence that suggests that individuals use of water is influenced by its price, i.e., as price

increases quantity demanded decreases. There is also a great deal of evidence that suggests that prices charged for the outputs of water projects are too low relative to the costs of providing the output. This implies output is being subsidized from another source such as taxes, and that the cost of providing the output exceeds the value of the output to the users. Raising the price of water project output will reduce demand and result in more efficient facility use. Indeed, this action may obviate the necessity of expanding or building new facilities.

The use of user fees to finance the repayment of debt may make bonds more attractive to buyers for several reasons. First, the project is likely to be viewed as more efficient than if the bonds were financed from tax revenues. Second, user fees represent revenue dedicated to the payment of debt obligations with no competing claims for their use. Taxes, on the other hand, are used to finance many different programs and have many competing claims. Consequently, whether they will be used to repay debt presents more uncertainty to the investor than if user fees are used.

Despite the advantages of user fees, they are viewed by some as inappropriate to finance water projects. They are often viewed as inequitable in the sense that some users cannot afford to pay for a service at full price, but yet they are entitled to it. This is obviously a different definition of equity than we have been using throughout this monograph. However, it is an important consideration when designing user fees but a difficult argument to

deal with because it involves a subjective evaluation of what individuals are entitled to by right and what price constitutes an "unfair" price. Whatever our individual notions of "fair price" are, we must recognize that setting prices below costs means that some individuals are subsidizing others, either through taxes or payments of higher fees. Thus, to argue that user fees are inequitable in the sense defined at the beginning of this paragraph is to argue that some individuals should pay at least part of the cost of providing the service to other individuals.

Another argument against the use of users fees is a more practical one. That is, they are not appropriate for water projects that generate collectively consumed outputs, such as recreation and fisheries. In these cases it is impossible or prohibitively expensive to exclude potential users from enjoying the benefits of the projects. User fee financing would be inappropriate in these cases. However, many water projects do generate output which can be sold on a user fee basis. These would include water supply, sewerage, hydroelectricity, navigation, and irrigation.

It is one thing to argue the appropriateness of using user fees, it is quite another to determine the appropriate user fee. This is a task to which we now turn, albeit in a general way.

Perhaps the most perplexing problem in determining the appropriate user fee is the choice of cost measure that should be included in price. This problem actually has two dimensions to it, one economic and the other accounting. Dealing with the economic dimen-

sion first, we can think of project costs as either fixed or variable. Fixed costs are those that do not vary with output, while variable costs do. The change in variable costs per unit change in output is known as marginal cost. From an economic standpoint the price should be based on marginal cost since it reflects the value of the resources that are being used up to provide the output. Fixed costs, such as those to construct a new water filtration plant, are sunk costs that are the same no matter how much water passes through the plant. Once the plant is built they are irrelevant in determining the cost of the resources that are used to filter a gallon of water. Consequently, they should not be considered when setting fees based on use. User fees should reflect the cost of providing an extra unit of output, that is, they should reflect marginal cost.

Although the benefits of using marginal cost pricing for water outputs are well known, implementation of such a scheme is often difficult. The reason is that many water projects are characterized by large economies of scale, i.e., declining average costs over a large range of output. This means that average costs are less than marginal costs. If marginal cost pricing were to be used in this case, it would not generate sufficient revenue to cover all costs, including fixed. This situation would impair the ability of the locality to repay its loans and would not be looked on favorably by potential investors. The question arises as to whether there is a way to cover all costs associated with the project but at the same

time retain the advantages of marginal cost pricing.

Fortunately, user fees can be designed in such a manner, using a two-part tariff. Consider a water supply project. The first part of the tariff would be a fixed charge that reflects the fixed costs associated with project output. It could be considered an access fee that would not vary from month to month even though use of project output might. The second part of the tariff reflects the marginal costs of providing project output. This charge would vary from month to month depending on use. A two-part tariff would enable the utility to cover production costs but at the same use marginal cost as the basis for determining price.

In practice, it is often difficult to calculate marginal cost for public sector enterprises, but there is a growing literature that indicates the problems are manageable and that a solution is possible (Boland, 1984). Because of the difficulty is calculating marginal cost and for other reasons, many utilities set rates on the basis of average costs. Moreover, they usually use multiblock tariffs that decline with water use. These rate-making schemes are inefficient not only because they fail to use marginal cost pricing but also because they introduce price discrimination among consumers. There is empirical work that indicates most utilities do not set rates that reflect relevant marginal costs and, hence, promote inefficient use of water (Boland, 1984).

The economic problem in setting appropriate user fees is not easily resolved. Perhaps more easily dealt with is the accounting

problem referred to previously. The problem involves the question of whether historical or replacement cost should be used as the basis for determining costs. Historical cost refers to cost at the time the project was built, while replacement cost refers to the cost of the project in current dollars. Obviously these cost concepts are identical if prices do not change. In periods of rising prices, however, prices based on historical cost will understate the value of the resources being used to supply the project output. If the locality used historical cost in setting its fees it would not generate enough funds to maintain its current system. The deterioration in project quality is likely to adversely affect how investors view its debt and could trigger a red flag in the municipal bond market. Therefore, replacement costs should be the basis on which appropriate user fees are based.

Reference was made earlier that an appropriate use of user fees might be for irrigation. This is not a well accepted notion but it is an important one to consider in such agricultural states as Arkansas that have problems of water shortages and water quality directly attributable to the agricultural use of water. It is not the intent of this report to advocate user fees for agricultural users, but only point out some of the considerations that should be made in determining whether such fees would be beneficial.

Most of the water used for agricultural purposes in Arkansas comes from the ground. The only cost associated with groundwater extraction is the cost to pump water from the acquifer to the sur-

face. Pumping costs are function of the pumping rate and the depth of the water table. Because the agricultural user faces no other costs in extraction of the groundwater he will use it to the point where additional pumping costs are equal to the additional value of the water for agricultural purposes. As the user extracts water he lowers the water table and thus imposes additional costs on others who are also extracting groundwater from that acquifer. But because the cost of extraction to the user, i.e., his pumping costs, is less than the total cost of extraction, i.e., his pumping costs plus those of others due to a lower water table, he uses more than the economically efficient amount of water. That is, the value of the water to the user is less than the total cost to extract it. As a result, many areas that rely on groundwater face declining water tables because water is being used at a faster rate than the acquifer (or underground reservoir) is being recharged.

The problem of groundwater depletion can be limited by imposing a tax on that reflects the additional pumping cost a user imposes on others. Such a tax would raise the cost of extraction to a user and curtail his consumption, thus alleviating the overdraft problem. The tax should reflect three factors (Maddock and Haines, 1975; Wetzel, 1978). First, it should include the effect of water depth on the pumping costs of all water users. Second, it should include the effect of net extractions on water depth. Net extractions refer to the total amount of groundwater extracted minus the amount that returns to the source. It is equivalent to consumptive

water use when we speak of surface water use. Third, it should include the effect of water use on net extractions.

There are many technical problems involved in designed efficient pump taxes and these are discussed elsewhere (Maddock and Haines, 1975; Wetzel, 1978). For purposes of this report the main point of this discussion is that pump taxes are a way for local governments to use existing water supplies more efficiently. Properly designed, they may curtail the development of expensive water supply projects to alleviate the depletion of groundwater. Groundwater depletion may be a problem not so much of inadequate supply to meet demand but more of excess demand relative to supply. In other words, the excess demand that results in groundwater depletion is the result of water prices that are too low relative to supply. An efficiently designed pump tax could alleviate this problem.

The pump tax does have some disadvantages, notable of which is the effect it might have on property values. By charging landowners for the use of water that they previously received "free," the state effectively curtails one of the rights associated with the use of that land. This tends to lessen the value of that land just as any other restrictive covenant would do. This is an important consideration but it must be weighed against the economic benefits of imposing a pump tax. Is the potential loss of land values worth the additional economic benefits of a dependable water supply? This is a difficult question to answer. Not many areas have adopt-

ed pump taxes but there is evidence that suggests that these taxes have significantly curtailed or eliminated the overdraft problem and at the same time increased revenues (Lipson, 1978).

Leasing and Contracts. Due primarily to tax law changes various types of leasing arrangements have become a popular way for local governments to provide services in recent years. There are three general types of leasing arrangements, that is, true lease, conditional sale lease, and service contract (Mugler, 1984). In a true lease the local government pays a private owner for the use of the facility, but has no financial interest in it. In a conditional sale lease, or lease-purchase agreement, the local government leases the facility from a private owner like in a true lease. At the end of the lease, however, the facility reverts to the local government for a nominal charge. In a service contract, which is sometimes referred to as privitization, a private firm sells services or outputs to the local government. It differs from a true lease in that the local government agency contracts with a private firm for services or output. With a true lease the local government agency leases facilities from a private firm and actually provides those services. In either case the cost to the local government could be less than if it had financed the facilities with its own general obligation bonds. The reason is that under existing tax laws, private firms can increase their effective rate of return by taking advantage of tax benefits, such as depreciation, and certain tax credits that are not available to public concerns. Thus, if tax

benefits are sufficiently high, a private firm could offer to support a specific water project at a lower cost than the local government could if it built and operated the facility itself.

The tax law makes leasing an attractive alternative way for local governments to finance water projects. But whether the law will continue to make these arrangements possible is questionable. There has been discussion in Congress of introducing legislation that would effectively preclude the use of government leases as a means of transferring tax benefits to private sector investors (Peterson, 1984). This uncertainty reduces the attractiveness of leasing and contracting arrangements. Nevertheless, should this situation stabilize, there are good reasons for considering leasing or contracting (Mugler, 1984). First, leasing and contracting usually avoid restrictions or indebtedness, i.e., they are an effective way of avoiding the limitations of debt ceilings. Second, private financing of public facilities lowers the up-front cost of the facility to the municipality since these are incurred by the private firm. For most water projects these costs can be substantial. Third, for projects with vendible outputs, leasing and contracts increase the revenue base of the municipality without requiring up-front capital and, consequently, may create a net increase in debt capacity. Fourth, private firms may be able to construct facilities at less cost than public agencies because they are subject to fewer restrictions of design standards, wage rates, and contracting procedures. Lastly, leasing and contracting may result in

lower costs not only because of the tax benefits mentioned previously but also because a private firm may face lower costs of debt than a public entity. Research has shown that for comparably rated bonds private investors face lower financing costs (Miller, 1977; Trezcinka, 1982).

Financial Planning. The decrease in federal involvement in water projects and corresponding increase in nonfederal involvement heightens the importance of sound financial planning and analysis. A local government does not have access to the wealth of resources that the federal government does and, therefore, must be more judicious in how it decides to allocate them. This means it must analyze potential projects not only on the basis of their economic feasibility but also on the basis of their financial feasibility. The former analysis primarily includes matters concerning efficiency, while the latter analysis primarily includes matters of cost recovery, capital structure, and cash flow. Indeed, of all the aspects of financial analysis, cash flow is perhaps the most important in the environment of greater nonfederal participation. The reason is that nonfederal sponsors are smaller, have smaller portfolios of investment projects, and, therefore, cannot absorb projects with long payback periods. In addition, many municipalities often finance projects through revenues that are closely related to the project which increases the importance of early cash returns to finance substantial up-front costs.

In general terms, financial planning involves answering two

questions. First, is the project "needed"? Second, if so, what is the least expensive method of finance? Answering the first question involves an analysis of whether existing facilities might be used more efficiently. That is, are there ways to reduce demand for existing facilities in an efficient manner. We have already talked about the use of user fees to bring about such an adjustment. Other methods that may be considered are the use of nonprice allocation schemes to generate greater conservation, e.g., odd-even watering days and water-saving devices. These are not likely to be as effective or as efficient as user fees but they might be appropriate for short term situations. The use of nonprice allocation methods, however, are not likely to affect long term financing capabilities of the local government.

The use of user fees and nonprice methods of demand management are but two aspects of a broader strategy to defer capital expenditures for water projects. In asking whether a particular project is "needed," the local government might also consider additional ways to "make due" with existing facilities. These include improved efficiencies in the operation and maintenance of existing facilities and the use of load management techniques to reduce peak loads. There are new, non-structural management techniques that appear to well suited to increasing operating efficiencies, especially in regional situations with complex supply systems and multiple service areas (Moreau and Whittington, 1984).

Another technique that could effectively defer capital expen-

ditures, and one that should be explored prior to embarking on plans to finance expansion of existing facilities, is load management. Although this is used in the electric power industry it is rarely discussed with respect to water projects. It is not applicable to all water projects, but it is definitely applicable to water supply facilities. The purpose of load management is to balance demands on a system over time. There are certain times of the day and year when the use of water strains the capacity of the system to provide it, while at other times unused capacity is very high. In the electric power industry time of day and time of year pricing are used sometimes to influence consumer demands so that they use less electricity during peak periods. To build facilities large enough to accomodate peak demands would be inefficient because of the large amounts of unused capacity that would exist in off peak times. The analogy between electric power demand and water demand is appropriate. Load management is a technique that is worth analyzing before a locality embarks on an expensive expansion project. The cost of such an analysis is small relative to savings that can be realized if it is made to work.

The second general aspect of financial planning is determining the least expensive way to finance a project once the decision has been made that it is needed. We have already discussed the importance of up-front financing, cash flow, and the various financing alternatives that a locality might consider. These will not be discussed again here. However, one other consideration that should

be made is whether the project can be divided into several smaller projects so that the service might be provided in an orderly way more in line with the development of demand for the project output. Project sequencing, if appropriate, reduces the need for up-front capital. It may also improve the community's economic base in the eyes of potential investors since project costs would be more in line with project revenues.

There are a variety of options open to local governments to fund water projects. The options considered in this section were evaluated on the basis of whether they could reduce the cost of credit to the municipality and/or result in increased efficiencies in the use of existing facilities, thus obviating the necessity for new or expanded facilities. Options most likely to achieve these result include the issuance of bonds financed with user fees, lease arrangements, privitization, and various aspects of sound financial planning. The use of taxes, while appealing on the basis of revenue potential, are likely to increase the costs of financing water projects and redistribute them to individuals who do not benefit or benefit only marginally by the project. However, taxes are more appropriate for projects characterized by collective consumption such as fisheries, commercial navigation, and flood hazard reduction.

CONCLUSIONS

The state and local policy options discussed in the previous sections of this report are not all equally applicable to the situ-

ation in the state of Arkansas. Local governments face significant legal constraints in the amount and type of debt they can issue even though they have the resources to safely issue more (Ziegler et al, 1980). Moreover, the state is prohibited from issuing debt except in a few instances. Even though debt is the preferred method to finance water projects, constitutional and statuatory limitations preclude significant use of this form of finance on an ongoing basis.

The state legislature recently passed legislation that permits the Arkansas Soil and Water Commission to issue up to $100 million in general obligation bonds with a limit of $15 million per year, subject to legislative approval. The commission is considering several ways of disbursing this money, including grants and loans. This bond program is the largest single source of state money available for water projects and will likely be the focus of many local efforts as money from the federal agencies, such as Farmers Home Administration, HUD, and EPA, decline. But the limits placed on this fund are not likely to make it a long term viable alternative to reduced federal participation in water resources development.

In conjunction with the use of monies from this fund, there are other alternatives which the state and local governments might consider. Among the more significant alternatives are the increased use of user charges, including pump taxes, and clarification of water rights. According to information gathered from individuals throughout the state, charges for water and sewer services, espe-

cially for older systems, are too low to cover replacement costs. Even in newer systems, the rates are usually set to cover only debt service, reserve fund, and depreciation. As discussed previously, in an era of rising prices such rates are likely to be inadequate to maintain, not to mention improve, the quality of the existing system. In Arkansas, user charges take on an added significance as a source of revenue because of the limitations on issuing debt. Increased user charges for water projects, where feasible, not only provide additional funding for the maintenance and improvement of these projects but also may lessen the necessity for expended facilities by reducing demand.

The biggest drawback to increased user charges is that they may dramatically increase rates for those least able to pay. This is a significant consideration, particularly for a poor state such as Arkansas. The increases in efficiency and equity brought about by higher user charges must be weighed against the hardships created for low income individuals. To continue to charge low rates, however, seems to be an invitation to long term deterioration in water projects throughout the state. Decreasing federal funds combined with state and local debt limitations leave few financing options available. The state and local governments should explore alternatives to existing rate structures while at the same time remaining cognizant of the impact of these alternatives on low-income individuals.

Another significant alternative that might be explored is the

clarification of water rights. This is a serious, politically sensitive, but important issue that confronts the people of Arkansas. The present institutional structure is inadequate to deal with conflicting claims over the use of water. The use of water in Arkansas is based on the riparian rights doctrine, which basically limits the rights of water to those who own land abutting a stream or lake. This significantly limits the ability to deal with water use conflicts in an efficient and timely manner. Among its shortcomings, this doctrine severely restricts the transfer of water from areas which have significant surpluses to those facing shortages, requires case by case conflict resolution, and leaves uncertain the public's right to water surpluses, instream uses, etc. In addition, as discussed previously, clearly defined water rights are necessary for low cost financing of water projects because they reduce the financial risks borne by bond holders by reducing uncertainty about who has the right to use water.

It is not the purpose of this report to propose how water rights should be defined in the state of Arkansas. Many individuals have grappled with this important issue over the past five years and no concensus has emerged. Rather, the purpose is to point out that clearly defined water rights that allow voluntary water transfers, particularly if they are defined in terms of consumptive use rather than diversion, tend to facilitate less costly water projects and more efficient allocation of water resources.

Although the increased use of user charges and the clarifica-

tion of water rights are perhaps the two most significant alternatives the state and local governments might consider, they might also consider other alternatives that would reduce the costs of borrowing. These include increased technical and planning assistance, bond guarantees, bond insurance, and privitization. At present, planning and technical assistance is limited and varies widely among Planning and Development Districts which are the primary source of such assistance. As discussed previously, technical assistance tends to facilitate the issuance of bonds, encourage responsible debt management, and improve credit ratings. Planning assistance, particularly financial planning, helps enable localities to meet their obligations in a timely and efficient manner. In addition, localities might consider the adaptation of load management techniques and the sequencing of capital improvement projects as ways to reduce expenditures for water resource projects.

The state might also consider bond guarantees and bond insurance for local debt issues as ways of reducing costs. Although they will not always reduce borrowing costs, they are relatively inexpensive ways to improve yields on municipal bonds.

Potentially, privitization is an option that could reduce water project costs. It has been used successfully elsewhere but Arkansas should proceed cautiously here. Privitization is financially attractive because of provisions included in previous tax laws. There has been serious debate in Congress whether private companies should receive the extent of tax advantages currently available

under existing laws or whether these laws should be modified. There is a great deal of uncertainty at the present time whether these tax advantages will continue and, consequently, whether privitization will be financially feasible.

In summary, it is the recommendation of this report that, based on the premise that debt finance is the most appropriate way to finance long term water projects and that state and local governments in Arkansas would prefer to avoid additional financing costs completely or to reduce them, these governments should consider the following alternatives as ways to either reduce the cost of debt and/or result in more efficient use of existing facilities: increased use of user charges, clarification of water rights, planning and technical assistance, bond guarantees, bond insurance, other credit enhancements such as letters and lines of credit, load management techniques, and sequencing of capital projects. Of all the options investigated in this report these seem the most promising for Arkansas.

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