CHAPTER 4

FINANCE AND OPERATION POLICY OPTIONS

"As Elche [in Spain] ... the water belongs to parties who do not own the land. The land has no rights. When the farmer needs water, he buys it as he buys any other article. There is a daily water exchange, where one may buy the use of water in an irrigating channel for twenty-four hours, beginning at six in the evening. The prices that are stated to have been paid in times of scarcity, tax our credulity very much." *Report of the Board of Commissioners on the Irrigation of the San Joaquin, Tulare, and Sacramento Valleys of the State of California* (1873), p. 132.

A variety of finance mechanisms and policy approaches exist for managing water delivery and storage systems in California. A complex combination of federal, state, and local water agencies operate an inter-connected system that provides water for urban, agricultural, and environmental water uses. Table 4-1 reflects the historical involvement of public water supply agencies in development of California's water supply. Each level of government uses distinct methods of financing and water allocation. Private ventures have historically and are currently being proposed to complement governmental efforts in water supply.

Table 4-1. Reservoirs[a] Built by Different Levels of Government

Construction Date	Federal	State	Local/Regional[b]
pre-1940	5		23
1940-1949	3		3
1950-1959	8		11
1960-1969	8	6	17
1970-1979	5	4	3
1980-2005	1		3[c]
Total Number	30	10	60

Notes:
[a] *Only those of 50 taf or more are included in these numbers.*
[b] *Local/Regional includes reservoirs operated and maintained by local agencies, even though many of these reservoir were designed and constructed with significant federal assistance.*
[c] *Los Vaqueros Reservoir and Eastside Reservoir are included here.*

Source: DWR (1993)

This chapter describes the traditional finance and water allocation methods of federal, state, local, and private water systems and then discusses new methods of finance and water allocation arising out of recent drought conditions in California. These new methods include privatization, water transfers and marketing, and innovative institutional arrangements. An inextricable relationship exists between finance and water allocation methodology; traditional methods of finance such as federal government loans and grants complement more traditional methods of water allocation based on project contracts. Some traditional finance methods can cause conflicts and/or are incompatible with proposed allocation methods such as water marketing and water transfers. Likewise, new finance methods such as privatization may be ill-suited with traditional water allocation methods. The interactions of finance and water allocation policies are a major difficulty for long term water supply planning.

TRADITIONAL CALIFORNIA WATER INFRASTRUCTURE FINANCING

Water infrastructure has historically employed numerous government financing methods. This section briefly discusses conventional public financing options and then reviews financing historically adopted by federal, state, and local water agencies.

Conventional Finance Options

Conventional mechanisms to finance public water infrastructure include such things as user fees, taxes, bonds, grants, and loans as summarized in Table 4-2. User fees and taxes are often collected to repay bonds and loans obtained to finance up front construction costs and other expenditures. They also provide funds for recurrent operating costs.

Table 4-2. Summary of Finance Options for California Water Infrastructure

User Fees (for transportation, administration, water) collected from
Agricultural water contractors
Urban water contractors
Hydropower contractors
Bonds (one time full funding or incremental project bonds)
General Obligation
Revenue
Mello-Roos or Assessment Bonds
Revolving Funds
Grants and Loans (Federal, State, and Other)
Tax Revenue
General Revenue
Earmarked taxes on
Property
Sales
Special assessment districts
Special Districts
Private Financing (design, construction, ownership and/or operation by private sector)

User Fees/Taxes

Fundamental to most water financing schemes is the concept of user fees, where the individual benefiting from a project pays for the use of a facility by a unit of water delivered, a unit of watered contracted, or some combination of the two. Private, local, or regional water agencies sometimes derive funds from tax revenues. Tax revenues may be collected from general tax revenues or from earmarked taxes allocating a specific amount towards a particular project. Earmarked taxes are collected from property holders, sales, excises, or from special assessment districts composed of those who receive direct benefit from a project.

Taxes and user fees are often limited by the willingness to pay and are unable to cover large initial capital costs. In these cases, water agencies seek revenue from bonds, loans, and grants. Loans and grants entail a large financial commitment from a single funding source, often too great of a commitment. As a result, bonds have been one of the most commonly employed methods of public finance.

Bonds

Bonds occur in the form of general obligation bonds, revenue bonds, assessment bonds, and revolving funds. Designed to finance projects benefiting the community as a whole, general obligation bonds are secured by the "full faith and credit" of the water agency. Full faith and credit of a water agency involves invoking the agency's "ad-valorem" taxing power, a difficult task in California considering the institutional resistance to more taxes. Aside from simple unpopularity, new taxes require a two-thirds majority voter approval in California, a consequence of the passage of Proposition 13 in the late 1970s. Such a voter consensus is virtually unheard of in water resource management in California (DWR 1998a).

Given the difficulties with general obligation bonds, other forms of bonds have become more commonplace. Revenue bonds have been employed as an alternative since they do not require an agency's pledge of full faith and credit. Debt service for revenue bonds is paid from revenues generated from the financed infrastructure, via charges for hydropower and water delivery.

Mello-Roos bonds are another type of bond that does not require direct voter approval. They were introduced in the 1982 Mello-Roos Community Facilities Act. Mello-Roos bonds are paid through assessment levied on property benefiting from infrastructure improvements and are secured by placing a lien of the same property (CDAC 1990).

Revolving Funds

Revolving funds also are used by water purveyors to cover costs that exceed user fees. In a revolving fund, a grant is obtained from different financing sources and placed in a fund that can be borrowed against. Loans are then repaid to the fund with interest. Government entities will usually loan the fund out again in a revolving fashion while a private entity may wish to profit from the generated interest.

Shared Facility Financing

Many water infrastructure projects involve the sale or sharing of facility capacity, enabling smaller governmental or private entities to benefit from a large pool of financial resources. A single farmer would seldom be able to solely finance the construction of an irrigation canal. On the other hand, a mutual ditch company, a collection of farmers, has the capacity to accumulate enough resources for such infrastructure. Sale and sharing of facility capacity occurs at and between all levels of government.

Special Water Districts

California water supply has historically been developed by several thousand water districts established under 32 general and special acts of the state legislature (Porter et al. 1987). Smaller local districts are useful in stabilizing water supply needs of a local region by their ability to contract for imported water. Financing of infrastructure can come from tax assessments when allowed in the enabling legislation of a water district. Additionally, California water districts have the power to create sub-units in their service area known as improvement districts that can finance even more specific activities benefiting the inhabitants of their districts. Much of the water district enabling legislation allows great flexibility in the services provided to customers. These many kinds of special districts are not only a means to provide innovative financing via taxes and user fees, but also provide the flexibility to implement market solutions to water issues.

Private Involvement

With the contemporary wave of deregulation, private involvement in water resource infrastructure is being more widely explored. Private contracting by water agencies has traditionally been limited to consulting services, but private financing of water infrastructure investments may prove attractive to decision makers and private investors given the right circumstances.

Availability of Finance Options

Financing methods available to water agencies generally depend on agency size (Table 4-3). Self-financing is usually reserved for small projects in larger water agencies. Larger projects are generally paid through debt financing. Large water agencies have access to more financing options, from the conventional to the innovative. Smaller agencies must be innovative or qualify for a state or federal financial assistance program (DWR 1998a). Although federal aid for water resources projects has been decreasing since the 1980s, loans and grants for some specific objectives can be obtained. The state also funds particular types of water development, such as conservation/groundwater recharge facilities and water recycling (DWR 1998a).

Table 4-3. Financing Methods Typically Available to Water Agencies

Method	Small	Intermediate	Medium	Large
Self-financing			X	X
Short-term financing				
Fixed rate notes				X
Commercial paper				X
Floating rate demand notes				X
Conventional long-term financing				
Equity shares or stock			X	X
Bonds (GO and revenue)				X
Lease revenue bonds				X
Innovative long-term financing				
Bond pools	X	X	X	X
Privatization	X	X	X	X
Water transfers	X	X	X	X
Financial assistance programs	X[a]	X[a]	X[a]	X[a]

Notes:
[a] *State and federal loan and grant programs have limited application for private water agencies.*

Source: DWR (1998a)

Historical Finance of Water Infrastructure

Financing of water infrastructure has cycled from being composed of significant efforts by private and local entities (late 1800s and early 1900s), to intensive federal involvement (1900-1970) to the current period where local and private financing is actively sought, as reflected in Table 4-1. These efforts have been greatly complemented by active state involvement between 1960 and 1980 with the SWP. This section describes some historical examples of federal, state, local and regional, and private water infrastructure financing efforts.

Federal Financing: Central Valley Project

In 1922, the California state legislature, governor, and electorate approved the construction of the State Central Valley Project. Finding difficulty marketing the appropriate bonds and attracting Federal grants or loans to finance the project, the state asked the Federal Government to

complete the construction of the CVP soon after its conception (USBR 1992). Congressional authorization and government directives (summarized in Table 4-4) have historically provided the financing of the CVP. These are reviewed next.

Table 4-4. Federal Laws and Directives Affecting CVP Finance

Law or Directive	Year	CVP provisions
Reclamation Act	1902	Legal basis for authorization of CVP
Reclamation Project Act	1939	Repayment of construction charges extended from 10 to 40 years plus a 10 year development period; authorized water sales to municipalities and irrigation users
Water Services Contracts	1944	Delivery quantities of irrigation and urban water to contractors
Water Right Settlement Contracts	1950	Supplementation of CVP water to riparian and senior appropriative rights holders on the Sacramento and American Rivers
Reclamation Project Act	1956	Right of renewal of long-term contracts with agricultural contractors not to exceed 40 years
San Luis Authorization Act	1960	San Luis Unit and financial participation in development of recreation
Reclamation Project Act	1963	Right of renewal of long-term contracts with urban contractors not to exceed 40 years
Reclamation Reform Act	1982	Concept of full-cost pricing, interest on unpaid pumping plant investment, and irrigation water deliveries to leased lands; increased acreage limitation to 960 acres
Public Law 99-546	1986	DOI and USBR directed to include total costs of water including distributing and servicing it in CVP contracts (capital and operation & maintenance costs)
CVP Improvement Act	1992	Significant changes to CVP legislative authorization (see effect of CVPIA)

Source: USBR (1992, 1997)

The Reclamation Act of 1902 established the Reclamation Fund, providing the legal basis for federal financing of the CVP. The Act defined the purposes of Reclamation projects, uses of Reclamation water, and provisions for repayment of Federal investment. Finances were to be developed from the sale of public land and directed towards surveying, constructing, and maintaining irrigation works (Wahl 1989). Initially, the Reclamation fund was set up as a revolving fund, with western settlers supposed to make repayments within a 10-year period. However, additional appropriations became so routine that the idea of a revolving fund was abandoned. Repayment difficulties in pre-CVP irrigation projects were severe enough to instigate an extension of the repayment period to 40 years under the Reclamation Project Act of 1939 (RPA of 1939), 12 years before Lake Shasta, the largest CVP reservoir, began to release water.

As the principal contracting authorization for the CVP, the RPA of 1939 allowed for two types of contracts: repayment contacts and water service contracts (Wahl 1989). The former contracts amortize capital costs over the repayment period in annual installments, with the fixed annual charge independent of the amount of water delivered. The later contracts levy a combined capital and operation and maintenance charge on each acre-foot delivered to the district. Both types of contracts are interest free with the ability to be adjusted downward dependent on a users' ability to pay. By the 1960s, the "average cost of service approach" was failing to fulfill

the repayment obligation of the CVP as water rates were too low and the fixed rate contracts did not produce enough revenue. Th option to increase annual operating and/or capital investment costs was not covered under the original rate structure.

Pre-1982 CVP operation led to tensions with the California Department of Water Resources (DWR 1982). In a 1982 reconnaissance study, DWR found that: (1) CVP power sales had created a $150 million deficit in the previous decade in addition to not recovering operation and maintenance (O&M) costs; (2) many irrigation districts failed to pay their own O&M costs; (3) CVP contractors had repaid only one quarter of the cost of building the project despite the 37 year time period since construction; (4) failure to share protection of the Delta during drought years threatened the achievement of SWP objectives; and (5) potential water and energy savings could result from coordinated operation of the SWP and CVP by a single entity (DWR 1982).

After a series of partial reforms, the Reclamation Reform Act of 1982 (RRA of 1982) implemented "full cost" pricing. Interest payments were now included, although interest charges accruing between the time of construction and the date of RRA of 1982 were forgiven. Wahl (1989) demonstrates that the RRA "full cost" covers a range of 3 to 87 percent of actual full financial costs of irrigation water supply—the discrepancy mostly a result of forgiving past interest. Another important reform within the RRA of 1982 was the increase to 960 of the 160 acre farm size limitation established in the 1902 legislation. An extensive literature exists discussing the history and effects of the acreage limitation provision (Hogan 1972; USBR 1981; Wahl 1989; Hundley 1992)

To increase its yield and to help maintain the flows necessary to maintain the Sacramento-San Joaquin Delta water quality, DWR sought to purchase CVP water. In 1986, USBR and DWR entered into the Coordinated Operations Agreement, establishing the amount of CVP and SWP water needed to maintain water quality standards. Increased operational flexibility and efficiency would theoretically make 1 million af of CVP water available for contracting, water that DWR could purchase at the inexpensive CVP contractor rates (Wahl 1989).

The irrigation districts' subsidized interest rate before 1982 and long repayment periods have led to water costs highly favorable for agriculture. Electricity and urban water users have historically paid their portions of the cost of constructing the project, while federal contributions to financing construction and operation of irrigation projects have covered about 85 to 90 percent of all irrigation-related project costs (Congressional Budget Office 1997). Given inequities associated with federal cost allocation policies, projected water supply shortages have led to increasing interest in changing CVP operation and cost allocation methods.

State Financing: The State Water Project

Subsequent to the completion of the CVP, Governor Edmund G. "Pat" Brown made a state owned and operated water project one of the highest priorities of his administration (Hundley 1992). The result of Brown's toils and negotiation with 31 water districts and agencies was the State Water Project (SWP). Similar to the CVP, the SWP is largely financed and operated pursuant to legislative mandates and agency directives summarized in Table 4-5.

Table 4-5. Laws and Directives Affecting SWP Finance

Law or Directive	Year	CVP provisions
State CVP Act	1933	Authorized construction of State Central Valley Project (failed due to depression but used later to fund SWP)
California Water Resources Development Bond Act (Burns-Porter Act)	1960	Authorized issuance of $1.75 billion in general obligation bonds, subject to vote in Prop. 1
Proposition 1	1960	Enacted Burns-Porter Act; passed by 2,857,586 to 2,791,942 votes
Contracting Principles for Water Service Contracts	1960	Initiated cost allocation procedures, water rate determination, and a pledge of each contractor to ensure repayment of any and all charges
Table A Entitlements of Water Service Contracts	1965	Determines annual and maximum amount of water to be delivered to contractors
Monterey Agreements	1994	Agricultural deficiencies eliminated; potential transfer and retirement of Table A entitlement allowed; increased operational flexibility; SWP financial security ensured.

Sources: O'Connor (1994a)

Capital expenditures for the SWP totaled $5.84 billion as of 1999 (DWR 1999). Capital expenses include initial project facilities, Delta and Suisun Marsh facilities, power generation and transmission facilities, general construction expenditures, and a variety of other capital costs. Capital costs have been financed from five distinct sources shown in Table 4-6. SWP derives financing first from the California Water Fund consisting of state receipts of tideland oil revenues. Pursuant to the Burns-Porter Act, general obligation bonds can only be issued after this fund is used up. One of the largest sources of funding for SWP construction has been the Initial Project Facility Bonds, general obligation bonds issued after the California Water Fund was spent. Of the $1.75 billion bond authorized in the Burns-Porter Act, $1.48 billion has been used to finance SWP construction. Although the 1933 state CVP Act never produced a state CVP, DWR was authorized to issue CVP revenue bonds for the construction of SWP facilities including water system revenue bonds issued for the construction of non-power related SWP facilities such as the East Branch enlargement.

Table 4-6. Funding Sources for SWP Capital Expenditures[a]

Source	$ Billion
California Water Fund	0.51
Initial Project Facility Bonds	1.48
CVP Revenue Bonds	1.16
Water System Revenue Bonds	1.96
Miscellaneous Sources	0.73
Total	5.84

Notes:
[a] *Up to 1999*

Source: DWR (1997)

Operating expenditures for the SWP totaled $11.26 billion by 1999 as shown in Table 4-7. Included in this total is: operation, maintenance, and power; deposits in reserves for replacement of existing SWP facilities; interest payments; and, capital resource expenditures. To recover these costs, DWR has collected the majority of repayment from annual water contractor

payments for transportation, availability (via the Delta Water charge), SWP expansions, and Water System Revenue Bond surcharges. Additional funding comes from various other sources. These cost recovery mechanisms have generated $0.36 billion in surpluses that are applied to California Water Fund repayment and capital expenditures.

Table 4-7. Funding Sources for SWP Operating and Debt Services Costs[a]

Source	$ Billion
Water Contractor Payments	9.48
Capital Resources Revenues	0.80
Interest Earning on Operating Revenues	0.44
Revenue Bond Proceeds	0.46
Miscellaneous Sources	0.44
Total	11.62

Notes:
[a] *Up to 1999*

Source: DWR (1997)

The State has depended on the ability to pass bonds for construction. The difficulty of this approach was demonstrated from the first passage by a small majority of votes (52.5% for and 47.5% against) of the Burns-Porter Act in 1960.

Improving SWP financing is hampered by the difficulty of achieving a consensus among interested parties (SWP contractors, DWR financial advisors, environmental groups, etc.) about what elements need improvement (O'Connor 1994b). Many improvements and criticisms of SWP financing were addressed in the Monterey Agreement negotiations (discussed later) and are summarized by O'Connor (1994b). Criticisms reflect discontent with the wide annual variation in SWP cost-per-af, the high cost-per-af of SWP water, an economically inefficient repayment system, an apparent lack of frugality by DWR, and contractor payments in excess of operation, maintenance, and loan repayment.

Local and Regional Financing: Los Angeles Aqueduct and Hetch Hetchy Financing

Early in the 20th century, as urbanization rapidly progressed in Los Angeles and San Francisco Bay areas, numerous municipalities sought to secure future growth with the acquisition and expansion of their water supplies from distant sources. For local and regional water agencies, user fees and system revenues account for most of the operating costs and a portion of the capital costs. Debt financing is the primary option used to cover capital costs.

Financing construction of the Los Angeles Aqueduct (LAA) could not have been achieved without the shrewd mind of William Mulholland, who instituted water metering directly after his appointment by the City of Los Angeles. Volumetric water fees encouraged more frugal water use and produced $1.5 million of profit in four years (Hundley 1992). Yet the major accomplishment of Mulholland would be in "conserving" a water source 233 miles outside the City's limits. Aside from having to side step several political issues, an angry group of Owens Valley residents, federal permission to build an aqueduct overlying their lands, and purchasing water rights at elevated prices, Mulholland had to accumulate $25 million to complete the system, an immense amount of money in 1905. Winning the support of the Board of Water Commissioners and the LA city council, Muholland was able to secure $24.5 million of municipal bonds in two elections ($1.5 million in 1905 for the necessary water rights, and $23

million in 1907 for construction). Stimulated by contemporary drought hysteria and some of Mulholland's hyperbole, the city's voters eagerly passed these bonds to prevent the oncoming "water famine" (Hundley 1992).

In northern California, San Francisco faced a similar water shortage, despite being located next to San Francisco Bay where two-thirds of California's natural runoff emptied into the Pacific. Equally as difficult in terms of political opposition, San Francisco's financing approach was different from that of Los Angeles. San Francisco chose to ask for bonds in increments, resulting in a final cost of $100 million, $23 million more than the original estimate. Although much of these costs can be attributed to technical difficulties, Hundley (1992) asserts that the incremental financing approach was largely responsible for delays and excessive costs (the LAA was largely finished in 1913, while the Hetch Hetchy Aqueduct failed to deliver water to San Francisco until 1934.

Regional water agencies, such as MWD, use similar methods to finance capital costs. The most recent MWD financing of capital costs include $2 billion to build the Eastside Reservoir (to be completed in 2005) and the Inland Feeder (to be completed in 2003). MWD (1997) estimates 80 percent of this capital expenditure will be debt financed, and the remaining amount funded directly from water sales revenues.

One common difficulty for regional water agencies with several member districts is determining the appropriate water rate. These water rates are a complex composition of water availability, demand, and local conditions. When sales are greater during dry years, water rates will generate more plentiful revenues than average year sales. To maintain a steadier stream of revenues, MWD employs a rate stabilization fund. During dry years, excess water sales revenue is deposited in the fund. When followed by wet years, the fund serves as MWD's first source of reserves and is used to cover costs that would normally entail a water rate increase.

Private Financing

At the end of the 19th century, before construction of the LAA and Hetch Hetchy aqueducts, water supply development relied on private industry financing. Los Angeles' water supply was controlled and managed by the Los Angeles City Water Company prior to the reign of Mulholland and continually suffered from excessively high rates and poor service. This situation caused Los Angeles residents to issue an amendment to their city's charter declaring that "no…water rights now or hereafter owned…shall be conveyed, leased, or otherwise disposed of, without two-thirds of the qualified electors" (Kahrl 1982; Hundley 1992). San Francisco faired similarly prior to the Hetch Hetchy undertaking when the Spring Valley Water Works, a private company, angered residents by providing an inadequate supply at excessive rates.

Following the dramatic period of federal and state involvement in developing water supply and the more recent period of stagnation in infrastructure development, the ideas behind private involvement in water infrastructure and provision have once again become a topic of discussion among California's water managers. Privatization can be generalized to include any situation when the private sector becomes involved in design, financing, construction, ownership, and/or operation of a public facility or good. Several forms of privatization have been in place for long periods of time in the forms of consulting and construction. Recently, with the de-regulation of the electric and gas industries, interest has increased in investigating more active private sector

involvement in water supply. However, many issues should be considered before any privatization or de-regulation of water supply goes forward, from the perspective of both water users and the private sector.

NEW DIRECTIONS IN FINANCING AND OPERATING WATER SUPPLY

This section presents some alternative finance mechanisms and water operations that have arisen in recent droughts, in response to CVP and SWP water allocation and repayment problems and the increasing importance of environmental water uses. As indicated in Chapter 2, water contractors were not the only water users dramatically affected by water shortages. The drought also significantly reduced flows with adverse consequences to fish and wildlife. Locally, systems such as the LAA came under increased scrutiny, as the increased diversions exacerbated damage to fish and wildlife. Several significant alternatives to the traditional finance mechanisms and water allocations of the CVP and SWP occurred in response to the 1976-77 and 1987-92 drought periods. These include, among others, significant legislation and contractual changes (including the ongoing CALFED process), the Drought Water Bank, water transfers, and groundwater banking. Droughts have also motivated increased use and consideration of demand management options.

CVP Changes

The allocation of CVP water was altered dramatically by passage of the Central Valley Improvement Act of 1992 (CVPIA). The CVPIA gave fish and wildlife mitigation, restoration, and enhancement equal priority with water supply and power generation. A brief description of CVPIA provisions appears in Table 4-8. Implementation of the CVPIA has proven especially difficult and remains one of the focuses of the CALFED process.

Table 4-8. CVPIA Provisions and Implications

Provision	Implications
Renewal of CVP Water Service Contracts	Most of the CVP water service contracts, except those for fish and wildlife purposes, are not allowed to be executed until environmental restoration activities are completed; renewal is limited to a 25 year period; contracts are to include CVPIA provisions such as tiered water pricing.
Transfers of Project Water	Transfer of project water outside of CVP service area is allowed under restricted conditions; water districts can veto transfers only if the transfers reallocate more than 20 percent of their CVP allocation; parties given the power to block a potential transfer are the Secretary of the Interior and SWRCB, only under justified conditions.
Fish and Wildlife Restoration	USBR is required to "dedicate and manage annually 800,000 af of CVP yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures…" authorized by the CVPIA (§3406(b)(2) of CVPIA); physical restoration measures; surcharge on CVP water and power contracts for creation of a Restoration Fund.
Land Retirement	DOI authorized to initiate an agricultural land retirement program for lands that "are no longer suitable for sustained agriculture production because of permanent damage resulting from severe drainage or agricultural withdrawals, or other causes…"

Source: DWR (1998a)

SWP Changes

Parallel to major changes in operation of the CVP, SWP contractors signed the Monterey Agreement in 1994. The agreement attempts to alleviate many of the difficulties arising out of the drought of 1987-1992. Provisions of the Monterey Agreement include (State Water Contractors and DWR 1994):

1. §18(a) was effectively removed so all contractors receive shortages proportional to their Table A entitlement.
2. Agricultural contractors must relinquish 130 taf of annual entitlement to urban contractors on a willing buyer willing seller basis.
3. Kern Water Bank property was transferred to KCWA and Dudley Ridge Water District in return for 45 taf of annual entitlement relinquished to the SWP.
4. SWP contractors and DWR are to develop financial programs related to payment of debt service on bonds to: (i) bring the obligations of the parties in line with current market and regulatory circumstances facing SWP, DWR, and contractors; (ii) ensure continuing financial viability of the SWP and improve security for bond holders; and (iii) provide for more efficient use of project water and facilities.
5. Concepts of surplus, wet weather, and make-up water are replaced with interruptible water service.
6. Operations of Perris and Castaic Reservoir will be altered to better conform to the needs of local water supply facilities.
7. Contractors gained the ability to store SWP water outside a Contractor's service area.
8. Transfer of non-SWP water is now allowed via SWP facilities
9. Creation of an annual "turnback" pool, an internal SWP mechanism where unused water supplies can be purchased by other contractors at a set price or may be sold to non-SWP contractors. Contractors that participate in the pool are prohibited from storing SWP water outside their service area.

Drought Water Banks

Prior to the Monterey Agreement, DWR and USBR implemented Drought Water Banks and exchange agreements to deliver water from agencies with excess supplies to areas of dire need starting in 1977. The 1977 Emergency Drought Act granted the Secretary of the Interior authority to facilitate water purchases from willing sellers and deliveries to willing buyers. However, fixed administrative prices prevented sellers from receiving any profit or benefit from the trade and consequently restricted the amount of trading. USBR purchased 46,438 af of transfers at a cost of $2.25 million. Of this purchase, 42,544 af were delivered to buyers for $2.58 million (Wahl 1989).

With the experience acquired in the 1977 drought, the state implemented the Drought Water Banks (DWB) of 1991, 1992, and 1994. A breakdown of DWB purchases and allocations appear in Table 4-9. These banking arrangements allowed the State to act as water broker, while water contractors served as clients. Wahl (1994) and Howitt et al. (1992) examined the 1991 and 1992 droughts, concluding that the water bank had broken ground on water market implementation, although implementation improvements should be made before another drought bank is operated.

Table 4-9. Drought Water Bank Purchases and Allocations (taf)

	1991	1992	1994[a]
Supply:			
Purchases	821	193	222
Delta and instream fish requirements	(165)	(34)	(48)
Net supply	656	159	174
Allocation:			
Urban	307	39	24
Agricultural	83	95	150
Environmental	----	25	----
SWP carryover	266	159	----
Total allocation	656	159	174
Selling price ($/af)[b]	175	72	68

Notes:
[a] *Includes deliveries for the SWP*
[b] *Price to buyers south of the Delta at Banks Pumping Plant. Includes the cost of the water, adjustments for carriage losses and administrative charges. Does not include transportation charges that have ranged form $15 to $200/af depending on the point of delivery and other factors.*

Source: DWR (1998a)

Despite the problems of hurried formation and fixed prices, the 1991 DWB was a great success. By selling 390,000 af, the bank equilibrated water supply and demand under conditions of extreme drought, and in doing so, generated a substantial net economic surplus for California's economy. The actual quantity of water sold by the DWB was small in comparison to the total use. However, the price of water sold during the drought set a value for all potentially tradable water. Thus, the operation of the DWB changed the value of most of the State's water. This ability to increase the value of water without an increase in cost to the farmer is a politically acceptable way of sending the signal to users of the true value of water.

The 1991 DWB generated direct benefits for the State economy by creating a net gain in income of $104 million and net employment gains of 3,740 jobs by trading water from lower value to higher value uses (Howitt et al. 1992). The drought of 1987-91 continued in 1992 with improved water supplies, but drought conditions. Accordingly, the DWB was continued in 1992. Given the improved water supplies, the 1992 bank operated at a lower purchase and sale price and smaller quantities (see Table 4-9). Water was not purchased by fallowing crops in 1992, and supplies came from surplus reservoir storage (20%), and groundwater substitution (80%).

In 1992, total DWB purchases were 193 taf, and the price paid for the water was $50/af. Water sales amounted to 159 taf at $72/af, less than half the price of the previous year. In addition to supplies sold mostly to agricultural and some urban uses, 15% of the 1992 bank water was sold for environmental purposes. Public funds had been allocated to assist in the purchase of this environmental water. The differences in the price and quantity equilibrium between the 1991 and 1992 DWBs strongly support the contention that both the demand and supply of water in California is price responsive, even under severe drought conditions.

1994 was once again a dry year leading to establishment of another DWB. Given past bank experience and the similarity with 1992, the 1994 bank bought 222 taf from reservoir and groundwater substitution contracts. The average purchase price was the same as 1992 at $50/af. A total of 170 taf was sold to urban and agricultural interests in 1994 at a price of about $68/af, fractionally lower than the 1992 price. The administrative transaction costs of the DWBs were

low, in the region of 7% (personal communication). The main reason for the substantial price spread between sellers and buyers was to finance the "carriage water" requirement (approximately 30% on the delivered quantity) that was needed to control salinity in the Sacramento-San Joaquin Delta. In short, the DWBs worked well within their restrictions of rigid price levels and regulatory controls on third party effects.

At the start of the 1995 water season precipitation and river flows were at low levels. To add some security and flexibility to a potential water bank, DWR initiated an option market in December 1994. The market took the form of purchasing options to buy water in the event of a drought at the fixed price of $3.50/af and selling options to purchase water at $10/af. Details of the operation of the option water bank are published in Jercich (1997).

A criticism of the DWBs was that due to the timing of the last rainfalls in California and the need for early agricultural planting decisions, the banks did not allow adequate time for adjustment on both the market supply and demand sides. Introduction of the option market in December 1994 induced a more elastic supply of water to the bank and a price structure that varied as the extent of water supplies become better known between December and April. In 1995, substantial precipitation and snow-pack occurred in the latter part of the season, removing the need to exercise the options.

Lund et al. (1992) made the following conclusions about the DWB of 1991 and 1992:

1. State-operated Water Banks provided a greater opportunity for completing transfers from sellers to buyers without third-party interference; a state operated DWB can substantially reduce transaction costs.
2. Urban, agricultural, and environmental interests demonstrated willingness to participate in DWBs.
3. A significant number of willing sellers exist, particularly in drought years.
4. Reservoir and conveyance operations can often limit ability to transfer water.
5. Legislative and institutional constraints were waived for the DWB of 1991 and 1992; long-term water banks may require special legislative assistance for enactment.
6. Excess purchases by DWR can be used as a hedge against more severe long-term drought.
7. The DWB of 1991 and 1992 increased interest in and attention to water transfers of various types, while crucial experience was gained in their operation and implementation.

Groundwater Conjunctive Use

Additional sources for increasing CVP and SWP water supply are conjunctive use of groundwater for the storage, recharge, and withdrawal of water (see options in Chapter 3). DWR initiated the Kern Water Bank (KWB) in 1985 for such purposes, before relinquishing ownership of the spreading grounds to KCWA and Dudley Ridge in the Monterey Agreements. Although conjunctive use had been part of normal operations of federal, state, and local water purveyors before the Kern Water Bank, it had yet to be institutionalized. Currently, DWR is investigating a conjunctive use project in the American River basin that could potentially provide 55 taf during drought periods at $50/af (DWR 1998a). USBR also has indicated interest in conjunctive use, suggesting the 800 taf dedicated for environmental flows by the CVPIA could come entirely from conjunctive use, although numerous feasibility and environmental investigations would first be required.

Several urban areas are exploring conjunctive use opportunities as well. MWD currently has agreements for storing up to 700 taf in the ground in the Semitropic Water Storage District and in the Arvin Edison Storage District for up to a total of 120 taf of drought yield. MWD has also crossed state lines in its conjunctive use efforts, executing an agreement to store up to 90 taf of its Colorado River entitlement in Central Arizona Water Conservation District's service area for a drought year exchange for Colorado River water (MWD 1993). In all these agreements, MWD supplies the excess water in wet years and contracts with out-of-area local districts for storage.

These groundwater storage and conjunctive operations increasingly rely on the ability to transfer or exchange water and often entail some form of water marketing or wheeling. The subsequent sections of the chapter explore these new water allocation mechanisms and operating policies in more detail.

PRIVATIZATION FOR FINANCING AND MANAGING CALIFORNIA WATER

Increasing implementation of conjunctive use and changes in CVP and SWP financing, combined with recent experience gained with drought water banking, have all contributed to interest in market oriented finance mechanisms to better augment water demands. Market oriented finance mechanisms may include altering traditional roles of state, regional, and local water agencies through privatization and redefining water agency responsibility; instituting changes to water allocation methodology through increased use of water transfers and water marketing; or some combination of both. Furthermore, with budget and environmental constraints on new surface storage persistently facing federal and state water policy-makers (see Chapters 2 and 3), and as local efforts for solutions to water resource problems continue to fall short, the concept of privatization has gained increasing attention along with water marketing. Although applicability to water supply financing has yet to become widespread, efforts in privatization have occurred in the gas, electric, wastewater, and other utility industries,

Privatization Alternatives

Several forms of privatization have been used historically to fund public infrastructure, and the water resources arena has extensive experience with privatizing wastewater treatment plant operations. Savas (1990) segregates privatization into three types: 1) delegation, 2) divestment, and 3) displacement. Table 4-10 provides specific examples of each of these types of privatization.

Delegation of Government Responsibility

Delegation of governmental responsibility has been commonly used in the water supply arena through the employment of consultants, who may provide technical expertise not internally available to a public agency. Public construction activities also are usually delegated to construction contractors. Delegation may also include franchise agreements with private companies to provide water supply or some other specific service as a monopoly or as an entrant to a specific market. In many areas, a private water company is provided with a franchise to provide local water service by a local government. Many USBR facilities are operated by local user groups or agencies, a form of local government delegation. Vouchers, community self-help, and governmental incentives also fall under the category of delegation. A practice where the

government subsidizes private investments is in agriculture, which has historically received subsidized water, in part, to provide consumers with agricultural products at a reasonable cost.

Table 4-10. Description of Privatization Options

Delegation of Government Roles	
Contracting out	Government contracts with a private firm to produce and/or deliver a service or part of a service.
Franchise agreements	Government grants an organization either an exclusive or nonexclusive right to provide a particular service within a specific region.
Grants/subsidies	Government provides a financial or in-kind contribution to a private organization or individual to facilitate the private provision of a service at a reduced cost to consumers.
Vouchers	Government issues redeemable certificates to eligible citizens or agencies, who exchange them for services from approved private providers. Service-providers then typically return the vouchers to the issuing government for reimbursement.
Self-help	Individuals, community organizations, or agencies supplement or take over a service and in turn benefit from the acquired service.
Incentives	Local and regional government use legislative and taxing powers to encourage private firms to provide needed services or to encourage individuals to reduce their demand for such services.
Divestment of an Enterprise or Asset	
Sale	Selling a government owned entity to a single buyer or a group of buyers; entails sales to employees as well as customers or users.
Donation	Giving away a government owned entity, when government profit is no longer attained.
Liquidation	Selling the assets of a government owned entity when meager prospects exist for achieving profitability
Displacement of a Government Entity	
Default	Transfer of ownership from public to private sectors when government service is deemed inadequate by the public.
Withdrawal	Transfer of ownership from public to private sectors when government service is deemed inadequate by the government.
Deregulation	Used when a monopoly granted status is revoked (e.g., the electric and phone industry in the U.S.)

Source: Clarkson (1989), Savas (1990)

Divestment of Public Assets

Divestment of a publicly owned or operated enterprise is another form of privatization instigated through a sale, donation, or liquidation. Selling government infrastructure may be attractive when employees or customers of a service seek more autonomy or where the complexity of the system requires decentralized decision making. Donations occur when there is a lack of sellers or buyers, or it is deemed inappropriate to sell an asset or enterprise. This may occur with low valued services or public goods that should or could not be sold. Liquidation is the process of replacing a good or service with a cash value and allowing a private individual or group to use the resource as they wish, an option which may be attractive for assets which promise no profitability or other benefit.

Displacement of Government Entity

When government involvement is no longer desired or economically feasible, displacement of the governmental role occurs. This can take place in the form of default, when government service is no longer adequate and is simply displaced by privately provided services. Legislative mandates and directives requiring deregulation may also force the displacement of the government sector, although this often only involves allowing private venture to compete with what may have previously been government monopolies.

Limitations to Privatization

Several potential limitations to privatization are delineated in Clarkson (1989) and Starr (1987). These concerns include a private firm's possible failure to comply with contractual obligations, profiteers seeking excess profits at the public's expense, increased costs, and the displacement of public employees. Monopoly problems are common concern for private sector involvement in utility industries.

WATER TRANSFERS AND WATER MARKETING

Traditional approaches to finance and operations have resulted in numerous conflicts over water allocation procedures, cost allocation, and physical solutions to water resource problems (see Chapter 2). Market solutions to these problems have been offered and increasingly used to augment and manage water supplies. Allowing a market to allocate supplies will, in theory, achieve an efficient allocation, assuming limited transaction costs and numerous buyers and sellers.

This report adopts definitions of *water transfers* as defined in MacDonnell (1990) and Lund et al. (1992): "the voluntary permanent or temporary change in existing purpose and/or place of use of water under an established legal right or entitlement". *Water marketing* is a transfer involving a financial transaction. Market and non-market water transfers have been used in several forms as described in Table 4-11.

In some cases water marketing agreements may need to incorporate exchanges without a change in ownership (conjunctive use, for example) to circumvent legal obstacles and impacts to third parties. In addition, water wheeling and exchanges will be an important element of future water marketing transactions.

Difficulties of Water Market Implementation

Many of California's water managers have agreed that water marketing may provide substantial economic benefits and more efficient water usage. Thus, transfers are becoming ubiquitous in many long-range plans (MWD 1997; SDCWA 1997). However, numerous impediments have prevented widespread use of water markets.

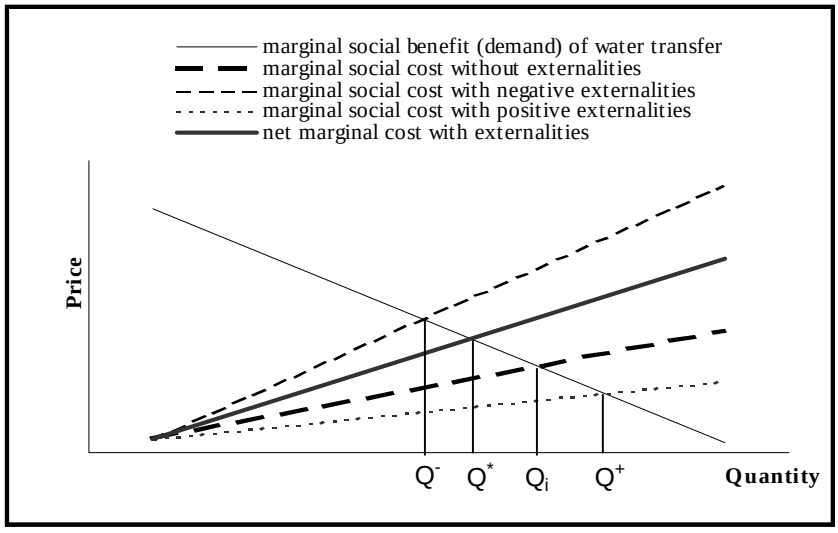
Table 4-11. Taxonomy of Water Transfers

Type	Description
Permanent Transfers	*Permanent transfer of water right from one user to another.* Often, these are incorporated with lease back arrangements during wet years, when supplies are more plentiful. Permanent trading of water rights may best accommodate favorable shifts in water demand (Howitt 1998).
Spot Markets	*Typically classified by single year short-term transfers or water rights leases.* Bidding processes often establish these markets, although they recently have resulted from multi-party negotiations. Spot Markets have historically been viewed by California's water managers as a source of supply with higher risk (Howitt 1998).
Water Banks	*A regulated and centralized form of market where third party impacts and transaction risks are reduced.* Water banks have been employed in both the 1976-1977 and 1987-1992 droughts.
Contingent Transfers/Dry-Year Options	*Occur under agreements to transfer water contingent to a specified event.* They may be activated for numerous reasons: drought, water supply interruption due to earthquakes, flooding, contamination, or mechanical failure of a conveyance system.
Conservation, Reclamation, and Surplus Transfers	*Using water transfers in combination with a conserved water source.* Water utilities have employed such practices involving their retail customers on a small scale (Lund et al. 1992). Transfer water under these arrangements comes from the water saved from the use of BMP's such as installation of low flush toilets and xeriscaping (DWR 1994a).
Water wheeling and Exchanges	*Water sold from one water district to another can be "wheeled" via conveyance and storage facilities owned by water agencies*. Exchanges usually entail exchanging equal amounts of water for different purposes. Wheeling can benefit operational, storage, water quality, seasonal, and environmental concerns.
Water Quality Transfers and Exchanges	*Exchange of higher quality water to a region or contractor requiring it*. An example could include an exchange where an agricultural contractor uses urban gray water while the urban contractor uses the agricultural contractor's water right to higher quality water

Source: Lund et al. (1992)

The initial reluctance to rely on market solutions for water supply problems could result from both third party impacts and the inherent risk associated with market implementation (Lund 1993). Evaluating these impacts is crucial in determining the efficient amount of water to be transferred. As illustrated in Figure 4-1, a buyer and seller in negotiations who neglect costs and benefits associated with third parties will transfer the amount Q_i, where the apparent marginal social cost is equivalent to the marginal social benefit. However, when negative externalities, third party impacts, and transaction risks and costs are included, the marginal social cost increases and the efficient amount to transfer is reduced to Q^-. When only positive externalities are considered, apparent social costs are less and transfers increase to Q^+. When both positive and negative externalities and transaction costs are considered, a more middling transfer quantity is ideal, Q*.

Figure 4-1. Water Marketing with Externalities



In theory, a pure market in water can exist only if four criteria are achieved: 1) water property rights must be well defined; 2) there must be many buyers and sellers; 3) resources are easily transferable; and 4) adequate information must be available (Brajer et al. 1989).

Many water rights are poorly defined for market transfers. Additionally, the vast majority of water in California is allocated based on applied rather than consumptive use, while only consumptive use is available for transfer. This creates difficulty in separating "real" from "paper" water. Monopsonistic and monopolistic behavior can be present in water markets, as excess water is sometimes owned by few users or, more commonly, excess water is demanded by relatively few buyers. For example, Kern County Water Agency and MWD together hold entitlement to over 75 percent of the entire SWP supply. Marketing by one of these two agencies will likely alter water market conditions within the SWP.

Transferability of water in California is easy in theory and difficult in practice. Use of the extensive California infrastructure is often costly or currently politically infeasible. Water transfers may become increasingly restricted as excess conveyance capacity is appropriated, environmental concerns are raised, and parties external to the financial transaction object through political or legal means. In addition, market information about potential buyers and sellers may often be difficult to obtain. This problem was perhaps more significant before California instituted the DWBs, which caused many water agencies to rethink their preconceptions about water marketing.

Six criteria for evaluating resource allocation are presented in Howe et al. (1986) and further summarized in Saliba (1987) and Lund et al. (1992). Briefly these criteria are:

1. Does the market provide greater flexibility in meeting demands?
2. Can water marketing allow water users to be secure in their tenure of water use?
3. Is the user confronting the real opportunity cost of water?
4. Is the market outcome predictable on a regular basis?

5. According to public perception, is the market allocation fair and equitable?
6. Are public values reflected in market outcome?

The authors conclude that water marketing can fulfill these criteria with careful consideration of the arguments against water marketing. One of the main obstacles in market implementation is the uncertainty associated with effects on third parties, those external to the buyer and seller.

An additional difficulty in implementing long-term transfers is the distinction between real and paper water (Lund et al.1992). Contracts are invariably written in terms of "wet" water that is defined in terms of consumptive use foregone by the seller. They should also reflect the interdependence of surface and ground water sources. Conveyance losses resulting from seepage, leakage, or evaporation also become difficult to quantify in a contract where negotiations may span many different spatial and temporal hydrologic conditions.

Third Party Impacts and Externalities

Third party impacts and externalities occur when a good is traded between parties and individuals not involved in the trade are harmed or benefited as a result of the transaction. Such impacts are common throughout the economy with many types of property. Water transfers potentially affect a variety of third parties as illustrated from Lund et al. (1992):

1. Urban: Downstream urban uses, landscaping firms and employees, retailers of lawn and garden supplies.
2. Rural: farm workers, farm service companies and employees, rural retailers and service providers, downstream farmers, and local governments.
3. Environmental: fish, wildlife, those affected by potential land subsidence, those affected by potential groundwater quality deterioration.
4. General: taxpayers.

Externalities associated with agricultural transfers include agricultural labor, equipment, material and service providers, and local government tax revenues. Examples in Colorado demonstrate the long-term damage associated with permanent transfers from agriculture to urban (Committee on Western Water 1992). Much of the literature considers the externalities associated with agriculture a greater threat since the focus of water marketing has emphasized agriculture to urban transfers or transfers from low value agriculture to high value agriculture (Howe et al. 1990; Dinar and Letey 1991; Reisner and Bates 1992; Michelson and Young 1993). Return flow, water quality, and instream flow effects of transfers can have both positive and negative impacts.

The California DWBs avoided many of the property right complications of longer-term transfers by invoking the drought emergency to avoid prolonged investigation of possible environmental problems and resolution of third party impacts. Often transfers occurred without any independent environmental review. Subsequent studies of third party environmental effects found the costs to be relatively small compared with the substantial social benefits of the water bank (Howitt et al. 1992; Dixon et al. 1993).

Economic third party effects of water trades have proved to be a notable source of objection to water markets in California. Conceptual analysis of third party impacts is widespread, but

quantitative evidence of the extent of regional economic impacts is hard to find. Howitt (1994) used both county-level primary surveys and a simulation model to estimate the aggregate county-level income changes attributable to water sales. The results from Yolo and Solano Counties that supplied 25% of the water sales to the Bank ranged from 6.5% to 3.2% average reduction in income for those county residents not participating directly in the water sales. These low average third party costs mask considerable variation within the regions studied. Where sales from land fallowing were concentrated in small areas, several businesses associated with agricultural production suffered a substantial and unexpected reduction in business. It is hard to quote low average figures when faced with a harvesting contractor who lost half his normal contracts after committing to purchase new equipment. This increase in the third party economic cost was born out by empirical simulations that show a rapidly increasing cost per unit as the proportion of water sold in a local area increases. The key to keeping third party externalities from water sales at a politically acceptable level is to geographically disperse the sales and provide a means for associated businesses to anticipate when they will occur.

An advantage of option sales over spot markets is that the level of sales and the conditions under which they occur are well known to all businesses in the area. Accordingly, a supplier to agricultural firms can plan and anticipate his sales that are, or are not, interruptible by water markets.

Permanent transfer of water rights from a region lead to substantial impacts on the local economy. This type of sale is almost unknown in California, but Howe et al (1990) show regional losses in farm value added of 10 - 21 % in the Arkansas Valley of Colorado. Sales of water under options modulate these impacts in three ways. First, under option contracts the water remains in farming for the majority of the years, thus keeping the seller on the farm and providing a source of secondary income for associated businesses. Second, since the farmer is still active and resident in the region, the stream of option payments in years that the option is not exercised will add to the income in the region. Third, the negotiation of water sales options allows enough time to negotiate third party compensation where appropriate.

One method proposed by the Model Water Transfer Act of 1996 (see discussion later) in California to reduce water market transaction costs is to de-couple the actual water sale from third party compensation. The problem is how to reduce the uncertainty over individual or district property rights to water and at the same time ensure that mechanisms are in place to internalize legitimate third party costs. Traditional provisions to prevent or compensate third party impacts take the form of regulatory or hearings restrictions on actions.

One of the key tenets of water marketing is flexibility-- allowing water users to augment their water supply *when* they need to, using the bargaining process to achieve their goals. Timing, however, is also crucial to environmental uses of water for salmon runs, water quality, and recreation. Instream uses often conflict with water demands and greatly concern the environmental community. Environmental uses such as fishing, recreational boating, and habitat area are not traditionally perceived as having an economic value comparable to that of irrigation, urban water use, or hydropower. Although efforts have been made to place dollar value on environmental entities (Colby 1990), industry has been hesitant to use these values in making instream flow allocations. Public opposition may outweigh any measure economic benefits to a

decision-maker and inclusion of existence values, or non-use values, makes these quantities especially difficult to estimate.

Transaction Costs and Risks

What happens as the result of a water transfer is one element that cause hesitation initiating water marketing, but not the only one. The negotiating and administrative costs and perceived risks in developing a water transfer plan can inhibit such activity. Archibald and Renwick (1998) aggregate transaction costs into two categories: administrative induced costs and policy induced costs. Administrative costs include gathering appropriate information and negotiation. Policy induced costs result from the implementation conditions dictated by government decision-makers, including the legality of transfers, agency approval process, and possible adjustment of costs to account for third party impacts and litigation. Economic theory shows that high transaction costs reduce the operating efficiency of markets. Evidence from Colorado, New Mexico, and Utah over the 1975 to 1984 period suggests that current policies in these states do not overburden markets, while some suggest that costs may be too low (Colby 1990).

Transaction costs may become excessive in specific instances, often depending on the political feasibility of a transfer. MacDonnell (1990) found significantly higher transaction costs occurred in agricultural-to-urban water transfers. In Colorado, where transfers out of agriculture account for 80 percent of water transfer applications, 60 percent of all transfers were protested and took an average of 21 months for state approval. In contrast, only 30 to 40 percent of transfers in New Mexico and Utah are out of agriculture, with only 5% and 15% respectively, of transfers protested, and average times for state approval at 5.8 and 9 months, respectively.

In addition to potentially high transaction costs, many elements of water marketing are perceived as risky. From this perspective, Lund (1993) suggests that market reluctance is a function of the probability of failure as much of the actual transaction costs. The probability of successful water transfers requires that the rights of water rights holders are assured, firm legal guidelines for management of third party impacts and clear legal guidelines for the water transfer approval process exist, and that necessary conveyance, storage, and treatment facilities are available to physically complete a transfer.

Solutions to the Difficulties in Water Marketing

Several legislative actions have been proposed to solve the problems that prevent water market implementation, the most comprehensive and recent being the Model Water Transfer Act (Gray 1996). Briefly, some summarizing suggestions include:

<u>Streamline Water Transfer Laws</u>

Current laws designed to protect third parties often inhibit possibly beneficial water transfers. Reisner and Bates (1992) suggest state water codes should be revised to protect *substantial* injury rather than *any* injury as currently applied.

<u>Manage Third Party Protections</u>

Several mechanisms for limiting third party impacts have been suggested by the Committee on Western Water (1992), CAN (1992) and Lund et al. (1992) and include:

- monetary taxing on transfers to compensate third parties;

- requiring additional water for instream flow in every marketing transaction;
- state compensation for those economically harmed by water transfer exportations;
- requiring explicit regulatory approval of transfers (in addition to mandated environmental and contractual requirements);
- requiring formal monitoring of third party impacts of transfers; and
- public review of water transfer proposals.

Strengthen Property Rights and Water Accounting for Area of Origin and Area of Storage Users

Area of origin protections should be reviewed and modified to meet the needs of exporters. Reisner et al. (1992) and the Committee on Western Water (1992) warn of the danger in neglecting area of origin concerns, but care should be taken that impact analysis of area of origin protection is not prohibitive.

Strengthen Instream Flow Measures and Include in Water Market

Gray (1989) notes the apparent failure of the appropriative rights system to recognize instream flows as a beneficial use. The ability of environmental interests to secure these instream flows in a market system necessitates their classification as a beneficial use. Some advocate allowing these uses to be marketed along with urban and agricultural water rights under constrained condition, in a sense privatizing some instream flows (Griffin et al., 1993; Anderson et al. 1997; Willis et al. 1998).

Accommodate Public Trust Doctrine in State Water Transfer Laws and Policies

By invoking the public trust doctrine to protect the Mono Basin in *National Audobon Society vs. Superior Court of Alpine County* and subsequently enforcing it with SWRCB Decision 1631, California has necessitated the valuation of public trust in water allocation decisions. Transfers should account for the impact and implication on public trust values. Reisner and Bates (1992) suggest public interest determinations, although some find such methods too cumbersome and the public trust doctrine too vague in influencing transfer legislation (Anderson et al. 1997).

Status of Water Marketing in California

Given the impetus for water marketing from academia and from urban users during the 1987-1992 drought, several examples of water marketing are now in effect through out the state. For the first time since the concept of water marketing was developed, the 1988 California Water Plan update identifies water markets as a "water supply augmentation option." The following section summarizes water supply programs identified as water market transactions by DWR (1998a).

MWD and IID

Under the provisions of this agreement, MWD pays IID $92 million in capital costs, $3 million in annual O&M costs, and $23 million in liability and indirect costs for implementing a water conservation program in the IID service area. In return, MWD receives up to 100,000 af of IID's annual Colorado River entitlement (Reisner et al 1992).

Semitropic Water Storage District (SWSD)

SWSD has developed a conjunctive use water banking program capable of storing up to 1 million af and producing up to 223 taf/yr when requested. In addition to the 350 taf storage capacity provided to MWD, other contracting partners include Santa Clara Valley Water District (SCVWD) with 350 taf capacity, Alameda County Water District (ACWD) with 50 taf, and Alameda County Zone 7 District (Zone 7) with 43 taf. This leaves SWSD with 200 taf of marketable storage available at $175/af for recharge and extraction. Banking partners may contract with SWSD to deliver their SWP water or other water supplies to the California Aqueduct for in-lieu-groundwater recharge. At request by contractors, water could be extracted and delivered to the Aqueduct or pumped by SWSD farmers in exchange for SWP entitlement deliveries.

San Luis and Delta-Mendota Water Authority (Authority), SCVWD, and USBR

A three party agreement has been executed allowing some of the Authority's member districts to voluntarily act as drought water suppliers for SCVWD, an urban water agency. Part of SCVWD's CVP allocation will be delivered to these districts in normal and above-normal water years in exchange for allowing SCVWD to recover the allocation during drought years. This agreement ensures that SCVWD's 97.5 taf entitlement is delivered in years when CVP urban supplies are at 75% or less, thus increasing SCVWD's water supply reliability. Additionally, SCVWD has agreed to optimize its non-CVP supplies to ensure that this water transfer is requested only when needed. To date, the Westlands and San Luis Water District members of the Authority have agreed to act as drought water suppliers.

CVPIA authorization for Water Transfers

Federal efforts to promulgate water marketing under the CVPIA have yet to produce any transferred water. Only one contract had been signed as of 1996, between MWD and Areias Ranch, a large agricultural operator and member of the Central California Irrigation District. This contract, however, was intensely disputed and is very unlikely to deliver any water to MWD.

Arizona Water Banking Authority (AWBA)

Authorized in 1996 by the Arizona legislature, AWBA is allowed to purchase surplus Colorado River water and store it in the ground to meet future needs. As previously mentioned, MWD has purchased water from Arizona, but not yet through AWBA. Future interstate water banking could lead to an increased Colorado River yield of up to 100 taf when activated.

CVP Interim Water Acquisition Program

Fish and wildlife requirements have been augmented by a temporary CVP program to help USBR fulfill Section 4306(b) of the CVPIA. In 1995, 1996, and 1997, approximately 39, 63, and 179 taf of water were purchased, respectively. Water from this program benefited wildlife refuges in the Sacramento and San Joaquin Valleys, spawning conditions for spring-run Chinook salmon and steelhead trout on Battle Creek, and instream flow requirements on the Stanislaus, Tuolumne, and Merced Rivers.

Other Agricultural to Urban Transfers

Of the 130 taf of SWP annual entitlement allocated for permanent sale to urban contractors in the Monterey Agreement, 25 taf has been relinquished to the Mojave Water Agency and 7 taf is in the process of being sold to Zone 7.

In addition to the conservation arrangement with IID, MWD has investigated land fallowing programs with the Palo Verde Irrigation District. MWD paid PVID irrigators $1,240 per fallowed acre, allowing MWD to purchase water at about $135/af. DWR (1998a) estimates up to 100 taf of water from land fallowing arrangements from southern agricultural regions could be provided to southern urban areas. IID also has contracted with the San Diego County Water Authority in a similar agreement, although implementation of this agreement is currently in litigation.

Initiating a short-term water buy-back program, Westlands Water District will purchase unused water supply from its water users and reallocate it to other users to meet their water supply needs. Complementing this buy-back program, Westlands is in the process of environmental documentation for the purchase and transfer of up to 200 taf/yr from external sources.

INNOVATIVE INSTITUTIONAL ARRANGEMENTS FOR CALIFORNIA

Altering the traditional roles of state, regional, and local government in financing schemes is not limited to privatization or to relinquishing of government control. State and local water agencies often have considerable flexibility to participate in joint ventures and cooperative efforts that develop innovative methods to use facilities and available funding.

Independent Authorities

Explicit language in California law provides agencies with the ability to solve regional or extra-boundary problems involving more than one governmental entity. California code §6502 states:

> "If authorized by their legislative or other governing bodies, two or more public agencies by agreement may jointly exercise any power common to the contracting parties.... [T]wo or more public agencies having the power to conduct agricultural, livestock, industrial, cultural, or other fairs or exhibitions shall be deemed to have common power with respect to any such fair or exhibition conducted by any one or more of such public agencies or by an entity created pursuant to a joint powers agreement entered into by such public agencies."

Several local water agencies have combined together to form water authorities gaining political and financial clout and the ability to plan over vast, politically heterogeneous regions, such as MWD and SDCWA. On a smaller scale, cities creating independent authorities have been able to better use existing resources, sharing services such as police departments and fire departments rather than overlapping their efforts in some areas (BAC 1983).

In exploring development of an ideal regional water organization, Ostrom et al. (1964) provides an outline of what should be considered. First, the authority's jurisdictions should include the relevant set of activities to be controlled (e.g., conveyance, storage, or hydropower facilities). Second, boundary conditions of the entity should consider appropriate economies of scale so that

it does not suffer from lack of resources but avoids becoming too expansive. Third, representation from existing decision-making bodies should be included so the authority remains accountable and its development politically feasible. Finally, so the authority avoids becoming invasive and unresponsive to its member agencies, each member should have their desired level of autonomy.

Local Cooperative Efforts

Many solutions have been found without the creation of new governing entities. McGarry (1983) explains how a successful solution to potential water shortages on the Potomac River basin was attained not through private or federal assistance, but rather through more effective local agency cooperation. Infrastructure needs were determined to be much less than initially anticipated and more efficient use of existing facilities was attained. Task forces for the accomplishment of local objectives were formed consisting of elected officials subject to public scrutiny in contrast with public utility decision making. These task forces were guided by citizen leadership and affected every decision so as to continually gain public input. More rigid federal traditional planning concepts were ignored in exchange for local coordination. McGarry (1983) is careful to note the extreme personal dedication on the part of task force and citizen leaders to accomplish their objectives, dedication driven by the fear of drought.

Infrastructure Banking

In response to dramatic drought conditions, faced with future state deficits, and determined to maintain a triple A bond rating, the state of New Jersey instituted an 'infrastructure bank' in 1983 to attain their infrastructure needs (Arbesman 1983). Deposits into the bank include federal appropriations and outstanding state bond issues. Loans are then given out from a reserve account to supplement state-wide infrastructure needs. A revolving fund is created as the loans are paid back with user charges. Arbesman (1983) sees the ideal institutional arrangement for infrastructure banks as suppliers for local collection, distribution, and rehabilitation projects while the private sector provides for large capital investment, in a kind of private-public marriage. Alternatively, the French system of *affermage* uses public funding for infrastructure capital and private funding to support operating costs, a system sought to remedy nonexistent or low willingness-to-pay in developing countries (Young et al. 1989).

CONCLUSIONS

A wide variety of non-structural, operating and financial options are available for California's water supply problems. Markets are likely to be a vital part of long-term solutions, especially those that seek to involve the use of private capital. Water demand management, another non-structural measure, will be discussed in Chapter 6, where user water demands are discussed and integrated into a state-wide representation of California's water management.