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PUBLIC PROBLEMS AND NON-DECISION MAKING—
A STUDY OF THE TUCSON WATER SYSTEM

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PUBLIC PROBLEMS AND NON-DECISION MAKING* —A STUDY OF THE TUCSON WATER SYSTEM

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For several decades now, most major American metropolitan areas have been plagued by ineffective traffic systems, dirty air, polluted rivers and streams, deteriorating housing, growing slums, civil disorder, and other similarly undesirable conditions. Engineers, atmospheric scientists, social scientists, planners and others, have studied these conditions and described and analyzed their nature, causes and consequences. They have often called for intendedly remedial public action to solve the "problems."[1] But the problems seem to remain. In fact, although some attempts to deal with them have been made in most metropolitan areas, the problems may be increasing both in terms of frequency and seriousness.

This article attempts to explain this phenomenon It is argued, with specific and detailed reference to the problem of water supply in Tucson, Arizona, that political systems[2] in metropolitan areas have failed to produce comprehensive and sustained programs to alter the environment and eliminate problematic conditions. Four related factors are suggested as accounting for this failure. They are: (1) the relationship between the pattern of governmental organization and problem boundaries in metropolitan areas; (2) variations in the number and nature of functions performed by metropolitan area governments; (3) variations in the resources possessed by, and demands placed upon, metropolitan area governments; and (4) a resultant variation in the propensity of metropolitan area decision-makers to treat a given set of environmental conditions as a public problem, and then to incur the decision-costs[3] necessary to deal with that problem.

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1. Air pollution, water pollution, etc. are referred to as "conditions described by experts as problems" rather than simply as "problems" or as "public problems" because it can logically be argued that until a government places a question (such as air pollution) on its official agenda, there is, to that government, no public problem.

2. The term "political system" as employed in this article simply refers, in a collective sense, to all the governments in a metropolitan area. The term "sub-system," in turn, is used to refer individually to any one of these governments.

3. The term "decision-costs" refers to the payments which a government must make in terms of money, manpower, equipment and temporary neglect of other problems and other publics whenever it chooses to allocate its limited resources to any given problem.

Most American metropolitan areas today are plagued by a variety of conditions which have been externally defined by experts as problems and which, we are told, demand public attention. Engineers, social scientists and others suggest that there are problems plaguing entire metropolitan areas which span the jurisdictional boundaries of large numbers of governments. With most major metropolitan areas containing dozens, even hundreds, of governments, problem areas fail to match political boundaries and are, thus, difficult to "package."

Public action to alter unpleasant environmental conditions does not always follow their external identification as problems. Although decision-makers of the various governments (sub-systems) in metropolitan areas may recognize the existence of problem conditions, they frequently choose not to define officially these conditions as "public problems" by declining to place them on the agenda of government. They may decide that, given their limited resources and numerous demands, the decision-costs of dealing with a new "problem" cannot be paid.

Metropolitan area sub-systems perform a variety of functions. They provide services for and respond to a variety of publics. Although publics and functions may overlap, different governments generally perform different functions—or at least give priority to different functions. For example, the prime function of a school district, and the public to which the district responds, is not the same as the functions performed, and the publics responded to, by a city government. Thus, given a list of problems or services, different governments will rank them differently in terms of seriousness and importance.

The likelihood of public officials treating problematic conditions as "public problems" will increase "unevenly" within metropolitan political systems. Depending upon the ratio of resources to demands, a government may or may not choose to incur the decision-cost necessary to deal with a given problem. Thus, at any point in time, and relative to any given problem, some political sub-systems may choose to bear decision-costs and others may not. It is unlikely, therefore, that any problem affecting an entire metropolitan area will be dealt with by the full political system. It is more likely that the problem will receive only the limited attention of sub-systems which remain unable to "package" the total problem and deal with it effectively. This means that in most metropolitan areas, some efforts may be made to eliminate air pollution, slums, etc.; but in all likelihood these efforts will be incremental and insufficient to fully "solve" the problems.

Finally, the propensity of a given system, sub-system, or consortium of sub-systems to act vis-a-vis a given problem may change as decision-makers perceive changes in the ratio of resources to demands—as the decision-costs appear to decision-makers to increase or decrease. Such decision changes may result from variations in the level of resources which sub-systems possess, from variations in the level and nature of demands placed upon sub-systems by their public or publics, or from variations in decision-makers' perceptions caused by receipt of new information.

The persistence of the water supply "problem" in and around Tucson, Arizona is illustrative of the phenomenon described above—the failure of political systems to produce comprehensive and sustained programs to eliminate problem conditions. While it is generally recognized that Tucson has a water supply problem, the control of the Tucson water system is politically fragmented and its many sub-systems vary widely in terms of functions performed, resources possessed and demands placed upon them. The result has been uneven system development. That is, while those in control of a few sub-systems have initiated some action to remedy the problem, the system collectively has failed to act. The action that has been initiated has been insufficient to solve the problem.

I
THE TUCSON WATER PROBLEM

Tucson is located in the Santa Cruz River Valley in arid southern Arizona. Precipitation in the Valley is slight, averaging only ten inches a year. Underlying the Valley is a large groundwater basin—the Santa Cruz Basin. Over the years, this basin was filled by the downward percolation of rain water and mountain runoff. Geologists say it may have taken millions of years to fill this basin. All water now used in the Tucson area, and much of what is used in Arizona, is drawn from groundwater basins such as the Santa Cruz. Water is literally "mined."[4]

Tucson and the surrounding metropolitan area have experienced tremendous growth in the past two decades. As indicated in Table 1, the city grew in population from 45,454 in 1950 to 242,000 in 1967. In terms of area, Tucson grew from 9.55 square miles in 1950 to 75.96 in 1967. The population of Pima County, in which Tucson is located, rose from 141,216 in 1950, to 335,000 in 1967.

4. The "Tucson Region" is an area including all of the City of Tucson, most of eastern Pima County and covers 3,300 square miles.

TABLE 1
Population and Size: Tucson and Pima County

Year	Population City of Tucson	Population Pima Co.	Size in Sq. Miles City of Tucson	Size in Sq. Miles Pima Co.
1930	32,506	55,675		9,241
1950	45,454	141,216	9.55	9,241
1960	212,892	265,000	70.87	9,241
1967	242,000	335,000	75.96	9,241

Source: Bureau of the Census, *County–City Data Book;* and G. Davis and H. C. Schwalen, Tuscon Region's Water Use and Future Needs, on file at University of Arizona Department of Agriculture Engineering.

Population growth has caused an increase in water use. From 1930 to 1963, water used in the Tucson Region[5] increased over 300%. It is expected to double again by the year 2000, as indicated by Table 2.

During the past several decades, Arizona, specifically the Tucson Region, has been withdrawing groundwater faster than nature can replace it. For example, in 1963, 2.0 million acre-feet of surface water and 4.6 million acre-feet of groundwater were used in Arizona. Arizona has a "fixed income water supply" of 3.6 million acre-feet a year, made up of 2.0 million acre-feet of surface flow, and 1.6 million acre-feet of annually recharged groundwater. The result, given the water use figure for 1963, is an annual Arizona groundwater deficit of 3.0 million acre-feet.[6] Similarly, there was a sizable groundwater deficit in the Tucson Region in 1963. In that year, groundwater pumpage totaling 249,690 acre-feet while recharge was estimated at 91,000 acre-feet. This left Tucson with a ground water deficit for 1963 of over 150,000 acre-feet.[7]

By external definition, then, there appears to be a serious water shortage problem in the Tucson area. It has been empirically demonstrated that the level of the water table in the Santa Cruz basin has been falling at a rapid rate. And while there is not agreement among engineers, hydrologists and geologists as to the quantity and quality of the remaining water, there is general agreement that early action is needed to find and develop additional water sources. Further, some engineers believe that additional water sources should be developed at the earliest possible date so that the remaining local groundwater may be used as a "water bank" for peak period use, thus reducing the size and cost of schemes for importation facilities.

5. Technically, "groundwater" is subsurface water which demonstrably moves in definable channels. A second type of subsurface water is "percolating water." This is subsurface water which, supposedly, does not move. In this article all subsurface water is referred to as groundwater.

6. Arizona Academy, *Arizona's Water Supply* 2-3 (1964).

7. G. Davis and H. C. Schwalen, *Water Use and Future Needs in the Tucson Region*, an unpublished report prepared for the City of Tucson.

TABLE 2
Water Use in Tucson Region in Acre-Feet

Year	Population Tucson Region	Mun. and Dom.	Schools and Recreation	Gen. Industry and Mili.	Mines	Irrigation	Used to Irrigate	Total Water Used
1930	50,000	9,000	500	700	0	62,000	3,000	75,200
1950	132,00	28,400	2,100	2,600	0	99,00	4,000	136,000
1963	302,000	56,000	6,200	8,980	10,360	167,850	9,740	259,430
2000	1,500,000	294,000	30,700	38,200	16,000	34,750	71,000	484,650

Source: Bureau of the Census, *County–City Data Book*; and G. Davis and H. C. Schwalen, Tucson Region's Water Use and Future Needs, on file at University of Arizona Department of Agriculture Engineering.

II
THE TUCSON WATER SYSTEM

Water management in the Tucson area, and indeed, in all of Arizona, is highly decentralized. In many areas of the United States where water is imported into urban areas from rivers and lakes, only large governmental units are financially able to construct needed transmission facilities. In such areas, residents, businesses, industry, schools and small governmental units purchase imported water, and water management remains centralized in the hands of the importing units.

This is not the case in Tuscon. Given the nature of the groundwater basin and the absence of restrictive legislation, it is relatively easy, inexpensive and legal to sink wells and draw water. Consequently, dozens of organizations, both public and private, pump water. And besides these groundwater pumpers, a number of state and local agencies conduct regulatory activies related to water use. Following is a brief discussion of the major institutions which participate in "managing" Tucson's water.

A. Arizona Corporation Commission[8]

Public utilities in Arizona are "regulated monopolies." Their rates and methods of operation are regulated by a state agency—the Arizona Corporation Commission.

Among the public utilities which the Commission regulates are private water companies. Before a private water company may operate in Arizona its owners must secure, among other things, a "certificate of convenience and necessity" from the Commission. Applicants for a certificate must demonstrate a need for water service in the area for which the certificate is requested and must demonstrate the availability of potable water. They also must have previously secured the necessary approval papers from the state and county boards of health, the relevant county board of supervisors, and any other state or federal agencies which, by virtue of the location of the area for which a certificate is being requested, must be consulted. The receipt of a certificate then entitles the company to exclusive rights of operation within its certified area, and obligates the company to meet certain requirements. The Commission establishes the rates which the company may charge.

8. Ariz. Const. art. 15, §§ 205; Ariz. Rev. Stat. Ann. §§ 40-201 to -204, 40-281 to -283, 40-321 to -322, 40-331, 40-361 to -362, 40-367 to -368, 40-374 (1956), Ariz. Corp. Comm., *Rules and Regulations Relating to the Operation of Domestic Water Utility Companies*, and, personal interviews with Commissioners Milton Huskey and Richard Herbert, Commission Utility Department Chief Robert Kircher, and Chief Engineer Lionel Blair on July 20, 1966, and other dates.

The sole concern of the Commission is with the establishment and operation of the private water companies. It does not concern itself with the issues of water supply, the decline of Arizona groundwater tables, etc., except to assure itself that private companies actually provide service in their certificated areas.[9]

B. *Pima County and State of Arizona Health Departments*[10]

State and county health departments cooperatively regulate the quality of water used by establishments which are public in nature. These departments, pursuant to county and state ordinances and regulations, scrutinize the establishment of water service facilities (e.g., the physical plant of a private water company), and run regular checks on the chemical quality of water which these establishments dispense to the public.

C. *Pima County*[11]

Besides securing a certificate of convenience and necessity from the Corporation Commission, a private water company must obtain a "franchise" from the board of supervisors of the county in which it desires to operate. A franchise permits the company to run water distribution lines through county roads. Like the Corporation Commission's certificate, a franchise is exclusive; only one is granted to cover any particular area.

D. *The City of Tucson*[12]

The water department of the City of Tucson is by far the largest water service organization in the Tucson area. The Water and Sewerage Department's *Annual Report* for 1964-65 lists the number of total service connections at 60,352. The department has 206 active wells, 1,266 miles of mains, has pumped 14,203 million gallons of water (1964-65) and has a capitalized value of over $41 million.

9. *Id.*

10. Data from personal interviews with Mr. Otto L. Fritz, Chief of Division of Environmental Health, Pima County Health Department, July 28, 1966, and Mr. Frank Lord, Public Health Engineer, Arizona Public Health Department, August 1, 1966.

11. Data from Pima County Board of Supervisors, *Procedure for Securing Water Franchise;* Tucson Daily *Citizen*, Jan. 21, 1963; Pima County Board of Supervisors, *Statement of Policy with Reference to Water Franchises,* Jan. 21, 1963; Arizona Daily *Star,* April 16, 1965, Sec. D, at 14, col. 1; Letter from Dennis Weaver, member of Pima County Board of Supervisors, to Jack Weadock, Assistant Publisher of Arizona Daily *Star,* April 9, 1965; and personal interviews with Pima County Board of Supervisors Chairman, Thomas Jay, and William Ernst of the County Engineering Department.

12. Data from personal interviews with Messrs. Jay Abbey, Paul Beermann, Frank Brooks, Gordon Davis, Mark Keane, John Rausher, William Wheeler and others, all associated with the City of Tucson, plus such published materials as City of Tucson Water and Sewerage Department, *Annual Reports,* and numerous local newspaper reports.

These figures represent increases in each category of at least 1,000% since 1930.

The city's water system is fully integrated; that is, the water distribution system is interconnected. Thus, if the water table declines in one well field, the city can cease pumpage there and secure needed water from wells in other locations.

E. Tucson Area Schools[13]

Tucson School District Number One, Sunnyside School District, Ampitheater School District and the University of Arizona all pump some or all of their own water. This is done instead of purchasing water from the City of Tucson. Personnel associated with each of these schools argue that it would be much more expensive to purchase city water.

F. Private Water Companies[14]

According to one 1966 estimate, there were 407 private water companies certified for operation in Arizona. About 140 are located in Pima County, and about half of those located in or near the City of Tucson. They all sell groundwater pumped from the local groundwater basin.

These private water companies vary greatly in size. Some are only "paper" companies, holding Corporation Commission certificates but having no physical plant in operation. Also, many small companies were constructed by home developers to supply water for use in newly developed subdivisions. On the other hand, some are rather large corporations. One has over 1800 customers, twenty wells, and pumps over 200 million gallons of water annually. Some companies are owned and operated by local interests while others are controlled by out-of-state interests.

G. Minor Service Organizations

There are numerous other organizations in the Tucson area which, in some manner, are involved in water management. These include two irrigation districts, an air force base, several large manufacturing firms, several hotels and motels, two hospitals and hundreds of private persons, all of whom pump limited amounts of groundwater for their own purposes.

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13. Data from interviews with Messrs. Jay Abbey, Paul Beermann, Frank Brooks, Gordon Davis, Mark Keane, John Rausher, William Wheeler, all associated with the City of Tucson, and John Bauman, Earl Hamilton, Fred V. Hopkins, James Irwin, H. V. Summers and Francis Vesey, all associated with Tucson area schools.

14. *Id.*

H. Intergovernmental Relations

The geographic and hydrologic characteristics of the Santa Cruz Basin, in combination with an absence of restrictive legislation, account in large part for the atomized pattern of organization described above. Water is available to anyone who, with minimal expense, desires to sink a well anywhere in the basin. No state law exists to prevent this.

What are the implications of Tucson's physical characteristics and organizational pattern of water service in efforts to solve the "water problem"? Events to date indicate that the present pattern of organization—or more accurately, non-organization—precludes the generation of the type of decisions necessary to solve the problem. Instead, considerable conflict has been generated.

Almost without exception this conflict has involved efforts by the City of Tucson to play the leading role in area-wide water management. City officials are very concerned about the declining level of the groundwater table and feel that prompt action is needed to halt, or at least slow, the rate of decline. They feel that supplemental water sources must be developed and water management integrated so as to preserve local groundwater and to equalize the cost of water importation among all water users.

City personnel believe that reduced and judicious use of local groundwater will permit the construction of smaller import facilities and result in a savings. They contend that if import facilities are constructed and current groundwater pumping is reduced now, local groundwater can be saved and used to meet the peak-period demands of the summer months. Prompt action to preserve some local groundwater by reducing annual pumpage to the level of annual recharge will, they feel, permit the use of the local basin as a "water bank." Further, total management integration allegedly will help prevent the drying out and destruction of aquifers.

In recent years the City has spent large sums of money on research and development of supplemental water sources. It has purchased land in the San Pedro Valley east of Tucson with an eye toward possible development of well fields sometime in the future. The City has purchased land to the west, in the Altar-Avra Valley, and developed a well field there. It has contributed money to the Central Arizona Project Association's efforts to secure passage of the Central Arizona Project and has lent financial aid to various water research projects at the University of Arizona.

Except for water research at the University of Arizona, which is largely supported by federal funds (plus small contributions from Pima County, Pima County Sanitary District Number One and Tuc-

son Gas and Electric Company), the City of Tucson "has largely gone it alone" in efforts to integrate management and to import water from outside the basin. Many city personnel feel that this is unfair to the city's taxpayers and water customers.

As a result of its desire to integrate water management, to develop supplemental water sources and to equalize the costs, the City has long tried to get the schools to stop pumping water and to purchase city water. Further, the City has tried to purchase local and nearby water companies. These efforts have involved the City in heated and prolonged conflict with private water companies, the county, the schools, and the Corporation Commission.

CONCLUSIONS

As is so often the case in metropolitan areas, little has been done to deal with the apparent water shortage in the Tucson area, until very recently. While there have been some attempts to produce intendedly remedial policy, these have been largely unilateral. Intergovernmental (sub-system) relations have tended to be characterized by conflict rather than cooperation.

The Tucson water system is politically fragmented, and its numerous sub-systems vary widely in terms of functions, resources, and demands. Personnel connected with all sub-systems are aware of the declining water table, and they agree that a shortage exists and that there is cause for concern. In spite of widespread agreement that the community is in need of more water, a propensity to incur decision-costs so as to create additional sources has developed unevenly throughout the system. The willingness of the various sub-systems to pay decision-costs appear to vary with functions performed and with demand-resource ratios.

The City of Tucson is the major water service agency in the Tucson area and is so recognized by the community. With the community facing what many perceive as a water shortage, attention is focused upon the City, which thus is under community pressure to play the lead role in coping with the problem. The City's resources and its capacity to respond to this pressure are considerable in as much as it is already in the water business. It has engaged in some research and developement of new water sources (including lobbying for the Central Arizona Project, and initiating development in the Altar-Avara Valley) and it has attempted to involve other sub-systems in cooperative efforts to integrate water service in the area and share the research and development costs for additional water. In short, because of public expectations, and given its demands-resources

ratio, the City has chosen to incur some decision-costs so as to confront the supply problem.

Tucson area school districts, on the other hand, have chosen not incur additional decision-costs. The districts' prime functions relate to education—not to water management—and their budgets are, they claim, already strained in attempts to meet public demands concerning the schools. There is very little public expectation that the schools will allocate resources so as to deal with the water problem. They have no legal obligation to do so, and the City is unable to apply sanctions and force the school districts to allocate resources. Thus, for the schools, little is to be lost in the short run by refusing to incur decision-costs. The decision-costs of action are greater than the decision-costs of inaction—at least in the short run.

Faculty members in various academic departments at the University of Arizona perceive the existence of a water problem in the Tucson area, and many of them are engaged in water research. Some view the declining water table with greater alarm than do others, but collectively their efforts constitute some University involvement with the water problem. The University officially, however, has chosen not to incur the costs of cooperating with City efforts to integrate all water service. The University draws its own water from the basin, and does so simply because it costs the University less to maintain its own wells than to purchase city water.

Private water companies in the Tucson area incur no decision-costs whatever relative to the water problem. Although pumping costs increase as the water table level declines, private companies neither cooperate with the City in attempts to coordinate water service nor do they fund any research or development of supplemental water sources. This behavior may be rational for the private companies in the short run, but it is irrational in the long run. There are no legal, economic or political sanctions on the private companies to force them to share in the research and development costs in the search for more water. Thus, they can maximize short run profits by refusing to incur any new decision-costs. Should the basin go dry, however, most private companies would be forced to cease operations, and thus lose in the longer run.

Neither Pima County, the Arizona Corporation Commission nor the State Land Department are prepared to undertake innovative action to deal with the water problem. Each of these agencies performs water-related functions which are essentially regulatory in nature and which are spelled out in law. Aside from some pressure, unaccompanied by sanction, from the City of Tucson, these agencies are under no pressure to go beyond performance of legally prescribed

duties. They are unwilling to risk the decision-costs which innovative action might incur.

What is the import of all this for future problem solving—both in Tucson and elsewhere? I would suggest that public policy designed to improve the environment tends to be formed and applied to conditions which have been externally defined as problems only when such conditions are preceived by the decision-makers in viable political systems and sub-systems as being of sufficient salience to warrant the payment of the decision-costs which will be incurred in efforts to alter the environment and eliminate the problem. Thus, problems which now seem to go unattended will receive more efficacious attention than they now receive only when the following factors come into play: (1) when political boundaries are altered so as to match problem boundaries, thus clearly placing the burden of problem solving on the shoulders of the single relevant local government; (2) when a problem reaches crisis proportions and demands for remedial action increase, thus altering demand-resource ratios; (3) when resources are increased—when, for example, federal funds become available; (4) when state law is changed, thus officially charging local governments with previously unassigned duties; and/or (5) when increased demands, increased resources, changes in the law or increased education act to alter the perceptions of decision-makers. In short, action to solve metro-urban problems may well depend upon the constant existence of real or imagined crisis conditions, continued and increased use of federal funds by state and local govenments, or major alterations in state law relative to local governmental boundaries, powers and finances.