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**THE LOCAL GROUNDWATER ECONOMY IN
LOS ANGELES COUNTY, CALIFORNIA**

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THE LOCAL GROUNDWATER ECONOMY IN LOS ANGELES COUNTY, CALIFORNIA

The governance and management of water use in the United States generally, and in southern California in particular, are not organized as an ideal legal-rational centralized administration or as a perfectly competitive private market. This fact poses challenges to analysis that the local public economies (LPE) framework developed at the Workshop in Political Theory and Policy Analysis helps to resolve.

The LPE framework enlarges the possibilities for descriptive and prescriptive analysis of interorganizational relations. It is based on the idea that an understanding of current arrangements is an important prerequisite to the issuance of prescriptions for reform. That view, which has informed work on metropolitan area governmental organization (e.g., ACIR, 1987), suggests that analysts "begin to search for the nature of the order which exists in the complex of relationships among governmental units and abandon the assumption that all of these relationships are unique or random." By searching for "the nature of the order which exists" and "an analysis of how the system works," (Ostrom and Ostrom, 1965: 138) one can arrive at descriptions of current arrangements. Discussion of shortcomings and recommendations for improvements can follow, while the ultimate evaluations of the performance of public officials and governmental structures are left to citizens.

A Complex Water Economy

The LPE-derived concept of a complex and regulated water economy helps us understand the roles and relationships of the diverse organizations involved in water management in the United States. That complex water economy is composed of providers, producers, importers, wholesalers, retailers, and regulators.

When the organizing concept of a complex water economy, composed of providers and producers, importers, wholesalers, retailers, and regulators is applied to the management of water supplies in the United States, patterns of organizational development and of inter-organizational relationships begin to emerge that contribute to an understanding of the actual operation of this complex system that involves literally hundreds of thousands of entities, private and public, local, state, and national. It is, in fact, an organizing concept without which much of the activity involved in the provision and production of all kinds of services and commodities in the United States would be nearly incomprehensible.

In fact, the complex water economy in the United States may involve thousands, even hundreds of thousands, of organizations and relationships, yet not be beyond comprehension. Some organizations are providers of water, others are producers of water, others may be both, and there are many provider-producer relationships.

The LPE distinction between the provision of a service

or commodity and the production of a service or commodity (U.S. ACIR, 1987) is crucial for understanding the water economy. The provision of a service or commodity involves the set of decisions concerning the amount and quality that will be provided, at what costs, how the incidence of costs will be distributed among the users of that service or commodity -- in sum, the set of decisions translating preferences for the service or commodity into demand articulations to be satisfied by supply acquisition. The production of a service or commodity involves the set of decisions for acquiring and mixing production inputs in order to generate production outputs (services or commodities).

Provision and production decisions may be made and executed by the same organization or by different organizations. An organization may provide services or commodities that it does not produce. An organization in the "water supply industry" (for example, a general-purpose or a special-purpose local government) may provide water supply to its residents but do so by acquiring all or part of its supply from water that is actually produced by some other entity.

Overlaid on the provider-producer distinction is the difference in an economy between importers, wholesalers, and retailers. These are functional differentiations and relationships that are not surprising when found in the analysis of other sectors of the economy, and they are also

found in the water economy of the United States. Some organizations import water to areas where it is in demand. Others function as wholesalers, providing water supplies to more than one retail client organization. Retailers distribute water supplies directly to water users.

Some water wholesalers may be water producers as well as providers; others may be providers only, purchasing imported water supplies and then distributing them among retailers. Similarly, retailers may directly produce the water they sell to users, purchase it from wholesalers and deliver it to residents, or operate with some mix of these methods.

Regulatory functions, to oversee the operation of water suppliers and ensure safety to users, may be performed by still other organizations. In fact, throughout various sectors of the United States economy, the organizational separation of regulation from production and provision has been employed as the institutional arrangement of choice -- quasi-independent and independent regulatory agencies and commissions, and legislative bodies and committees in local, state and national governments typically review and mandate the safety of services and commodities produced and provided within various industries.

If one looks at "water resources management" as though it were one task, then the number and degree of specialization of provision units and regulators is likely to appear as "duplication" and "fragmentation," with several

units "each dealing with a part of the problem" (Krieger and Banks, 1962: 74, emphasis added). On the other hand, if "water resource management" consists of several functional aspects, then one may anticipate some organizational differentiation.

Water Supply Projects and Their Operation. The largest element in the complex water economy is the "water supply industry." It consists of publicly and privately owned systems of varying organizational forms and sizes.

The complex water economy concept may help us to understand the apparent paradox of a large number of small water suppliers in an industry characterized by many observers as involving large economies of scale. Since most larger water systems have relied primarily on surface water supplies, many analysts' claims about the scale economies inherent in water supply have been based on those present in surface water supply. Surface water projects typically do involve large capital investments in physical facilities, such as distribution systems to convey water from the point of supply to the point of use, and in many cases dams and reservoirs, facilities to exploit opportunities for low-cost hydroelectric power generation, and facilities to ensure the protection of aquatic life.

Some local communities and private water suppliers have made investments in developing surface water supplies, including the construction and operation of surface water

projects. But many surface water projects have required attention to the scale of a watershed, which is often beyond the scale of any one local community and contains several communities. In some cases, regional special districts have been created to finance and build surface water projects. In other cases, states have designed and constructed surface water projects. Still other projects have been financed and built by the national government.

However, construction and operation of a surface water project are two different functions. Throughout the western United States, for example, while Bureau of Reclamation projects have generated more surface water storage capacity than the several projects constructed by the U.S. After project construction, the U.S. Bureau of Reclamation has developed a practice of turning over the operation of its projects to irrigation districts or other local special-purpose governments that represent the users of water from the project (Leshy, 1983: 215).

The use of the water developed by a surface water project is also subject to decision-making that may be appropriately organized on a scale other than the scale of the construction of the project, or even its operation. Water provision decisions, decisions about how much water of what quality to acquire at what times and for what cost, depend on a number of factors that tend to be local in scope.

Therefore, a number of communities of interest may

exist within the service area of a large-scale surface water project. If they can organize representative collective entities -- associations, municipalities, special water districts -- that can bargain and contract with a large-scale water producer or water-project operators, the water project operator may operate as a wholesaler of water to different communities needing different amounts at different times, and the various communities within the service area may function as retailers, or as users' cooperatives.

The concept of competition among entities representing local resident water users runs counter to organizational-integration models, and will appear to some analysts to be "fragmentation" of decision-making, with "local parochial interests" being pursued at the sacrifice of "the general good" of the watershed. Nonetheless, this complex water economy with its bargaining and contractual relationships between providers and producers, wholesalers and retailers is how water supply actually operates throughout the United States, and this form of organization carries with it possibilities for efficient and equitable water resource management.

The Special Role of Special Districts. In some watersheds, where existing enterprises and agencies lacked the power or the jurisdictional boundaries (or both) to effectively engage in conjunctive management practices such as artificial recharge and taxes on pumping, new agencies have

been created to fit the boundaries of the groundwater basin. Where this has occurred, those agencies have been able to provide replenishment and water storage services for the interdependent users of the basin, while spreading the costs of such activities across all users in proportion to the benefits obtained.

Special districts are at the heart of the criticisms of the structure of government in the United States. Their advantages appear primarily by comparison with general-purpose local governments. Special water districts have the jurisdictional flexibility to cross other governmental boundaries, cover unincorporated areas, and embrace a natural resource boundary or a community of resource users.

Special water districts may also aid in making rational water pricing decisions. They create opportunities for revenue and pricing systems to be developed that (a) link the imposition of costs to the distribution of benefits, (b) provide incentives for efficient mix and use of services, and (c) can make the district and its activities self-financing. Properly empowered, special water districts provide a framework for making water supply and management decisions within the water-user community, removed from the decision-making processes and financial arrangements for other services.

Associations. Associations of water users, officials, and professionals in the water economy have played important

roles in facilitating effective water management. These roles generally fit two broad categories: (a) mobilizing and organizing the community of water users, officials, and professionals in support of management initiatives, and (b) providing communication and dissemination of information and technical assistance that is beneficial for water management.

Water user associations have frequently served to create a forum for the discussion of issues within a community when no other equally inclusive forum existed. Industrial users who produce their own water for their own uses, municipal and private suppliers of water to residential populations, citizens concerned about environmental quality, and others may employ association membership to avail themselves of an opportunity to discuss the conditions and prospects of their common groundwater supply, and possible remedial actions. Where such associations are developed (and they have appeared throughout the nation), they have often served as the first step toward the development of effective water management plans, programs, and institutions.

Regulators. The water economy is not unregulated. There exist local, state, and federal regulators. Local public regulators are most likely to be general-purpose local governments overseeing the operations and costs of private water suppliers in their area. When municipalities and

other general-purpose local governments contract for water supply with a private producer, the legislative body of the general-purpose local government generally retains oversight authority to review the actions of the contractor. Local governments have also been actively involved in the protection of groundwater quality and the remediation of contamination problems where they have occurred.

The states and the national government also act as regulators of water supply operations. States operate as regulators with respect both to quantity and quality. Most past federal regulation has been of water quality, although recent recommendations and emerging trends suggest the possibility of an enlarged role for the national government in regulating water supply operations and management.

A Local Water Economy at Work on the Los Angeles Coastal Plain

California has encouraged groundwater management by local water users, usually through the combined efforts of special water districts and water users' associations, with the support of state agencies such as the California Department of Water Resources. The state has also encouraged neighboring communities sharing similar water resource problems to form special water districts in order to address areawide, but substate, management challenges. This policy has been followed in most of the inhabited areas of southern California, and in much of better-supplied

northern California.

Although the approach has been criticized as promoting "piecemeal" management at best, or leaving the state's groundwater supplies "essentially unmanaged" at worst (Knapp and Vaux, 1982), other observers conclude that statewide groundwater management legislation and administration have been rationally foregone in California in light of the degree and variety of local management initiatives and activities. What critics see as an inadequate or ineffective approach to groundwater management is viewed by others as "a relatively well-developed and diverse system of local groundwater management that has evolved on a piecemeal basis over many years" (Lipson, 1978: 1).

Development of Groundwater Management Institutions in the Los Angeles Coastal Plain. A lack of defined rights to specific quantities of groundwater has presented significant barriers to effective management of the resource. It is not surprising, then, that among the first steps taken by local groundwater users in areas that have developed management schemes has been the determination of rights to specific quantities of groundwater. In many California localities, associations of local water users, including municipalities, water service companies, local businesses, and agricultural interests, were organized to discuss means by which determinations of rights could be achieved.

Frequently, they employed adjudications in order to

take advantage of a process that limited decision-making to the users affected, allowed for expert investigations of hydrologic conditions, balanced total extractions with the available groundwater supply, and produced enforceable water rights for the individual users. Stipulated judgments among the parties were often used to secure mutually agreeable allocations that might not have resulted from the strict application of state water laws.

The conjunctive management of groundwater supplies with local and imported surface water supplies in California typically has also involved the creation of local water districts with specialized functions. Such districts provide various elements of conjunctive management -- controlling and limiting overdraft through monitoring and enforcement, acquiring water supplies and replenishing the underground supply and regulating water storage, and protecting supplies from degradation. Occasionally, a water district will provide these services by producing them itself; in other cases, the district will act as a service provision unit contracting with other specialist producers of these services. An example of this system of inter-jurisdictional relationships can be seen in the conjunctive management of water in the Los Angeles Coastal Plain in Los Angeles County, California.

The Los Angeles Coastal Plain is underlain by two major groundwater basins, the West Coast Basin along the coast, and the Central Basin inland (although the southeast corner

of the Central Basin extends down to the coast in the Long Beach area). The the Newport-Inglewood Uplift, a northwest-southeast geologic disjuncture parallel to the coast, separates them. The West Coast Basin is recharged almost exclusively by subsurface flow across the Uplift from Central Basin, which in turn receives most of its replenishment from the San Gabriel Valley upstream.

Rapid development of the Coastal Plain during the first half of this century generated increased demands for water. These demands were met largely by use of Coastal Plain groundwater supplies. This resulted in declining groundwater levels, which in West Basin sank below sea level. Along the coast, salt water began to intrude into West Basin, rendering water in some wells near the coast unusable by the 1920s and 1930s. The main source of local water supply for West Basin's coastal communities was severely threatened.

The responses to those threats have been described in Ostrom (1965, 1990) and Blomquist (1992). Representatives of West Basin water users -- municipalities, water companies, local businesses -- formed a West Basin Water Association to investigate and pursue how to acquire and pay for additional imported water supplies from MWD, and how to gain control of the depletion problem in the West Basin.

The association operated on both problems through different avenues -- one involving special district formation, the other involving adjudication of rights to the

use of the groundwater supply. In working through the adjudication, West Basin users faced complicated and interrelated difficulties. In order to limit pumping to an extent needed to stop the overdraft, they would have to cut back their pumping by nearly two-thirds and replace the difference with more expensive imported supplies. A related problem was that raising West Basin water levels high enough to halt sea-water intrusion would raise them along the Newport-Inglewood Uplift to the point where Central Basin water would no longer flow into West Basin, since overpumping in Central Basin had lowered water levels there.

The association, the California Department of Water Resources, and the Los Angeles County Flood Control District (now a division of the Los Angeles County Department of Public Works) constructed and operated a pilot project in the late 1950s and early 1960s to create a sea-water intrusion barrier by injecting fresh water underground to form a pressure ridge along the coast. The project was successful, and a full-scale sea-water intrusion barrier was constructed. The barrier allowed water levels in West Basin to be kept lower, thereby increasing the amount of recharge flowing into the Basin from Central Basin and reducing the amount by which West Basin pumpers had to cut back.

In the 1950s, Central Basin water users formed a Central Basin Water Association and began to explore possibilities for reducing groundwater withdrawals and securing additional water supplies and a groundwater

replenishment program. A Central Basin Municipal Water District was formed and annexed to MWD in 1952, ensuring access to Colorado River water for communities in Central Basin. Later in the 1950s, sea-water intrusion problems began to appear in Central Basin near Long Beach, so overdraft created water quality problems there too.

Water users in the West and Central Basins needed to achieve several goals that would benefit both basins: limit groundwater withdrawals in Central Basin; raise water levels in Central Basin and keep them lower in West Basin in order to maximize the subsurface flow from Central Basin to West Basin; find a means to finance and operate a replenishment program that would benefit both basins; and find a permanent means for financing and operating the sea-water intrusion barrier projects.

The Central and West Basin Water Replenishment District was formed in 1959. Once formed, it began an adjudication of water rights in the Central Basin on behalf of the water users. This action began in 1962 and ended with a final judgment in 1965. At that point, water users in both basins had enforceable rights to specific quantities of water, which could be (and extensively have been) transferred. Both basins were placed on a modified safe-yield operation (technically, West Basin runs a deficit in order to maximize the intake of replenishment water from Central Basin). A replenishment program was implemented, involving the use of local recharge, and artificial recharge with imported water

and reclaimed water. Sea-water intrusion was effectively halted through the operation of the barrier projects.

Operation of the Conjunctive Management System in the Los Angeles Coastal Plain. The Central and West Basin Water Replenishment District is the public provision unit that organizes the conjunctive management program for the Los Angeles Coastal Plain. However, the Replenishment District has a staff of three, and shares an office with the Central Basin Municipal Water District. The Replenishment District provides a conjunctive-management program through a series of contractual arrangements with specialized producers.

One might ask why the Replenishment District was created when the West Basin Municipal Water District and the Central Basin Municipal Water District already existed. The West Basin Municipal Water District and the Central Basin Municipal Water District were formed, like many municipal water districts in California, to contract for the delivery of surface water. Such districts generally do not have artificial recharge programs or pumping assessments. Nor do municipal water districts generally correspond with the boundaries of groundwater basins; these districts typically represent existing political jurisdictions. Municipal water districts can be formed by the people of any county or counties, or of any portion of a county, and may include both incorporated and unincorporated areas. However, if any part of a municipality is included, it must all be included.

Therefore, neither the West Basin Municipal Water District nor the Central Basin Municipal Water District was in a position to finance and operate the replenishment of the Central and West Basins. However, municipal water districts, as specialized agents in the market for purchases of supplemental surface waters, were ideally suited to the acquisition of waters for recharge programs, since they already were members and contractors with the MWD for the importation of additional surface water supplies for their respective communities.

The creation of the Central and West Basin Water Replenishment District to cover the area of both interconnected basins, with the specialized authority to provide the replenishment and sea-water protection functions, generated the needed jurisdictional boundary fit and the needed authority. It was not, however, necessary to empower the Replenishment District to acquire imported supplemental water for recharge, or to make the Replenishment District a member agency of the MWD, since the two Municipal Water Districts with that authority and that membership already existed within the territory of the Replenishment District. The Central and West Basin Water Replenishment District became a customer for waters secured by the Municipal Water Districts.

The Replenishment District purchases imported supplemental water for recharge of the groundwater basins, and for injection against salt water intrusion, through the

Municipal Water Districts. The Municipal Water Districts recover their costs through water sales and property taxes. The Replenishment District recovers its water purchase costs through taxation of pumping, while its administrative costs are covered by ad valorem property taxes. The theory behind these arrangements is that the existence of a secure water-supply infrastructure is of benefit to all property holders in the areas covered by these Districts, while the replenishment program primarily benefits groundwater pumpers and their customers, and the water sales of the Municipal Water Districts primarily benefit the water retailers of the area and their customers. The Replenishment District also operates an in-lieu replenishment program, financed from pumping assessments, through which it reimburses pumpers the difference in their costs from not pumping and taking more expensive imported water supplies instead.

The Central and West Basin Replenishment District owns extensive recharge facilities, but it does not operate them. The Los Angeles County Department of Public Works has specialized personnel with extensive experience in operating reservoirs to impound and release waters, and it operates the Central and West Basin Replenishment District's spreading project in the Central Basin forebay. Similarly, the Department of Public Works gained experience in the operation of the sea-water intrusion barrier projects, and so it performs the actual injection of the barrier project water that the Replenishment District purchases.

The Los Angeles County Sanitation Districts have operated water reclamation plants at the Whittier Narrows and nearby San Jose Creek for years. With the authorization under supervision of the California Department of Health Services, the Replenishment District purchases reclaimed water from the Sanitation Districts for groundwater replenishment. The Sanitation Districts release the purchased quantities of reclaimed water to the spreading facilities operated by the Department of Public Works for the Replenishment Districts. Since reclaimed water from the Sanitation Districts is much less expensive than replenishment water imported from the Colorado River or from northern California, the Replenishment District uses as much of the reclaimed water as it can, and has been increasing those amounts.

While locally reclaimed water is the least expensive source of replenishment water, the major imported water wholesaler, the MWD, offers surplus replenishment water at a lower price than its treated, filtered regular water supplies for direct delivery. Conjunctive use of groundwater supplies lowers the demand for imported water and reduces the amount of capacity MWD has to construct and maintain for dry periods, so the MWD Board has encouraged this practice through the lower price of replenishment water. Similarly, in years when it has surplus water available in the State Water Project, the California Department of Water Resources has offered surplus water at

reduced prices to local districts for artificial recharge.

Thus, each year, the Central and West Basin Water Replenishment District anticipates the approximate mix of surface water supplies and groundwater pumping within the Coastal Plain (based the anticipated availability of surface water supplies), estimates the amount of replenishment water and barrier water needed in the Central and West Basins, arranges the purchase of that water from several sources in such a way as to secure the needed quantity at the least total cost, and arranges for the operation of its spreading facilities and barrier projects. It then assesses those purchase and operations costs against the water users within the Central and West Basins.

Thus, the operation of these facilities, the supplying of the replenishment waters, and the maintenance of water quantity and quality in the basins, are accomplished through a local public economy featuring a network of intergovernmental contracts with specialized producers exhibiting a high degree of division of labor. These arrangements have provided the Coastal Plain of Los Angeles County with an effective conjunctive management program that is beginning its fourth decade of operation.

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