

Preliminary draft for  
comment only and not to  
be quoted. The author  
welcomes comments and  
criticism.

INSTITUTIONAL FAILURE AND REFORM:

A Problem in Economic and Political Analysis of Water Resource Development

by

Vincent Ostrom

Department of Government  
Indiana University

Prepared for a Conference on "Political Science and the Study of Public Policy," sponsored by the Committee on Governmental and Legal Processes of the Social Science Research Council, to be held August 28-30, 1967 at Cape Newagen, Maine.

CONTENTS

I

Introduction ..... 1

II

The Water Problem ..... 8  
    The Common-Pool, Flow-Resource Problem ..... 8  
    The Complex Bundle of Potential Goods and Bads ..... 12  
    Interdependence Among Joint and Alternative Uses ..... 17

III

Problems of Allocation and Development in Economic Analysis ..... 20  
    Discrepancies Between Individual Welfare Calculations  
    and Aggregate Social Welfare Calculations ..... 21  
    Divergence Between Least-Cost Solutions and Marginal-Cost  
    Pricing ..... 23

IV

The Problem of Political Analysis ..... 28  
    The Ethical-Observer Solution ..... 29  
    An Individualistic Approach to Collective Decision Making ..... 32  
        A Concept of Political Price ..... 33  
        A Political Price Implied in all Legal Relationships ..... 34  
        Cost Functions in Political Decision Making ..... 37  
    Application to Political Analysis ..... 39

V

A Concluding Analysis ..... 43  
    Institutions as Political Artifacts ..... 43  
    An Analysis of the Terms and Conditions of Political Action ..... 44  
        An Ethical Observer's Distorted Image ..... 45  
        Governments as Sets of Institutional Facilities for  
        Decision Making ..... 47  
            (a) A Multi-Leveled, Fragmented Structure of  
            Authority..... 48  
            (b) Property Law as an Assignment of Benefits  
            and Burdens ..... 49  
            (c) The Public Enterprise Solution ..... 50  
            (d) Incremental Decision Making (i.e. Institution  
            Building) ..... 52  
    Resolving Problems of Misallocation and Overdevelopment  
    Through the Political Process ..... 55

Footnotes ..... 63

## INSTITUTIONAL FAILURE AND REFORM:

A Problem in Economic and Political Analysis of Water Resource Development\*

### Introduction

The purpose of this conference is to consider the question of "... what special contribution, if any, can political scientists make to the analysis and formulation of public policy?" At an earlier time, essentially the same question might have been posed by inquiring about "What special contribution can political scientists make to political reform?" More recently, the reform motif has become something of an anathema to the more scientifically rigorous political scientists. Yet, we keep returning to the problems of reform like moths drawn to a candle flame.<sup>-1/</sup> Perhaps we will be able to make a special contribution as political scientists to the analysis and formulation of public policy only when we develop the capability for analyzing the issue of reform with some measure of professional competence.

My invitation to participate in this meeting was to direct attention to the tangible and practical problems of public policy associated with water

---

\*Earlier research on institutional aspects of water resource development has been supported by the Water Resources Center, University of California and Resources for the Future, Inc., Washington, D. C. b work on the politics of institutional development and reform in water resource development is currently being assisted by support from the Water Resources Research Center, Indiana University. This assistance has been most essential in what I have done.

resource development and not to discourse about political reform as such. Yet, contemporary studies of water resource development persistently turn to allegations of institutional failure among resource development and management agencies and conclude by either explicitly or implicitly proposing a program of reform. Most of these studies have been made by economists, but those done by political scientists have a similar, albeit, variant approach to institutional failure and reform. The studies by economists are both more systematic and more consistent in their critique, and I shall use their work as the principal point of departure.

Since a significant portion of all water services are provided by public agencies of one sort or another, the structural characteristics of these agencies functioning as economic enterprises are usually identified as major impediments to efficient operation. Most of these analyses then go one step further and indicate that the legal norms or public policies established by the political institutions of government are not well formulated to secure the appropriate economic results. As a consequence, these allegations of institutional failure represent a two-fold indictment of political institutions: first in relation to their economic function as agencies for water resource management and development, and second in relation to their political function as governmental institutions responsible for the development and enforcement of public policies regarding water resource development.<sup>2/</sup> Indictments of water institutions for their poor economic performance then are usually paralleled with indictments of governmental institutions for their poor political performance. The second level of indictment may be specific in pointing to alleged deficiencies, for example, in the law of water rights, or they may be more generally directed to broad deficiencies in the performance of the political system as a whole.

The indictments of water institutions by economists for their poor economic performance consistently point to the same maladies. The basic malady can be simply stated as overdevelopment and misallocation. Particular descriptions of the symptomatic characteristic of this malady usually give opportunity for individual authors to give expression to their sense of amusement, wit, or anger. Some may be amused at the efforts of politicians to ration water by public harangues, while declining to meter water service and thus to charge in proportion to the water consumed. Another may be bemused by the use of water to irrigate "domesticated phreatophytes" for pasture, when neighboring farmers are required to forego opportunities to develop economically valuable citrus crops. Occasionally, one can discern the indignation of the complete angler qua economist who voices his indignation about the "economic felonies" involved in using public subsidies to make water freely available for the irrigation of agriculture while at the same time, destroying potentials for fishing and spending public funds to sustain other programs for limiting agricultural production.

I am prepared to accept the general thrust of these indictments of the economic performance of American water institutions. One might wish for some additional refinements such as an economic analysis of water metering or an economic evaluation of public expenditures on fisheries in the context of water resource development, but these qualifications simply confirm my inclination to rely upon the validity of the conclusion drawn from these analyses based upon the evaluations inherent in economic theory. However, these analyses might be challenged at the margin on two different grounds. On theoretical grounds, they might be challenged on the basis of the evaluation inherent in economic theory. In addition, they might be challenged on political grounds,

for failing to take into account the costs of reform. Circumstances arise in the normal course of events where a malady is less costly than its cure and one learns to live with his malaise.

Economists have been quite explicit in defining the political character of water problems. J. W. Milliman, for example, has indicated that 'water crises', as reflecting a widespread concern about water shortages are "greatly exaggerated and unwarranted". Most water crises are not crises deriving from natural disasters which cannot be anticipated but are essentially political crises provoked by inappropriate management of the development and allocation of water supplies.<sup>3/</sup>

The general allegation of institutional failure has most forcefully been restated by three distinguished economists who recently published an extensive analysis on water resource development in California. They conclude with a powerful indictment of the political process which charges that:

Our political system. . . renders the legislative and executive levels of higher government undependable for seeking to insure the preservation of the general public interest (as distinct from the interests of limited water-using groups) in the field of water resource projects. Water is a political football, as is every major water project. Executive and legislative support of federal projects demonstrably tends to turn a good deal on the desires of congressmen to secure federal expenditures within their districts, on the desires of party members at executive and legislative levels to curry favor in forthcoming elections, and on the mechanism of the legislative log-rolling process. In this context, a bureaucratic project evaluation is not a document to be objectively scrutinized but a necessary bit of armor in a political struggle. At the state level, the situation. . . differs only in degree. Coalitions of pressure groups, bureaucracies, legislators, and executives form to secure projects in a process in which project evaluations are flexible instruments of questionable validity.<sup>4/</sup>

The indictment is general. They are explicit in their contention that, "the flaws . . . do not rest narrowly upon particular institutional features of agency bias, legislative organization, and the like. Rather, they reflect a whole system of relations among interest groups inside and outside the public sector". -<sup>5/</sup> Because the difficulties are systemic, i.e. "all of a piece", they call for "radical legal reform" directed toward ". . . curtailing the discretionary powers of executives, executive departments, legislatures, and the bureaucratic agencies with regard to making final decisions on water development projects, and to providing for an independent and objective appraisal of projects that the agencies propose to undertake".-<sup>6/</sup> They also explicitly take the position that, "it is the function of the political economist to view the water policy problems as a governmental as well as an economic problem and to consider what legal and governmental changes would actually result in the adoption and pursuit of better economic policies". -<sup>7/</sup>

I doubt that many political scientists would Join Bain, Caves and Margolis in their emphatic prescription of a "nonpolitical" solution by recommending the establishment of an independent regulatory commission with quasi-Judicial powers to protect the public interest in water resource project planning, evaluation and selection and, thus, with power to control the incremental pattern of water resource development. While political scientists would overwhelmingly disagree with this prescription, would they be as consistent in their grounds for disagreement? Would political scientists in turn not tend to present an equally pat set of prescriptions for assuring coordinated and comprehensive development by the integrated management of a single regional authority or executive department of government? Is the

solution of increased bureaucratization any more tenable or any less tenable than a "nonpolitical" solution for governing water resource development through an independent quasi-judicial, regulatory commission?

Paradoxically the "nonpolitical" solutions proposed in the Bain, Caves and Margolis study is urged as a political measure--as "radical legal reform". Thus, their nonpolitical solution must meet the terms of trade in the political process in order to become a legal reality, and continue to be sustained by those same political terms of trade in order to survive as a viable "nonpolitical", governmental authority capable of enforcing decisions for an indefinite period into the future in the continued presence of conflict and disagreement.

If we respond with the assertion, "Impossible!" we must be prepared to demonstrate the basis for that judgment, and to indicate the bases for our alternative modes of analyses in diagnosing problems and for offering alternative remedies to problematic situations where existing institutional arrangements are not yielding satisfactory results.

The allegation of institutional failure has been sufficiently pervasive in considering the organization of American public life, that these allegations cannot simply be ignored by those who profess to be political scientists. In fact, many political scientists have been in the forefront of the attack. From Woodrow Wilson to James MacGregor Burns one can find a persistent assertion of institutional failure regarding the conduct of the American system of government.<sup>-8/</sup> Yet, the "system" with its own peculiar terms of trade has been as persistent in rejecting the course of reform contemplated

by these political scientists as it has been in rejecting the course of reform urged by economists for restructuring the arrangements of water institutions.

If the "system" tends to evoke characteristic solutions which deviate significantly from the results prescribed by different sets of reformers, political scientists should have a substantial concern with the question, "Why do we get the results that we do from the political process?" Before we can direct our attention to the question of why we get the results we do, perhaps we need to give much more careful consideration to the question of what are the characteristic results which we do tend to get from the political process? If we can arrive at some initial assessment of the results we tend to get and pursue by inference a tentative examination of why we tend to get certain results, then we may be in a position of advancing a form of analysis which can be of professional significance for the formulation of public policy.

I shall attempt to present the magnitude of the problem confronting us in developing a mode of analysis appropriate to a consideration of the rather fundamental policy problems involved in water resource development. Both the practical and theoretical relevance of these problems is revealed by the persistent concern with institutional failure and reform in theoretically significant studies of both economic and political conduct. Institutional problems of resource development cannot, however, be understood without reference to the physical conditions which affect the opportunities for the use and development of water resources; and I shall consider these conditions in a discussion of "The Water Problem". I shall turn to a discussion of

"Problems of Allocation and Development in Economic Analysis". I shall then consider "The Problem of Political Analysis". Finally, I shall draw some tentative conclusions about the problems of institutional development and reform in regard to the California water industry.

### The Water Problem

There are quite tangible and practical reasons, unrelated to the wiles of politicians, for problems of water resource development to become deeply involved in the political process. The water problem is, in fact, a multitude of problems, but most of these are problems of fluidity. Wherever water behaves as a liquid, it has the characteristics of 1) a common pool, flow resource involving; 2) a complex bundle of potential goods and bads which sustain; 3) a high level of interaction or interdependency among the various Joint and alternative uses. The interrelationships among all three of these characteristics of a water resource situation simply compounds the difficulties in settling upon stable, long-term institutional arrangements for the economic development of water resources.

### The Common-Pool, Flow-Resource Problem

The simple case of a common-pool, flow-resource problem can be illustrated by reference to the development of an oil pool overlaid with a property ownership pattern where numerous individual owners have an equal and independent right to tap the oil beneath their land. The decision rules of private property law require an owner's willing consent to undertake Joint action involving the use or control of his property. Without political interference each is free to exploit the oil underlying his land for his own benefit. The most aggressive

proprietor can attempt to capture the lion's share by a strategy of trying to pump as much as possible from under his land. Each other proprietor has an incentive to follow a similar strategy and maximize his individual return. Each will be led by the structure of the common-pool situation to make excessive expenditures, to overproduce in the short-run and to waste the physical resource potential in the long-run.

Since the net return to each overlying proprietor would be greater if they all agreed to act collectively in arranging the optimum development of the resource, the rational solution would involve collective action by all overlying proprietors. However, the decision rule for collective action by private proprietors acting individually would require unanimous consent and no one would be willing to agree to restrict his independence in decision making unless all others would also agree to restrict their independence of decision making and could be required to adhere to any such an agreement in the implementation of its terms. The last person in fact would gain every advantage, if others would restrict their production and leave him free to pursue his own independent course of action. The discrepancy between potential individual gain and the aggregate net benefit to the total community of overlying proprietors is apt to lead toward a "dog-in-the-manger" attitude where each proprietor pursues his advantage and attempts to ignore the consequences of his action upon the aggregate welfare of the other proprietors. This is a classical case of a situation where the rational self-interests of all individuals would suggest a collective solution but where the prospect of acting collectively on the basis of the decision-rule requiring the willing consent of each proprietor is negligible. Someone would usually find it expedient to function as a holdout and capture a lion's share, and only one

holdout could effectively veto any collective arrangement. A rational solution requires that the rule of willing consent be relaxed and that collective action be authorized on the basis of some alternative decision rule requiring less than the willing consent of each and every proprietor. Such action requires recourse to the decision-making facilities provided by governmental institutions which are nothing more nor less than the institutional facilities for taking and enforcing decisions where willing consent need not be required.<sup>-9/</sup>

The development of common-pool resources may thus require political solutions which allow the several owners of a common-pool resource to form a collectivity or a "pool" of owners capable of Jointly developing the resource, and of, then, distributing the Joint benefits to each on the basis of a pro-rata formula or some comparable formula permitting an equitable distribution of the economic return to each individual participating in the pool.

In resource management, a common-pool problem typically involves 1) a fluid, mobile, fugitive resource which is difficult to confine, contain or control in its natural state, and; 2) a system of property and property law authorizing diverse proprietors to act independently in furtherance of their own interests so long as they do not cause harm or injury to others. Property law based upon a policy of free enterprise is confronted with a situation in the development of a common-pool resource where market solutions are not sufficient and the political process must be relied upon to produce alternative solutions. The common pool resource problem requires a commensurate aggregation or pooling of individual interests in a collective solution involving Joint consideration of mutual interests in the development of the common-pool resource. A limited form of monopoly must be recreated in a system of law where monopolies and perpetuities are considered to be contrary to public policy.

The development of an oil pool is a relatively simple common-pool problem. The pool is relatively stable in its geological confines and its yield is a relatively homogeneous product which can be contained and can then be processed into a marketable commodity. Water resource systems are much more variable in their hydrological characteristics and they yield a most heterogeneous mix of economic goods and services.

The hydrologic characteristics of different river systems will vary significantly from one to another in total drainage area, aggregate annual yield of water crop, stream gradient and total hydraulic drop, flow characteristics including seasonal and long-term variation in volume of flow, water quality measured in the load of water soluble chemicals, in suspended solids subject to sedimentation, water temperature, and in the communities of aquatic life sustained by the flowing water of a river system. Each of these characteristics when varied in conjunction with other characteristics gives rise to different opportunities and priorities for development. Each impinges upon others to pose extraordinarily complex problems of allocation and development.

Ground-water supply systems, in turn, behave in quite different ways than surface waters. The velocity of percolation in a ground-water basin, for example, is usually very much slower than a surface stream, but some ground waters flow in identifiable underground streams. Ground-water systems are also interconnected with surface supplies in different ways. Percolating ground water may supply a stream and in turn a stream may supply a ground-water basin. Many ground-water basins are much more analogous to the oil-pool situation when viewed as a common-pool problem than to the complex flow-resource problems involved in a major river system.

## The Complex Bundle of Potential Goods and Bads

Any major river system is the potential source of a complex bundle of goods and bads for the human population which can draw upon and utilize its potentials. Water is essential to all life processes, to all productive enterprises and offers a variety of opportunities of substantial importance to human welfare.

The goods or services which can potentially be derived from a river system can initially be distinguished between various on-the-land uses and various in-the-channel uses. On-the-land uses include the provision of water for domestic consumption, stock watering, municipal and industrial purposes, irrigation and the discharge of many waste products generated upon the land. These uses tend to be related to volume of water, and water can be metered by volume and be marketed by the volume used. In-the-channel uses emphasize utilities to be derived from the flow characteristics of a stream and involve such uses as navigation, recreation, fish and wildlife, flood control, pollution abatement and power production.

On-the-land uses require special works to divert water from its source and to transport water to the site or location of use upon the land. Water for such uses is typically confined in a distribution system and can be treated as a marketable commodity. But even in the case of a municipal water supply system, common-pool, flow-resource characteristics manifest themselves in a number of ways. In order to build a distribution system capable of handling large demands for water, a flow system is required and such a flow system must be constructed as a continuous system uninterrupted by the individual happenstance of intervening property ownership. Again the structure of incentives inherent in the common-pool problem arises. If each proprietor

whose property is traversed were free to hold out for as much as he could get, the costs of acquiring right-of-way for a water distribution system would become extraordinarily high to the long-run disadvantage of the aggregate community of water users. As a result, the extraordinary powers of eminent domain (i.e. the power to compel the sale of an easement or right-of-way for "just compensation") is usually made available to any enterprise offering water services for sale to the public. A water distribution system can thus be constructed on a least-cost basis with compensation being required only for the opportunities foregone by intervening land owners by virtue of their land being occupied by an adverse easement.

In turn, the high capital costs of constructing a distribution system capable of sustaining a continuous flow implies that the first proprietor will preempt a marketing service area and a second or third proprietor can be effectively precluded from entry. In short, continuous flow distribution systems give rise to natural monopolies. The implied political quid pro quo for the power to traverse the property of unwilling land owners is a liability on the part of profitable enterprises to public regulation of their water pricing and service policies.<sup>10/</sup>

Other common-pool, flow characteristics show up in the design, construction and operation of municipal water distribution systems. An important use of water is for fire suppression and such a use depends in part upon the flow characteristics of a water distribution system.

These "fire-flow" characteristics of a municipal water supply system, in turn, enter into calculations for determining fire insurance rates

on insurable property. Similarly, water quality standards in relation to public health requirements are an incidental common-pool attribute of water supplied by a distribution system. Grievances associated with the "lack of water" for fire control purposes and the epidemics of water borne diseases have been important factors associated with the shift from private to public ownership of municipal water distribution systems during the course of the past century.

Finally, an additional facet of the flow resource problem associated with the distribution of water for various on-the-land uses arises from the return flow of water which is residual to any particular pattern of use. Water is rarely consumed in toto. In municipal supply systems, the residual supply is often used to perform the added function of disposing wastes through sewers before the water is again discharged into a water course to intermingle as a part of the flow-resource system. Residual waters discharged after their cycle of on-the-land uses may be so heavily polluted as to be toxic and injurious to subsequent uses, and thus constitute a "bad" for other downstream users. In irrigation systems, the return flow residual to prior uses, on the other hand, may have substantial economic value in replenishing ground-water supplies or for subsequent diversion by other irrigators at downstream locations. The use and reuse of residual waters, which flow into and become a part of the aggregate resource pool, create many of the most sensitive political problems in management of water resource systems and in the interrelationships among enterprises involved in water resource development.

In-the-channel uses of a water resource system pose even more

difficult problems of management and allocation than are involved in the management and allocation of water supplies for on-the-land use. The benefits in many cases are there to be enjoyed in a state of nature and some form of public monopoly must be exercised to control a water resource system for such purposes. A private proprietor might be able to deny access to a particular site along a stream but private proprietors cannot effectively deny access to a river system for boating, swimming, fishing or for other such recreational uses.<sup>11/</sup> All who can gain access are free to use; and, within very broad tolerances, use by one does not preclude or interfere with use by others.

Where a common-pool, flow resource is subject to use in its natural state for the ultimate enjoyment of a consuming population, a common-pool resource meets all of the criteria associated with a purely public good. A private proprietor cannot exclude a potential user from its ultimate use and enjoyment, and the use by one does not preclude its use by others. Only a public monopoly can exercise control over such a resource where access is either denied to everyone except under the terms and conditions regulating the public use of such a resource, or equivalently is extended to everyone under the terms and conditions of public use.

The physical conditions bearing upon various in-the-channel uses give rise to different opportunities for constituting appropriate organizational arrangements to develop and manage such services. The provision of flood control facilities and the regulation of a stream for flood control purposes provides a benefit to the affected property owners which is available to all in like circumstances. None can be technically excluded from enjoying the benefit. A charge for flood

control service cannot be instituted except as a compulsory tax levy. The task of devising a tax which would function as an efficient service charge proportional to the benefit received would be extraordinarily difficult. Landowners at each different contour of a flood plain would enjoy a different level of benefit.

On the other hand, the use of water for sports fishing can be subject to exclusion by prohibiting all without a license from fishing. A license fee can be conceptualized as the equivalent of a price charged by a legal monopoly. But fish and game departments cannot exercise effective monopoly control over anadromous salmonoid fisheries in the open ocean. The common pool problems involving anadromous fisheries, thus, are of fundamentally different proportions than the common pool problems involving flood control and the discharge of flood waters.

The use of a river for navigational purposes is somewhat analogous to its use for fishing purposes. Improvements to enhance navigation might be financed by a service fee charged upon those using a stream for navigational purposes. While exclusion is technically feasible and service fees might be established to place the burden for the cost of the improvement upon the beneficiaries, a problem may arise over the economic feasibility of establishing such marketing arrangements. If the cost of collecting service charges exceeds the revenues produced then a system of service charges would not be warranted on economic grounds.

The use of the hydraulic gradient of a stream for the production of hydroelectric energy is relatively easy to conceptualize in marketing terms. At the production level the use of a stream for the generation of power is a part and parcel of the common-pool) flow resource situation. However, electrical power can be metered and sold under circumstances

that are crudely analogous to, but simpler than, the distribution and sale of water for on-the-land uses. Electrical energy as a product derived from a common-pool source can be marketed to the ultimate consumer.

Thus, the complex bundle of economic goods and services which comprise the potential yield of a water resource system range in a spectrum from those which can be subject to provision in a market economy to those which can only be provided as a public good or service. At one extreme would be the marginal case of the production and distribution of bottled water, and at the other extreme would be the provision of flood control services. Between is a range of services subject to provision under imperfect market conditions or subject to an unequal provision as a public service. The provision of most water services involves special problems of a systemic character that are not amenable to simple solution by provision in a competitive market economy.

#### Interdependence Among Joint and Alternative Uses

The final element of complexity associated with the water problem is the high degree of interdependence or interaction among the joint and alternative uses which can be made of a later resource system as a common-pool, flow resource. Patterns of interaction may under certain circumstances be complementary or facilitative so that use for one purpose enhances the use of water for another purpose. Or, the patterns of interaction may be competitive or exclusive so that a use or an increase in use for one purpose precludes the use or diminishes the potential supply for another purpose.

Under conditions of extreme variation between peak flood flows and low flows which coincide with peak demands, any measure to increase the low flow for on-the-land use by storing flood water could have a joint payoff in reduced flood damages as well as increased supply of water for subsequent diversion. However, increasing diversions for consumptive on-the-land uses during the low-flow season without commensurate increases in supply from storage may impair the diverse in-the-channel uses of a river system. Flood control, power productions and diversion of water for on-the-land uses often have substantial complementarities. When such situations occur, other problems arise regarding assignments of costs and benefits. Who pays for what, and who gets what benefit?

Each pattern of use has relatively specific parameters where substantial variations beyond those parameters begin to have a significant influence upon the supply of that utility. Perhaps the most sensitive in-the-channel use of a stream is its use as a fishery. The maintenance of a fishery may be relatively sensitive to conditions of water temperature, sedimentation, pollution, oxygen content of the water, and the maintenance of an unobstructed flow. Unless these values are taken into account in the construction of dams, in the screening of diversion works, in regulation of the quality of return flow, and in maintenance of a live stream flow, the utilization of the resource pool inherent in a river system for these other uses is apt to have the consequence of impairing or even destroying the use of that stream as a fishery. Is a fishery simply a resource to be destroyed by default through the failure of the individual calculus to take such costs into account in

the exploitation of a common-pool resource system? Or, if it is to be taken into account, how is the accounting to be made in the context of specific institutional arrangements? In turn, how much should be paid in the provision of fish facilities under varying circumstances of potential yield?

Peripheral changes in the economy, changes in water technology and changes in consumer preferences may significantly affect the equilibrium of supply and demand for different uses of a later resources system at different points in time. Prior to the development of the railroad and the automobile, for example, a very high priority was given to the use of water for transportation purposes. Large expenditures were made for canals and other navigational facilities. The use of water for navigational purposes during much of this last century is of a proportionally much smaller magnitude than its use for such purposes during the first half of the Nineteenth Century. The contemporary era of affluence with increased leisure time and abundant automobile transportation may see substantial growth in demand for the use and enjoyment of flowing water for recreational purposes in the environs of a natural stream. The development of electricity and the invention of the deep-well turbine pump at the turn of the century significantly expanded the potential water supply available from ground water sources. Desalinization of ocean water and weather modification may again alter supply conditions in the future.

The basic task in designing institutional arrangements for the management and development of water resource systems is to devise arrangements which will properly proportion the supply of water to each

of its joint and alternative uses and to reallocate the supply among those joint and alternative uses to meet changing conditions of demand and supply. I shall turn next to the problems of water resource allocation and development in economic analysis and then to a consideration of the problems of analyzing the political calculus involved in water resource development.

Problems of Allocation and Development in  
Economic Analysis

The solution to a problem of resource allocation in economic theory requires that a resource should be allocated to its various uses until the marginal unit of a resource allocated to each use is equal in value. The value reflected by that point of equilibrium represents the economic price which at any given point in time will efficiently allocate the available supply to all of the competing demands. If patterns of demands change, the equilibrium should readjust to a new price equilibrium where the quantities supplied to various uses may have changed but an equilibrium will have been reestablished at a point where the marginal value for each use is equal for all uses. A resource, thus, would be continuously allocated and reallocated to maintain an equilibrium among all uses so that the marginal value of the supply is equal for each and every use.

Development is justified when the potential supply of a resource can be devoted to a potential use which will realize sufficient revenue at the marginal price equilibrium to cover the cost of producing the marginal unit of supply over an appropriate time horizon which will

take account of the opportunities foregone in alternative forms of investment. The flow of anticipated revenues discounted at an appropriate rate of interest to reflect the opportunity cost of money should at least equal the anticipated costs of any incremental development before that development is economically justified.

The economic solution is theoretically attainable in a perfectly competitive market dealing with homogeneous, packageable goods which can be freely (i.e. in a legal and political sense) exchanged for a price under market conditions. When applied to the conditions of allocating and developing water resources, some rather paradoxical problems arise. The least-cost solution is not always the economic solution when the criteria of economic theory is used as the appropriate yardstick for the allocation and development of water resources.

This disjunction between least-cost solutions and economic solutions arises from two sources. The first source is the discrepancy which may arise between the calculation of costs and benefits by the individual proprietor using a common-pool resource as against the aggregate calculation of costs and benefits for all users. The second source of discrepancy arises from the circumstance where the cost of developing each incremental source of supply is proportionately more costly than each previous source of supply. I shall examine these two situations in turn.

#### Discrepancies Between Individual Welfare Calculations and Aggregate Social Welfare Calculations

As previously indicated, the individual proprietor using a common-Pool resource in the absence of a determinate allocation is apt to pursue

an individualistic, "dog-in-the-manger" attitude in gaining his own greatest advantage with disregard for the adverse consequences that his pattern of use may have in impairing other users and potential users. Why should he, if not compelled to do so, go to the added expense of screening the intake to his diversion works? Why should he build a fish ladder around his pier or dam to protect fish life? Why should he concern himself with the way that the dikes protecting his property may redirect the flood flow. of a river toward the land on the opposite bank, or concern himself with the water quality of the return flow?

Common-pool, flow resources which yield a complex bundle of goods and bads subject to a high degree of interdependence among different joint and alternative uses are apt to manifest a high degree of divergence between individual benefit-cost calculations and social benefit-cost calculations. The short-run economic interest of the individual is to maximize his individual benefits and to disregard the calculation of the opportunity costs which he causes others to forego. The least-cost solution for the individual entrepreneur is likely not to be the optimal solution for the aggregate of all users in relation to their total pattern of utilization. This disequilibrium between the individual calculus and the aggregate social calculus can only be resolved through the political process in a way that causes the individual to take account of spill-over effects or external costs so that his individual actions can be harmonized with the aggregate social welfare. The economic solution is the equivalent of a least-cost solution when all external effects and spill overs have been taken

into account. However, the aggregate economic solution may diverge significantly from any particular producer's least-cost solution.

The literature in economic analysis has dealt extensively with the common-pool problem and the divergence between "economic" costs and benefits as against "social" costs and benefits. Extensive recognition has been given to the problem of calculating "spill-over effects" and "externalities" and to the problem of constituting enterprises so as to "internalize" the externalities. The essential function of public enterprises for internalizing the externalities of water resource development has gained increasing recognition in the literature of economic analysis.

#### Divergence Between Least-Cost Solutions and Marginal-Cost Pricing

The development of any flow resource may give rise to still another circumstance where the least-cost solution may deviate significantly from the economically rational solution for allocating and reallocating a resource to its highest economic use. In the interest of a least-cost solution, water users would rationally develop the cheapest source of water, first. When the limits of that source of supply were reached, alternative sources of supply from more distant sources would be sought out and developed. In an area experiencing a high rate of growth over a period of time, several sources of supply may be added from progressively more distant sources and at an increasing cost for the average unit of water from each marginal addition.

Economic theory would argue for the marginal cost of the last added unit to establish the price for all units of production. Such

a pricing policy would assure that water users take account of an increasing marginal value of water in their decisions as water users. They would accordingly learn to use water more economically, cease to use water for uneconomic uses (i.e. where costs would exceed benefits) and reallocate the supply to more valued uses.

If we have the case of a sharply rising marginal-cost curve for the incremental addition of increasingly costly sources of water supply, the least-cost solution for any single enterprise would be to average out the aggregate costs over the total amount supplied. Such a price might be substantially less than the average cost of the marginal unit; <sup>12/</sup> and thus, average cost pricing would not create the appropriate incentive for users to allocate water to their economic use given the marginal value of water. The corollary of this condition is that the water production agency operating under conditions of a marginal pricing policy with a sharply rising marginal cost curve will realize a substantial windfall profit.

This relationship can be indicated by a relatively simple hypothetical illustration. Let us assume that City X is currently supplying 500,000 acre-feet of water annually from sources (A), (B), and (C) with an average production cost of \$2.50 per acre-foot from source (A) for 100,000 acre-feet, \$5.00 from source (B) for 300,000 acre-feet and an average cost of \$25.00 from source (C) for the last 100,000 acre-feet. These costs are summed with potential revenues and profits indicated in Table I. <sup>13/</sup>

Table I

Production Cost and Revenue Potential for a Multiple Source  
Municipal Water Supply System

Production Costs for First Increment of Supply (100,000 acre-feet at \$2.50 an acre-foot)	\$ 250,000.
Production Costs for Second Increment of Supply (300,000 acre-feet at \$5.00 an acre-foot)	1,500,000.
Production Costs for Third Increment of Supply (100,000 acre-feet at \$25.00 an acre-foot)	<u>2,500,000.</u>
Production Costs for the Total Water Supply Used	\$ 5,250,000.
Total Revenue if Supply were Sold at a Price Equal to Average- Cost of Production (\$10.50 an acre-foot)	\$ 5,250,000.
Total Profit Derived from Average Cost Pricing	0
Total Revenue if Equivalent Supply .were Sold at a Price Equal to Marginal-Cost of Production (\$25.00 an acre-foot)	12,500,000.
Potential Profit that Might be Derived from Marginal Cost Pricing (not allowing for effect of change in price upon amount demanded)	\$ 7,250,000.

We are presented with the somewhat paradoxical result in this situation where economic analysis would advise the voters in City X to more than double their charge for water production in order to enable their municipal water supply system to return a 60 per cent profit on its gross water production revenue. <sup>14/</sup> Where marginal-cost pricing significantly diverges from the least-cost solution, the interests of producers will significantly diverge from the interests of consumers. Economists have traditionally assumed a divergence between the interests of producers and consumers. Yet, the situation involving an increasing marginal-cost curve is one also involved in publicly provided service. Political scientists might do well to reexamine assumptions that the interests of consumers and producers necessarily converge in the public sector.

Let us assume that the voters in City X here sufficiently enlightened economic theorists that they would rationally exercise their political sovereignty in the interest of the prescribed economic solution and, thus force themselves to exercise their economic sovereignty as consumers and producers in an economically optimal way. As consumers they would force themselves to cease uneconomic uses of water (i.e. uneconomic at the higher price) and would reallocate the supply available at that price to higher economic uses where the rate of return would justify payment of a higher price.

Assuming that the voters of City X forego their least-cost solution as consumers and approve of marginal cost pricing, we are then confronted with the problem of rationalizing the economic conduct of water Producers who appreciate the potentials for profit in their fortuitous

circumstance. Very large margins in rate of return give rise to a wide range of strategic entrepreneurial opportunities.

If the producer were a nonprofit government agency serving a local community of water users, as in City X, substantial incentive could exist for those functioning as water producers to preempt as large blocks of water supply as they could feasibly undertake within the limits of the available financial resources. One might anticipate a rather aggressive rivalry among such enterprises in attempting to preempt the potential sources of supply on behalf of different communities competing for limited water resources. Marginal-cost pricing would not seriously dampen producer incentives to preempt development opportunities, even though it would be expected to lead consumers to dampen their level of demand.

Public entrepreneurs might also find substantial incentive to take advantage of any potential opportunities to develop complementary joint uses where revenues would justify the marginal expenditure. As a result a municipal water system might use water flowing through its aqueducts from high in the mountains to generate electrical energy and further increase the profitability of the enterprise. The prospects of large margins of return might even create incentives to exploit opportunities entailing short-term losses in order to enhance long-term entrepreneurial opportunities.

Public expenditures to assure an appropriate level of development for a nonmarketable service such as flood control simply magnify the entrepreneurial opportunities inherent in multiple-purpose water resource development. If payments are not required to compensate for the

opportunities foregone in alternative in-the-channel uses of water for fish and wildlife, recreation and etc., problems of misallocation are inevitable.

While average-cost pricing of the total supply produced by each enterprise would tend to dampen independent entrepreneurial initiative somewhat such pricing policies could also tend to create an increased voter incentive to sustain a high level of investment to generate opportunities for economic development where a favorable rate of return could be procured by added increments of later supply. A people living in a desert region with a high economic potential, except for the scarcity of water, may have every incentive to pursue an aggressive pattern of water resource development. We would not be surprised to see water developers engaged in an aggressive entrepreneurship verging upon economic imperialism in their efforts to preempt unappropriated water supplies and to defend their existing claims to those supplies. The structure of incentives in such situations inevitably leads to overdevelopment and to misallocation.

If such enterprises were privately owned and profits were dispersed as dividends, the structure of incentives would not be significantly altered. The equity market would be capitalized at a proportionately high level. A similar scramble to preempt resources and to gain control over the profit producing potentials of such resources could be anticipated. The force of public regulation over the service charges of such enterprise has the cumulative effect of requiring average-cost pricing by limiting profits to a "fair" rate of return upon the aggregate investment.

Contrariwise, "economic" development (i.e. development based upon the prescriptions of economic theory in relation to marginal-cost pricing) might generate substantial resentment on the part of the community of water users about the "unfairness" and "unreasonableness" of their "Plight" as against the "windfall profits" enjoyed by water purveyors. The political terms of trade in the United States tend to preclude such "economic" solutions and most utility pricing for water services is based upon an average aggregate cost of production plus a "fair" rate of return to profitable enterprises. The "proper" settlement, if any, of this type of paradoxical, contradictory, and conflict laden situation is not conclusive if the political costs of the "economic" solution are considered.

#### The Problem of Political Analysis

Water will always tend to become a political football whenever the short-term interest of individuals and enterprises in least-cost solutions are not consonant with the aggregate welfare of all water users and cannot be continuously adjusted in the future to be consonant with the aggregate welfare of all potential water users. Since the short-term economic calculus does not in these circumstances produce satisfactory results, what then is the nature of the political calculus which might enable these problems to be remedied?

Most economists, with a few important exceptions, have been ambivalent about the calculations that form a part of the political process as against the economic calculation involved in an analysis of public expenditure decisions in familiar economic terms. Performance standards

have been substituted for money, and least-cost alternatives have been calculated in economic analyses which are reasonably appropriate to an evaluation of the economic performance of public agencies and enterprises. But this mode of analysis does not deal effectively with the political function of governmental institutions concerned with the articulation and implementation of public policies.

#### The Ethical-Observer Solution

The political function, when viewed as the provision of law and order, is usually postulated as a given economic theory. Law and order are viewed as constraints upon economic behavior and external to economic analysis. This analytical device is then incorporated into applied economic analysis as an ethical assumption that the rational person should pursue those economic opportunities which are to his individual advantage. Thus, Hirschleifer, De Haven and Milliman justify the ethical posture inherent in economic calculations when they observe:

We do not condemn the industrial and commercial firms for their failure to recirculate and reuse water; at prices that are currently being charged for water supplies in Southern California, particularly to large users, it does not pay to make the investment in facilities for the reuse of water.<sup>15/</sup>

For most economists, rational economic behavior should be controlled exclusively by economic calculations and not by political calculations. Somehow there should be political arrangements external to the economic process which can issue the appropriate commands and require the self-interested law-abiding economic man to pursue those courses of action which are consistent with maximizing the aggregate economic welfare of the community.

Logically, if there were an omniscient Ethical Observer <sup>16/</sup> who could 1) observe all such potential discrepancies between individual and aggregate welfare calculations, 2) pronounce appropriate changes in the rules to rectify such discrepancies, and 3) function as a referee in enforcing the modified calculus, then individuals would be free to function as economic men in pursuit of their own short-term economic advantage in harmony with the aggregate social welfare functions specified by the Ethical Observer.

The Ethical Observer is a convenient theoretical device for avoiding the theoretically difficult problem of dealing with disparities between individual utility functions and aggregate utility functions. As a theoretical device the Ethical Observer is essentially external to the problem of equilibrium analysis in economic theory. No great violence is done to economic price theory by imputing capabilities to an Ethical Observer to function as an omniscient and omnipotent political referee at zero costs. However, the postulation of omniscient, omnipotent, no-cost political capabilities can do substantial violence to problems of applied economic analysis whenever the political terms and conditions begin to assume a significant influence on economic conduct in a segment of the economy composed predominantly of public enterprises. Their enterprises are governed more by reference to the political process than by reference to market competition. Political reform is not a zero-cost process. The costs of "radical legal reform," indeed, are apt to assume radical proportions.

The use of the Ethical Observer as a theoretical device also leads economists toward an analytical bias of assuming all economic

behavior to be lawful behavior and to be concerned only with the exchange of goods. The strategic possibility of using threats in bargaining, and of considering the economics of "bads" has only recently been developed in an economics literature on the dynamics of conflict and of threat systems.<sup>17/</sup> The input-output ratios in producing "bads" are of fundamentally different magnitudes (as anyone who has contemplated the "economics" of Molotov cocktails would appreciate) than the input-output ratios involved in the usual benefit-cost analysis of "economic" undertakings. The task of resolving conflict and maintaining a social system at a point of political equilibrium where a population finds it agreeable to sustain productive pursuits rather than to sustain violent and destructive activities in a sensitive problem, and can never be empirically analyzed as a zero-cost function.

Economists are not alone in their reliance upon the theoretical convenience of postulating an Ethical Observer. Political theorists have derived a variety of solutions which approximate that of the Ethical Observer.

Plato's philosopher-king and Hobbe's Leviathan (i.e. "the mortal god") are close approximations to an Ethical Observer. Woodrow Wilson found Congress lacking because it did not measure up well to his conception of how an Ethical Observer's function should be performed. James MacGregor Burns would transform the American political system so that the President might be able to approximate more closely the function of an Ethical Observer and thus solve the deadlock of democracy.

If there were not a fundamental and perplexing ethical problem inherent in all efforts to devise a political calculus for attempting to establish the terms and conditions of the good life, a theoretical solution to the problem of political calculation would have been devised long ago without the necessity of postulating an Ethical Observer.<sup>18/</sup> Many ancient people including the Hebrews reached essentially the same theoretical solution as involved in the postulation of an Ethical Observer. But the history of the Hebrew people would cast some doubt about the sufficiency of the Ethical Observer solution for establishing an appropriate mode of political calculation to maximize aggregate social welfare.

#### An Individualistic Approach to Collective Decision Making

A central problem in the development of a political science relevant to an analysis of institutional failure and reform, then, is to conceptualize and assess the political terms and conditions which affect the individual calculus in making choices which impinge upon the long-term aggregate social welfare. We can all wish that there were indeed an omniscient Ethical Observer to guide us unto the Promised Land. Somehow individual men are much too limited in their knowledge and capabilities to function proficiently as real-life Ethical Observers. Men who are capable of political calculation are also highly proficient in short term, self-interested economic calculations. Thus, arrangements for making political calculations within the political process itself must be devised with full recognition of the potential divergence between economic and political calculations.

Political analysis relevant to decision making in a democratic society cannot begin by using the analytical device of an Ethical Observer as its underlying philosophical assumption. Instead, we are required to begin with the much more difficult and radical assumption that men in a democratic society must assume responsibility for reconciling the conflicts which derive from circumstances where short-term individual and group interest deviate significantly from aggregate social welfare functions.

#### A Concept of Political Price

A useful distinction between the calculations inherent in an economic situation and the calculations implicit in a political situation can be derived from Wicksteed's concept of price. Wicksteed defined price as "the terms on which alternatives are offered to us".<sup>19/</sup> Since we do not always confront "offers", I would prefer to modify Wicksteed's definition to read, "the terms on which alternatives are available to us". As Wicksteed indicates, "'Price' . . . in the narrow sense of 'the money for which a material thing, a service, or a privilege can be obtained' is simply a special case of price in the wider sense. . . ." <sup>20/</sup> Price in this narrower sense is the economic price. The "political" terms on which alternatives are available to us is another special case of price, i.e. the political price. Thus, the economic price plus the political price can be totaled to establish an aggregate price. A price in the wider sense reflects an economic component and a political component among "the terms on which alternatives are available to us".

With such a conception of "price" we would assume that a rational self-interested individual, who seeks to maximize his aggregate net welfare or income position, would have to make a mixed calculation of both the economic price and the political price of the alternatives available to him. He would make his decisions on the basis of the aggregate economic and political terms which leave him in the most favorable net position. The economic price, by definition, would be more easily calculated in money terms. The political price cannot be quantified in any precise sense, but represents conditional opportunities and exposures. The price of any good or service, in the wider sense, may theoretically have radically varying ratios between the economic component and the political component. Social relationships which we normally characterize as "economic" probably involve those situations where the ratio in an aggregate price is predominantly composed of the market price expressed in monetary terms; and those social relationships which we normally label as "political" involve the obverse where the political price expressed as conditional opportunities and exposures becomes proportionately a more significant element of the aggregate price.

#### A Political Price Implied in All Legal Relationships

The structure of all legal relationships implies a paradigm of Political terms and conditions which can be expressed as a correlative assignment of capabilities (rights, powers, privileges and immunities) and limitations (duties, liabilities, exposures and disabilities) in relation to all social conduct.<sup>21/</sup> The capability for action inherent

in any claim to a right involves a commensurate set of limitations inherent in the legal positions of others.

In private economic transactions the legal position of an individual might be formulated in the following terms: "An individual is free (i.e. has the legally assigned opportunity or capability) to act independently in the pursuit of his individual economic interest subject to the limitation (i.e. the legally assigned exposure) that he does not cause harm or injury to others". Any person who considers himself to be harmed or injured by the actions of another is entitled (i.e. has the legally assigned opportunity or capability) to seek an appropriate remedy through the political process subject to the calculated risk or limitation that his claim may not be sustained. Not all injuries are subject remedies as liabilities.<sup>22/</sup>

Thus, every transaction and every social relationship has an implied political price. For the bulk of transactions and social relationships which people sustain with one another, the political price can be minimized by relying upon the decision rule of willing consent or voluntary agreement. Private property law, the law of contracts and the law of voluntary association authorize and enable persons to undertake a variety of arrangements with one another so long as those arrangements are undertaken in accordance with the decision rule of willing consent or voluntary agreement of each and every person involved.

Those conditions which are conducive to the maintenance of an effective, workable competition in a market economy are also conducive to individual decision making on the basis of willing consent. A good which is easily confined or packaged, amenable to exclusive

control by individual action, and not the source of consequences which adversely impinge upon others, can readily be treated as a personal property subject to individual ownership with minimal necessity for public regulation.<sup>23/</sup>

Since most social relationships in a democratic society are governed on the basis of the decision rule of willing consent or voluntary agreement, I prefer to consider this the base rule in the constitution of a democratic society.<sup>24/</sup> It is a most useful rule for facilitating agreeable arrangements at minimum costs, but an insufficient rule for dealing with conflict and other disagreeable situations. Thus, all legal relationships imply a second order of decision-making where the rule of willing consent must be relaxed so that decisions can be taken in the absence of willing consent. Governmental institutions are the particular institutional facilities created for the purpose of making decisions and sustaining performance in the absence of voluntary agreement and willing consent. In effect, the remedies that a person may seek through governmental decision-making facilities are those that enable him to make use of decision-making arrangements where decisions can be taken and performances be required without reference to the willing consent of each and every person who is affected or potentially affected by an anticipated course of action.

The political price associated with any potential value can be expected to climb sharply when recourse is sought to this second order of decision-making requiring use of governmental decision-making arrangements. Yet, recourse to governmental decision-making arrangements theoretically affords opportunities to proceed at a lesser cost than

acting individually. Otherwise, there would be no incentive to use such facilities; and the state would indeed wither away.

#### Cost Functions in Political Decision-Making

Buchanan and Tullock in The Calculus of Consent have taken an initial step in developing a theoretical basis for analyzing the cost functions involved in political decision-making.<sup>25/</sup> They describe two cost functions which might be considered in establishing a system for collective decision-making applicable to any common-pool problem. One cost function describes the potential costs, harm or deprivations which can be expected to flow from assigning decision-making responsibility to a subset of the individuals involved. This cost function, which they call "expected external costs" is a declining cost curve, descends rapidly from a point of relying upon only one decision maker to a point of zero cost where the total population is included in the population of decision-makers.<sup>26/</sup> From the perspective of the population which is subject to such a set of decision rules, the curve describes their anticipated cost of potential deprivations. From the perspective of those exercising the decision-making capabilities this same curve would describe their opportunity for potential indulgences.

Buchanan and Tullock describe another cost curve which has a contrary trend. This curve they characterize as "expected decision costs", represented by time and effort costs involved in decision-making.<sup>27/</sup> If the decision-cost curve represents only out-of-pocket costs, there would be little reason to anticipate symmetry in the two cost curves. However, if time and effort costs are conceptualized to

include opportunity costs as a part of the aggregate time and effort costs, the strategic bargaining power inherent in the ultimate veto position in a common-pool situation would be as great as the power inherent in the assignment of full authority to one decision-maker. The expected-decision-cost curve would, thus, tend to be symmetrical at least at the end point with the expected-external-cost curve.

When these two cost functions are combined, they describe a single total political-cost curve with a U-shaped characteristic.<sup>28/</sup> The least-cost point is somewhere in the mid-range with expectations of sharply ascending costs as power is concentrated with either a single person holding full authority or a single person exercising the ultimate veto.

The Buchanan and Tullock analysis deviates radically from the Ethical-Observer solution. The Ethical-Observer solution would yield zero-costs in potential deprivations, in foregone opportunities and in actual expenditures on decision-making. This is a "no-cost" solution. Instead Buchanan and Tullock deny the possibility of "no-cost" decision rules. All decisions involve political cost. Even the market is not a cost-free decision-making mechanism.<sup>29/</sup> Buchanan and Tullock imply that a least cost rule can be conceived for each kind of decision-making situation depending upon the nature of the values involved. The least-cost position in their formulation is at the low point on the political-cost curve. If the least-cost position is at a point below the level of benefits which can be derived from collective action, then a rational group of men should be willing to relax the requirement of the rule of willing consent and to substitute

decision rule which would approximate the least-cost solution.<sup>30/</sup>

Thus, collective decisions can be taken on the basis of an individual political calculus allowing for collective action if the requirement of willing consent is relaxed and some alternative decision-rule is substituted for the rule of willing consent.

Buchanan and Tullock formulated their analysis for conceptualizing the theoretical problem involved in constitutional decision-making. If a group of people were to establish a system of rules for making decisions to take collective action, what kind of political calculations would such a group of individuals make in arriving at a rational solution to decision-making problems to which everyone could agree? In The Social Contract, Rousseau long ago recognized that the act of constituting a political community is analogous to the formation of a common pool involving diverse sets of individual, interdependent and collective interests among a community of people.<sup>31/</sup> Thus, the problems of political association would appear to have their rationale for dealing precisely with the type of common-pool flow-resource problems involved in water resource development.

#### Application to Political Analysis

Political associations capable of exercising Coercive powers in the absence of willing consent cannot be freely entered into and freely terminated: no resolution of the holdout problem in the common-pool situation could ever occur under conditions of free entry and free exit. As a result, any operative system of government can be conceptualized as providing, by law, a system of decision rules governing all types of social relationships. What actions can be taken by voluntary agreement

or the willing consent of those involved? These decisions can best be left to individual discretion. If the rule of willing consent must be relaxed, how are collective decisions to be taken? How is the assignment of authority to make individual decision or collective decisions on the basis of the willing consent of each and every person in contradistinction to other sets of decision rules authorizing the relaxation of willing consent to be maintained and enforced? When and how many new political associations can be formed permitting people to take action on behalf of limited collective interests in particular, common-pool problems under rules of collective decision making? The whole structure of local government in the United States is composed of such arrangements. How are these arrangements to be governed when their collective welfare functions deviates significantly from aggregate social welfare functions? How do we evaluate institutional performance? How are conflicts to be resolved and institutional structure to be changed if institutional performances are not satisfactory? What are the benefits and costs of proposed changes as reflected in an aggregate social price including both the economic and political terms on which alternatives are available to us? What, in particular, is the price of different forms of political action? What in general are the costs of political reform?

If we as political scientists can begin to assess the costs of political action in light of the terms on which alternative decision-making arrangements are available to people within a political system, we may be in a position to make an increasingly significant contribution to the analysis of public policy. At the same time, such a method of analysis should contribute to a better understanding of the operational

dynamics both of particular decision structures and of a relatively open, political system composed of a multiplicity of different decision-making structures which offer a large number of alternative political remedies for seeking solutions to diverse problems. If, for example, the potential costs of opportunities foregone as a consequence of a political stalemate might be very high, a decision rule authorizing decisions to be taken by a single person might be relied upon. One, of course, would expect the potential opportunities for self-indulgence by such a decision maker to be very great and the anticipated costs of potential deprivations for those subject to such a decision to be very high. This calculus might be modified by supplementary rules to condition and constrain such an exercise of authority and thus modify the anticipated costs of political action. Woodrow Wilson, for example, was much aware of the initiative a President could exercise in the area of foreign policy.<sup>32/</sup> But Wilson's life ended in tragedy for his failure to calculate accurately the political price of sustaining the initiative that he had taken.

In considering the dispersion of authority in a federal system of government (i.e. with two sets of governmental institutions each composed of diverse, relatively autonomous, decision structures) one might again advance a hypothetical formulation based upon Buchanan and Tullock's two cost functions. Reliance upon a single-sovereign solution with full and final authority vested in a single unit would probably result in great opportunities to impose potential deprivations upon others and to derive substantial indulgences for those who functioned in such a decision-making structure. As the alternative number of units

increased, the anticipated costs of potential deprivations would be expected to diminish. In turn, the long-run strategic decision-making costs would tend to increase as those who were dissatisfied with a particular decision would seek alternative political remedies in different decision structures.<sup>33/</sup>

Rational individuals, when confronted with such a cost calculus, would attempt to reach a workable solution which would constitute an agreeable settlement to everyone concerned rather than expose themselves to sharply increasing long-term strategic decision costs and increasing opportunity costs associated with continued conflict. Such persons would follow a mixed strategy of using governmental decision-making facilities where appropriate but would compliment such action with ancillary efforts to reach a negotiated settlements outside the formal arena provided by any particular decision-making structure.<sup>34/</sup>

Presumably the least cost position for each person including reference both to political costs and to the benefits of collective actions would vary. It would not be unreasonable to expect politicians to distort the political dialogue by an overemphasis upon the opportunity costs inherent in delay.<sup>35/</sup> As political entrepreneurs, politicians must sustain a level of support to assure reelection on the basis of facilitating the solution of political problems and the performance of public services on behalf of their constituencies. In general, one might anticipate that a political system composed of a number of units with a large variety of relatively independent public enterprises would be subject to persistent harangues by some about what ought to be done while delaying actions until countervailing interests could be

convinced of the material advantage of acting. Political "crises" need not be viewed as crises, in fact, but as a normal characteristic of political discourse in a political system which offers a variety of political remedies. Our modes of analysis should permit us to penetrate beneath the surface rather than take the protestations and harangues of political discourse at face value.

### A Concluding Analysis

#### Institutions as Political Artifacts

"Institutions" or "organizations" are the behavioral expressions of human activity organized to facilitate human endeavors. All institutional and organizational arrangements are based upon decisions to act in a characteristic way, and decisions taken to order activity in interpersonal relations are always expressed in a language of prescriptive rules or policies. Any institution can be represented in terms of the rules which sustain characteristic patterns of behavior. Consequently, any effort to design some new institutional arrangement or to reform some established institution in practice, must be conceptualized, by the formulation of an appropriate set of rules to prescribe and channel behavior in characteristic ways to produce intended results, or to alter such rules to produce a different set of results.<sup>36/</sup>

All institutions, then, represent the result of decisions taken and/or agreements undertaken to act in certain ways, i.e. in accordance with certain rules or policies. The institutional arrangements of the California water industry represent the way that people concerned

with the development, management and utilization of water resources in California have organized their conduct in relation to one another in order to accomplish their diverse purposes in water resource development. The course of institutional development is one of decision making, one of reaching agreements about the constitution of social relationships in human endeavors. In short, institutions can be represented as the structure of human relationships established by political settlements produced in and sustained through the political process.

The institutional arrangements of the California water industry, thus, represent the particular pattern of political settlements which people in California have devised in seeking solutions to their "water problems" in light of the decision-making facilities which were available to them. In part, these solutions reflect the physical problems inherent in water resource development. In part, they reflect the terms and conditions inherent in the opportunities and exposures afforded by the particular decision-making arrangements which are available in a particular political system.

#### An Analysis of the Terms and Conditions of Political Action

An examination of the history of California represents approximately 120 years of political experience concerned with the development of water institutions. This history of the institutional development of the California water industry can be used to examine the terms and conditions of the political life and thus to indicate the costs of political action inherent in building the institutional arrangements of the California water industry.

## An Ethical Observer's Distorted Image

If California's system of government were to be viewed as functioning like an empirical manifestation of an Ethical Observer or a Leviathan, one can only conclude that it is a most indecisive, bumbling and idiotic affair. A century of controversy has gone into an effort to formulate a definitive law of water rights. The result is a complicated jungle of contradictions and ambiguity filled with enough loopholes to baffle and confuse any knowledgeable expert who tries to conceptualize the California law of water rights as a logically coherent system of thought.

A new system of water law was first fashioned among the early California gold miners to determine the allocation of water rights on the basis of prior appropriation (i.e. first in time; first in right). The state supreme court, however, sustained the common law doctrine of riparian rights granting all proprietors owning land adjoining a stream equal access to make reasonable use of the water from a stream on riparian lands only. The state legislature, in turn, subsequently sought to convert all riparian rights to appropriations based upon historical use and to permit all subsequent development of surface waters to occur only by appropriation. The courts held this action to be void in so far as it circumscribed the inchoate rights of riparian proprietors and thus deprived persons of property without due process of law. The courts, in their turn, recognized all appropriations which met the statutory requirement of continued adverse use, over a period of five years, as establishing a prescriptive right as against all riparian owners whose rights had been adversely impaired. Substantial portions of the statute permitting the exercise of administrative

discretion in the licensing of appropriations and in the adjudication of water rights were adjudged to be beyond the competence of the state legislature and consequently to be an unconstitutional infringement of judicial authority.

Instead of relying upon the common law doctrine for establishing ground-water rights, the courts formulated a new correlative rights doctrine allowing all land owners to exercise a right to the reasonable use of ground-water supplies subject to the correlative right of all other proprietors to make reasonable use of such supplies without reference to the place of use. An effort was made in 1928 to reconcile some of the contradictions in the California law of water rights by the adoption of an amendment to the state constitution declaring a state water policy which would require the state courts to modify their previous course of decisions by which new appropriations had frequently been enjoined from impairing the prior rights of riparians to the full natural flow of a stream. This pattern of confusion in the California law of water rights is currently being compounded by a line of federal court decisions defining the special prerogatives of federal agencies and their degree of immunity from and liability to the provisions of state law.

In general, one can conclude that the California law of water rights has become so complicated that no entrepreneur can know precisely what he owns when he claims a water right. The present director of the California Department of Water Resources, W. R. Gianelli, once reached a similar conclusion about California water law when he observed:

Without agreement any of the parties could find enough loopholes in California water law to tie up the other parties indefinitely in litigation with the end result that nothing gets built and the parties are subject to long delays and considerable expense.<sup>37/</sup>

Gianelli's observation clearly implies that California's system of government has failed in its essential political function of formulating a clearly understandable set of legal prescriptions which would permit economic men to pursue their economic opportunities of water resource development within the limits of lawful conduct without further necessity to function as political men. Instead, Gianelli suggests that the burden for political action falls primarily upon water developer or entrepreneur to devise agreeable arrangements for undertaking any new program of water resource development. In effect, the shortcomings of the law create both an obligation and an opportunity. The economic entrepreneur must also be a political entrepreneur.

Governments as Sets of Institutional Facilities for Decision Making.

If we abandon the assumption that governments govern in the image of an Ethical Observer, we can alternatively examine the assumption that governments are simply sets of institutional facilities for taking decisions and reaching political settlements in the absence of willing consent and for securing the enforcement of decisions and agreements in the absence of voluntary performance. This assumption, when examined in the light of the preceding discussion of the problem of political analysis, gives a sharply different perspective of the institutional development of the California water industry.

(a) A Multi-Leveled, Fragmented Structure of Authority

The general structure of governmental decision-making facilities available to the people of California includes several different types of decision-making arrangements within four quite distinct, and relatively independent levels of governmental jurisdictions. The constitutional arrangements of the American national government and the terms and conditions applicable to the use of its different decision structures is familiar to all American political scientists.

The terms on which alternatives for political action are available to Californians at the state and local level deviate somewhat from the characteristic patterns of state and local government in the United States. The authority of the legislature is, in some areas of legislation, limited to action taken only in the form of general legislation. Legislative authority is also reserved to the people to act directly through initiative petition and referendum both in relation to statutory enactments and to constitutional enactments.

Legislative authority over the local affairs of municipalities is constitutionally reserved to municipal authorities; and municipalities are assigned the constitutional prerogative of formulating their own charters for the government of municipal affairs subject only to a potential veto by the state legislature without authority to alter or amend. Legislative approval has been freely given to local enactments of municipal charters or charter amendments. Municipal home-rule gives rise to quite an independent set of political alternatives for organizing enterprises concerned with the development and provision of water services to residents of municipalities with minimal reference to state authorities.

A home-rule tradition has also been extended to counties in California but is subject to more formal limitations than municipal home-rule. However, the independence exercised by cities has led counties to seek grants of broad discretionary authority from the legislature. A variety of public proprietary services to local unincorporated communities can, as a result, be provided under political terms and conditions established by county authorities within the broad latitudes of state law.

Thus, Californians have access to general decision-making facilities with substantial capabilities for independence of action at four different levels of government. Within each level of government, authority may also be dispersed among a variety of decision structures in accordance with various separation-of-power doctrines. Special mention need only be made of the significant measure of autonomous rule-making authority exercised by judges in state courts when formulating an equitable solution to a case arising under equity jurisprudence. Much of California water law is a product of such judicial "legislation" formulated as equitable solutions to cases adjudicating conflicts over water rights. Political scientists are apt to view judicial legislation as an adjunct of constitutional law and to overlook the important role of judicial legislation in equity jurisprudence.

(b) Property Law as an Assignment of Benefits and Burdens

The multitude of doctrines under which a claim to a water right in California may be asserted and defended has created substantial doubt and uncertainty about the practical significance of the allocational rule to apply in determining who gets what and at what political price

(i.e. commensurate burdens, liabilities or obligations) in particular circumstances. As a result, litigation has played a significant role in determining the equitable interest that each party to a conflict is entitled to claim from any given resource pool.

The definition of equitable interests rarely settles the matter but serves only to determine the respective bargaining positions of the different parties in formulating a solution to their mutual problems and in assigning the burdens or costs associated with that solution. The correlative rights doctrine which is manifest in several species of California water rights usually implies an obligation on the part of each claimant to assume a burden proportionate to his benefits. This results in a circumstance where no one is assured of a firm supply at the cost of someone else who must assume the primary burden or obligation for any shortages. Assigning proportionate burdens to all water users creates an incentive for each to search out a mutually satisfactory solution rather than attempt to shift the burden to the few highly exposed or disadvantaged individuals.

(c) The Public Enterprise Solution

Most solutions to such conflicts have usually included a plan to develop a supplementary source of water supply to meet increasing demands. The political solution, as an essential complement to the engineering and economic solution, has usually included plans for the organization of a public enterprise to permit collective action through a self-governing, public corporation for implementing the solution and, thus, to preclude anyone from exercising the strategic bargaining power inherent in a holdout position. Such public enterprises

are usually organized to include the aggregate community of people benefiting from the development of the resource pool with collective decision-making arrangements to provide for political representation of the local community of water users in all decisions affecting water resource development for that community of people.

The institutional substructure of the California water industry is today comprised of many hundred different public water districts and municipal utility systems organized in accordance with a large number of different formulae in constituting their internal decision-making structures for governing matters of collective concern to particular communities of water users. Such enterprises have been tiered one upon another to perform diverse and complementary functions. An enterprise producing a supplementary supply of water may, thus, come to function as a producer and/or wholesaler serving a variety of other public enterprises functioning as water distributors. The general configuration of water institutions providing water services in California reflects substantial vertical differentiation with an institutional base formed by individual water users who are either consumers of predominantly public enterprises or "independent" water producers supplying their own consumptive requirements from a "natural" source of supply. Most of the enterprises or organizations serving water consumers or independent producers are public enterprises or quasi-public enterprises capable of taking and implementing decisions under a system of public decision rules which permit relaxation of the rule of willing consent.<sup>38/</sup> The large-scale operations involving state-

wide and federal interests are organized through agencies of the state and federal (national) governments functioning as the principal large-scale water production and regulatory agencies.

The system of public enterprises which form the institutional complex of the California water industry also manifest characteristics of substantial horizontal differentiation. Water distribution systems for rural areas are usually organized independently of those serving urban areas, and the size of each individual distribution system varies significantly for different communities in the state. Sewer systems are usually organized independently through other public enterprises with separate facilities provided by different enterprises for sanitation sewers, storm drains and for agricultural drains. Agencies concerned with the management of in-the-channel uses of a resource system are also marked by substantial independence among different agencies specializing in supplying fish and wildlife, recreation facilities, flood control and navigation, hydroelectric power generation and storage of water both for diversion purposes and for the regulation of stream flow. Still other agencies may be concerned with the conservation and management of ground-water supplies.

(d) Incremental Decision Making (i.e. Institution Building)

Given the relatively easy access to a large number of governmental decision-making structures and the great diversity of conditions affecting the supply of and demand for water resources in different parts of California, efforts to devise general solutions to water problems have usually been frustrated with failure. Substantial disagreement simply means that those who win one round in a political

struggle are confronted with the task of sustaining their position for another round in a different political arena. Even the weight of federal authority may not be able to preclude an alternate arrangement inherent in organizing a new state Department of Water Resources to supply water at a more agreeable political price than is available from federal agencies.<sup>39/</sup>

Instead of seeking general solutions, Californians have demonstrated a clear preference for the political strategy of seeking particular solutions to specific problems in the development of their water institutions. If a general agreement can be reached for sustaining some particular solutions to a specific problem, that agreement can usually be sustained and confirmed through the decision-making facilities afforded by the general political system.

Given the very large number of interdependent relationships inherent in the variety of common-pool, flow-resource situations which manifest themselves in water resource development for a large, diversified state like California, it would be impossible to cover every contingency by the constitution of a new independent public enterprise to deal with each and every set of interdependent relationships. Once a basic structure of complementary public enterprises is established, problems may be solved incrementally by 1) negotiated agreement among enterprises, 2) an incremental change in the structure for governing internal agency relationships, 3) a change in statutory public policies affecting agency relationships or 4) a combination of all three of these arrangements.

Since the costs of political action can be significantly reduced if a general agreement can be reached, a substantial incentive exists to find agreeable solutions.<sup>40/</sup> Thus, the negotiation of an agreeable solution to common interests among public enterprises operating in the California water industry is the basic method of decision-making concerned with the water resource development. The availability of alternative governmental decision-making facilities assures that no one can occupy an ultimate holdout position and each has an incentive to seek a settlement in light of the comparative costs of different political alternatives.

Negotiations, in effect, is the hidden hand in government functioning to give due consideration to commonalities (i.e. common value) among diverse interests in much the same way that competition functions in the market to give due consideration to the exchange value (i.e. common value) of separable goods in the market. For negotiations to open the way to a solution in the political process, each negotiator must know the political price inherent in the other alternatives available for taking political action. An opportunity is, then, created to reach a settlement by negotiations on the basis of a lesser-cost solution given the political price established by alternative methods of decision making. Errors will be made in assessing and calculating strategic opportunities. We cannot anticipate that all decisions will be taken under optimal political terms and conditions. A relatively high political price will have to be paid when parties to an action miscalculate the alternative terms and conditions available to them and fail to settle for a lesser-cost

solution. All social structures are subject to error. Incentives can be created to avoid errors, to reduce the future costs of past errors and to reduce the prospects of repeating errors, but no arrangements are error proof.

Resolving Problems of Misallocation and Overdevelopment  
Through the Political Process

Where interdependent goods can be provided by a highly differentiated system of public enterprises, problems of misallocation can be alleviated by adjusting the terms of trade between different sets of such enterprises and consequently among different sets of users. Any serious misallocation where one set of users is realizing a benefit from common-pool, flow resource to the disadvantage of another set of users implies that the other users are paying a cost in foregone opportunities in proportion to the special benefit or misallocation being enjoyed by the privileged beneficiaries. If the aggregate price to the especially privileged beneficiaries is increased so as to eliminate the opportunity costs imposed upon others, a reasonable equilibrium among diverse uses of a common-pool flow resources should again be reestablished.

The criterion of economic theory that a resource should be allocated to its various uses until its value for each use is equivalent serves as a good criterion but this criterion can only be imperfectly applied in practice. The criterion is properly applied only to an aggregate social price or an aggregate social value. A price measured in monetary terms most closely reflects full social value when applied

to marketable commodities having insignificant social costs and benefits or minimal spillover effects. As social values not expressible in monetary terms increase in significance, a market price becomes an increasingly imperfect proxy for the aggregate value of a good. If nonmonetary values are to be recognized in a pricing system for publicly provided goods or services, then one would anticipate a necessity to establish a weighted and segregated pricing structure. If public provision of a good or service is justified, one would consequently expect a public pricing system to be an "administered" pricing system rather than a pricing system controlled by the free play of market forces. A community of people might freely choose for example, to forego the opportunities inherent in a sports fisheries in consideration of a relatively lower order of value to be gained from itinerant fishermen in comparison to paying for a greater value to be derived from having resident farmers as permanent neighbors.

Rather than rely exclusively upon the marginal value of water for its "highest" use in analyzing misallocational problems, the value of water for its "higher" uses needs to be critically compared with the value of water for opportunities which are being foregone. If the values being foregone are significant, and if those values being foregone are the result, in part, of adverse preemption by the "higher" users, then a political incentive will exist to modify the terms of trade between the two sets of uses and reduce extremes in misallocation. In the absence of market mechanisms to adjust the supply and demand for water for dissimilar but interdependent types of use, those who are injured or who are paying the costs of foregone opportunities will

be required to seek remedies through the political process. The political process has been repeatedly used to achieve such reallocations in the history of the California water industry.

Given the political calculations inherent in the previous discussion, it is reasonable to anticipate that as the value of water devoted to fisheries increases and as the costs of such foregone opportunities increase by the adverse preemption of water for other purposes, then fishery agencies and organizations of fisherment will press for the inclusion of any such opportunity costs in the "price" of water appropriated for those other purposes. The price of water at its source should at least be equal to the value of those foregone opportunities. The political costs of establishing such a policy need not be high in light of an increasing demand for water in outdoor recreation. The corollary to such a policy is the establishment of a pricing policy among public agencies conducting outdoor recreation programs including the provision of sports fisheries to pay the incremental costs for such programs without requiring other water users or general taxpayers to assume the added incremental costs.<sup>41/</sup>

Problems of misallocation will only be exacerbated if public funds derived from taxpayers without reference to the benefits associated with water resource development are used to sustain developmental programs of benefit to a discrete and disparate set of users and without general benefit to the taxpaying population as a whole. If the terms and conditions inherent in political action create an incentive to raid the public treasury and freely use treasury resources to avoid the economic costs inherent in allocating common-

pool water supplies to their respective uses, the political process does not provide an appropriate calculus in the short run to bring individual welfare functions into harmony with aggregate social welfare functions but may serve to magnify or distort the allocational problem.

The possibility of compounding misallocation upon misallocation in public decision making is an inherent part of the calculus implicit in any political system organized upon the basis of a diversity of decision rules. As indicated in the earlier discussion, we can anticipate very great costs in potential deprivations if authority to act is vested with one person and all other persons in a collectivity are compelled to pay the costs associated with such decisions. Money paid to the treasury for such purposes may represent a compounded deprivation (i.e. paying a price for having a bad done to oneself). Money in a public treasury, thus, may have a very low order of value (i.e. of a much lower value than money in a bank account), and under certain circumstances, it may be rational for persons to attempt to find ways to commit funds in the public treasury to "noneconomic" uses within the scope of their political influence but uses which represent a higher order of social return to them than to have these funds used to deprive themselves still further. The lesser-cost solutions for individuals in such a situation would emphatically not be to commit all areas of decision making to one-man rule, but rather to minimize their exposure to one-man rule to only such circumstances where the opportunity costs of a contrary rules might be even greater. But the costs in potential deprivations produced by a mixed structures

of decision rules may create highly divergent and seemingly irrational calculations to occur as people seek to take best advantage of the aggregate opportunities available to them.

I shall not undertake the task of comparing the opportunity costs of maintaining law and order in Vietnam with domestic opportunities for water resource development in California, in order to sustain a conclusion that "uneconomic" investment of federal funds for water resource development may be the more "economic" use of those funds. Action based upon such a process of reasoning may also lead both to very high costs in potential deprivation among the Vietnamese, the American "police" forces and the American taxpayers and to increasing cost in foregone opportunities on the part of those who have their sources of water supply preempted at no cost by those able to raid the treasury and affect a transfer of water to their "higher" economic benefit. Unless the political process can be used to facilitate agreeable arrangements for sustaining all human endeavors, the social costs inherent in imposing solutions upon unwilling people can quickly escalate as one conflict contributes to other conflicts.

As the requirement of willing consent is relaxed, the political process is apt to create an intoxicating illusion of affording opportunities to get something for nothing or of being able to impose a new and rational order upon muddle-headed people. Both the "spoilsman" and the "radical reformer" are apt to make short-term political calculations of "winning" on the assumption that the essential structure of the political process is a win-lose contest based upon capabilities for securing a minimum winning coalition.

Such contests do exist; and such strategies are possible! The structure of the common pool problem also exists! The strategy of the holdout is possible! A political system must, therefore, provide remedies for dealing with the "spoilsman" and for dealing with the radical reformer" just as it provides remedies for dealing with the holdout who by ignoring the consequences of his behavior imposes costs upon others!'

If one looks not to the short term gain to be derived from a preemptive win, but to the long-term problem of resource management, short-term wins can give rise to high costs both in inefficient resource allocation and to long-run strategic decision-making costs in unresolved controversy. Public entrepreneurs concerned with sustaining the operation of a resource development agency in the long run must be prepared to sustain the viability of their enterprises without regard for who "wins" or "loses" particular political contests in the short-run. In their political calculations, public entrepreneurs cannot afford to "lose"; and the only way to preclude a political defeat or a veto is to sustain decisions on the basis of an economic strategy to attempt to maximize the aggregate social welfare. The political counterpart of this economic strategy is to attempt to secure a negotiated settlement by willing agreement with due recognition that such a solution is not feasible when dealing with interdependencies in a common-pool type of situation without recourse to decision-making structures which permit decisions to be taken in the absence of willing consent. Occasional decisions can be taken by a minimum winning coalition, but those decisions are risky and can have a very high

political cost as other people pursue their political opportunities in other decision structures and return to engage the contest over and over again.

The political process does not afford both the necessary and sufficient conditions to assure efficient and harmonious results. The political process can provide the necessary conditions to enable people to secure optimal results. It can never provide the sufficient conditions, independent of human choice. A perfectly competitive market economy assures the necessary and sufficient conditions for the efficient allocation of some goods in economic theory only so long as law and order is postulated. The sufficiency of economic theory dissolves when the law and order postulate is relaxed.

The provision of law and order is a costly process. As we come to know the political process in the form of a political calculus elucidating the terms on which alternatives for decision making are available, perhaps we can begin to evaluate the costs of incremental reform within the limits of those alternatives. The costs of radical reforms which fundamentally alter political terms and conditions must necessarily remain less amenable to calculations.

The misallocational problems in the California water industry can perhaps best be solved by seeking means to adjust differences so that the price of water at its source covers the cost of opportunities being foregone in alternative uses for that water supply. Water production from ground water basins in Southern California is now being taxed to cover the costs of ground water basin replenishment and conservation programs. A water yield tax to cover foregone opportunities

inherent in excluded alternative uses of surface waters would tend to correct problems of misallocation and to adjust water prices to include the cost of excluded alternative uses as a part of that price.

If these misallocational problems can be kept within reasonable limits, and if public treasury funds do not come to have an unreasonably low value in opportunity costs, the aggregate overdevelopment of water resources in California should not assume disturbing proportions. In a world plagued by problems of underdevelopment, a mild case of overdevelopment provoked by an aggressive public entrepreneurship may be a stimulating and benign disease. Others may wish to learn more of the political terms and conditions for producing such a benign affliction in order to remedy still more serious problems of institutional failure.

Vincent Ostrom  
July 26, 1967  
Mindemoya, Onterio  
Manitoulin Island  
Canada

## Footnotes

(The first draft of this manuscript was prepared without access to a general library. Subsequent revisions will include fuller references to the substantial body of literature related to this paper.)

1/ A panel of distinguished political scientists has only recently advised the Committee on Economic Development in formulating a new call for political reform entitled "Modernizing Local Government". If the nineteenth century municipal reformers could read this most recent call to reform, one might expect to hear a resounding "Hallelujah".

2/ The institutions concerned with the economic functions of water resource development can be conceptualized as a set independent of the institutions concerned with the political functions bearing upon policy considerations. The two sets would have substantially the same elements, but the structural characteristics of those elements would assume quite different proportions in the two sets. The Supreme Court of the United States, for example, is a highly significant element among the governmental institutions concerned with considerations of water policy) but is a most insignificant element among water institutions as it functions economically in the consumption of water service.

3/ J. W. Milliman, "Some Observations on the Economics of Water Resource Policy", p. 2.

4/ Joe S. Bain, Richard E. Caves and Julius Margolis, Northern California's Water Industry (Baltimore: Johns Hopkins Press, 1966), p. 658.

5/ Ibid., p. 659.

6/ Ibid.

7/ Ibid.

8/ Woodrow Wilson, Congressional Government (Originally published, 1885): James MacGregor Burns, The Deadlock of Democracy (Englewood Cliffs, Prentice-Hall, Inc., 1963). Wilson's concern with "disintegrative: methods closely parallels Burns diagnosis that the cause of political inertia lies in ". . . a political system that evades and confuses the real issues rather than in sharpening and resolving them".

9/ William J. Baumol, Welfare Economics and the Theory of the State (Cambridge, Massachusetts: Harvard University Press, 1952), James Buchanan and Gordon Tullock, The Calculus of Consent (Ann Arbor: University of Michigan Press, 1962), and Mancur Olson, Jr., The Logic of Collective Action (Cambridge, Massachusetts: Harvard University Press, 1965).

10/ Apart from the public interest involved in public regulations the matter of securing rights-of-way along public thoroughfares creates the potential for regulation to be accomplished by negotiation among bilateral monopolists. Regulation in that case might be conceptualized as a direct quid pro quo relationship.

11/ If each property owner could deny the use of a river fronting upon his property for in-the-channel uses, each user would be confronted with the problem of coming to terms with each proprietor along the stretch of river used for his purposes. We have the familiar common-pool problem manifest itself again.

12/ I use the average cost of the marginal blocks added to total supply because water systems are built in increments which involve large blocks of added capacity. If any other cost unit is used, decisions to build added capacity would be based on one set of assumptions and decisions to use would be based upon other sets of assumptions with radically varying consequences for price structures.

13/ This hypothetical example is not unrealistic. If the cost data used in Jack Hirschleifer, James C. DeHaven and Jerome W. Milliman in Water Supply (Chicago: The University of Chicago Press, 1960) p. 305, to discuss water pricing policies of the City of Los Angeles were used, the potential profitability of that municipal water supply is proportionately larger than is revealed in this example without any reference to the value of hydro-electric power as a Joint product in the operation of the water system. The equivalent wholesale price of water for the marginal source of supply in the Southern Indiana community where I live is approximately \$150 per acre-foot in comparison to the \$25 price used in this hypothetical illustration.

14/ The reference to production cost is the cost of delivering water to a distribution system. This might be conceptualized as the equivalent of a wholesale price.

15/ Hirschleifer, DeHaven and Milliman, op. cit., p. 309.

16/ My use of this term is borrowed from the work of Paul A. Samuelson. The characterization and imputation are mine.

17/ e.g., Kenneth E. Boulding, "Towards a Pure Theory of Threat Systems," American Economic Review 53 (May, 1963), 424-434 and Thomas C. Schelling, The Strategy of Conflict (Cambridge, Massachusetts: Harvard University Press, 1963-).

18/ It is interesting to note that Hobbes explicitly considered his political theory in the Leviathan to be an effort to operationalize the Golden Rule. Rousseau in The Social Contract repeatedly conceives the task of a political society in propositions analogous to the Golden Rule; e.g., at one point the social contract is characterized in the following way:

Under the terms of the social contract all the citizens are equal. All, therefore, can prescribe what all are to do, but no one has the power to require any action that he himself does not perform (would not perform). The power to require such action is, however, indispensable to the life and activity of a political society. And, it is precisely this power that the sovereign (the principals to the social contract), in instituting the (a system of) government, convey to the prince (those who exercise decision making capabilities in the conduct of government),

The parenthetical observations are my comments in construing Rousseau's thought.

19/ Philip H. Wicksteed, *The Common Sense of Political Economy*, Lionel Robbins, ed. (London: Routledge and Kegan Paul, Ltd., 1957), . 28.

20/ Ibid.

21/ This paradigm of the structure of legal relationships is drawn from the works of W. N. Hohfeld and John R. Commons. Commons in Legal Foundations of Capitalism, Reprint edition (Madison: The University of Wisconsin Press, 1959), modified Hohfeld's paradigm and applied it to a general discussion of the institutional structure of economic relationships. Much of Commons' presentation is excellent except for some relatively superficial discussion of political association being based upon "physical power" or "violence". Contemporary anthropologists have drawn heavily upon this work but as far as I have been able to determine economists and political scientists have made little use of these works. The sociologically-oriented political scientist might wish to consider whether roles derive from the strategic opportunities inherent in the rules ordering the games of life or whether rules derive from roles. If the former is true, a sociology based upon role theory has more to learn from a political science than a political science has to learn from such a sociology, if we are to understand "regularities" in social behavior.

22/ e.g., "acts of God" are not compensable as legal liabilities except where covered by liability insurance. Losses caused by economic competition are usually not subject to liability. Presumably the right to do business carries the commensurate liability of being exposed to the competitive behavior of other entrepreneurs.

23/ Vincent Ostrom, "Property, Proprietorship and Politics: Law and the Structure of Strategic Opportunities in the California Water Industry," REF reprint No. 47.

24/ The majority-vote rules is only one of several different rules, albeit an important one, for taking decisions in the absence of willing consent.

25/ Buchanan and Tullock, op. cit.

26/ Ibid, p. 65.

27/ Ibid., p. 70. Herbert J. Kiesling in a paper entitled "A Criticism of the Potential Costs of Alternative Decision-Making Rules as Constructed by Buchanan and Tullock in their book, The Calculus of Consent" found it desirable to give greater emphasis to a "strategic bargaining" component apart from the "time and effort" component in expected decision costs as a means to recognize the potential veto position occupied by the nth person or a small set of nth persons in a collectivity relying upon a rule of unanimity. Strategic bargaining costs can also be conceptualized as opportunity costs inherent in time and effort costs as reflected by the opportunities foregone by not taking a decision or by taking a decision only under the terms agreeable to a holdout, As a result, I have chosen to think of time and effort costs as including opportunity costs associated with the time and effort expended.

28/ Ibid., p. 71.

29/ See R. H. Coase, "The Nature of the Firm," Economica IV (November, 1937), 386-405.

30/ Buchanan and Tullock, op. cit. p. 83.

31/ Gateway edition, p. 15.

32/ A new preface to the Fifteenth Printing of Congressional Government, dated 15 August, 1900, contained the following observation:

Much the most important change to be noted is the result of the war with Spain upon the lodgment and exercise of power in our federal system: the greatly increased power and opportunity for constructive statesmanship given the President by the plunge into international politics and into the administration of distant dependencies, which has been that war's most striking and momentous consequence. When foreign affairs play a prominent part in the politics and policy of a nation, its Executive must of necessity be its guide; must utter every initial judgment, take every first step of action, supply the information upon which it is to act, suggest and in large measure control its conduct..... Upon his choice, his character, his experience hang some of the most weighty issues of the future.....Interesting things may come out of this singular change.

...the new leadership of the Executive. . .will have a very far-reaching effect upon our whole method of government....It may bring about, as a consequence, an integration which will substitute statesmanship for government by mass meeting. It may put this whole volume hopelessly out of date. (My emphasis added. V. 0.)

(New York: Meridian Books, 1956), p. 22-23.

33/ Gordon Tullock has conceptualized a similar formulation in a paper on the theory of federalism not yet published.

34/ I have discussed the problem of mixed strategy in a "polycentric" political system much more fully in an unpublished paper on "Operational Federalism".

35/ Albert Breton in an unpublished paper on "A Rule of Government Behavior" discusses a hypothesis about governmental "advertising" which he recognized to be similar in dynamics to business advertising. The Puviani-Fasiani rule derived from the work of two Italian scholars in public finance asserts that governments will attempt to hide the burden of the taxes levied and to exaggerate the benefits of expenditures to maximize the degree of fiscal illusion.

36/ My point about the design and construction of institutions as political artifacts tends to be confirmed by the circumstances that lawyers characteristically perform the task of draftsmanship and, thus, perform an essential role in the design of institutional arrangements. Some lawyers have been among the most distinguished architects of our institutional order.

37/ Memorandum by W. R. Gianelli to Harvey O. Banks, (formerly Director, Department of Water Resources) on "Conflicts in the Development of Recent Major Water Development Projects", September 18, 1959, (ditto), p. 7.

38/ I use the term quasi public enterprise to refer to mutual water companies and other such arrangements where the "social contract" inherent in the constitution of the enterprise does not permit free entry and free exit by virtue of restrictions placed in deeds to real property which, when conveyed, contain provisions for the owner's participation in the rights and obligations of a mutual water company as a condition of water service.

39/ This allusion has reference, in part, to controversy over the 160 acre limitation, subsidies to agricultural water users and other federal policies. Urban water users have little (i.e. some but not much) incentive for paying to subsidize water for agricultural purposes; and some agricultural users would prefer to pay a higher price for water and not be subject to an acreage limitation. While no one has explicitly announced the purpose of the Department of Water Resources to be that of functioning as a rival large-scale water producer offering different terms and conditions (including a higher dollar price for irrigation water) than the large-scale federal water producers, the implication is obvious. While federal law prevails in the service policies of federal agencies, the state need not accept the absolute priority of agricultural use inherent in federal reclamation law as controlling the allocations of water supplied by state or local agencies not contracting for services with the Bureau of Reclamation. Some of those who see state and local governments as archaic strongholds of a rural-based, political-power structures might do well to analyze the way that federal policies are used to impose outdated priorities plus subsidies on behalf of agricultural developments in areas being overwhelmed by urbanization.

40/ By general agreement" I mean a circumstance where an effort is made to secure a decision or agreements acceptable to all parties but with due recognition that this may not be possible. If a substantial majority of those participating can find an agreeable solution, and if others are willing to settle while withholding formal assent, then a general agreement has been attained.

Concepts of justice and equity are based upon systems of reasoning about the institutional order of social life, and about the reasonableness of solutions in righting wrongs or in making decisions regarding individual welfare functions and aggregate social welfare functions. It is possible to agree to a rule as reasonable even though the application of such a rule means greater deprivations than benefits for particular individuals or aggregates of individuals. Willing consent to voluntary agreements may not be forthcoming in such a situation even though gracious acceptance of a social obligation would be forthcoming. This is the fundamental ground upon which concepts of authority and legitimacy depend if they are to have any psychological or political validity.

41/ If a municipal water supply system opens its reservoirs for recreational use and the costs of processing water are increased as a consequence, the costs should be borne by those enjoying the recreational benefits. If the two communities of users are identical, then no difficulty need arise, but if the two sets of users represent disparate populations, it is difficult to argue that one should go to an expense to produce a benefit for others.

I have excluded welfare considerations bearing upon redistribution of income from these discussions. I doubt that this purpose can be effectively served by water resource allocational policies. Too frequently discussion of income redistribution effects are no more than political illusions when, for example, the poor are dispossessed in the name of "urban renewal" to improve the welfare position of the well-to-do, when wage earners are required to pay a disproportionately large share of the costs of free medical care to the aged, or when free public recreational facilities are provided only at distant locations requiring high transportation costs to gain access.