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Getting the Most Valuable Water Supply Pie: Economic Efficiency in Florida's Reasonable-Beneficial Use Standard

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GETTING THE MOST VALUABLE WATER SUPPLY PIE: ECONOMIC EFFICIENCY IN FLORIDA'S REASONABLE-BENEFICIAL USE STANDARD

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I. INTRODUCTION

In the twenty years since enactment of the Florida Water Resources Act of 1972,[1] the five water management districts have issued thousands of consumptive use permits in accordance with their legislated charge, as delegated by the Secretary of the Department of Environmental Regulation, "to accomplish the conservation, protection, management and control of the water of the state."[2] The waters of the state "should be managed to conserve and protect natural resources and scenic beauty and to realize the full beneficial use of the resource."[3] For most of those twenty years the water management districts have allocated water on a first-come, first-served basis while nominally meeting the consumptive use permit criteria.[4] In that time, surprisingly few permits have been challenged either administratively or in court largely because long term water levels have been adequate.[5]

Any allocation system will function with minimal conflict as long as water sources are adequate, but the true test of an effective permit system comes with scarcity.[6] Water scarcity in Florida has generally been defined as regional droughts or rainfall deficits greater than the "two in ten" shortage commonly used by the districts as the basis for determining water levels for use permits.[7]

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1. FLA. STAT. §§ 373.012-373.619 (1991).

2. FLA. STAT. § 373.016(3) (1991). *See generally* Carlyn Harper & Elizabeth Ross, *The Reasonable-Beneficial Test: Maximizing the Water Supply Pie Before Relinquishing the Last Piece*, FLA. B.J., May 1990, at 68.

3. FLA. ADMIN. CODE. ANN. r. 17-40.110(1) (1991).

4. *See* Harper & Ross, *supra* note 2, at 68. The criteria for obtaining a permit for consumptive use of water are described in section 373.223(1), *Florida Statutes*.

5. Harper & Ross, *supra* note 2, at 68; *see* Gary D. Lynne et al., *Water Permitting Behavior under the 1972 Florida Water Resources Act*, 67 LAND ECON. 340, 345-46 (1991) ("From a sample of agricultural water use applications to the SWFWMD for the period 1982-84, about 85% of the water use permits were given "more or less automatically.").

6. Richard Ausness, *Water Rights Legislation in the East: A Program for Reform*, 24 WM. & MARY L. REV. 547, 581 (1983).

7. Harper & Ross, *supra* note 2, at 69.

Water allocation during droughts is addressed by the individual districts' emergency water shortage plan.[8]

More subtle indications of "chronic" water scarcity have become evident in the past few years: the potentiometric surface of primary source aquifers drops over several years and does not recover;[9] aquifer salinity fronts migrate into formerly freshwater aquifers in coastal and some inland areas;[10] land surfaces subside creating sinkholes;[11] well withdrawals interfere with each other; and surface lakes and wetlands show the drying effects of water table declines.[12] These occurrences are symptomatic of consumptive withdrawals exceeding available recharge.[13]

The water districts have responded with increasing emphasis on:

- information gathering in order to characterize more reliably the aquifers and surface sources, and the natural systems dependent on water;
- pumpage metering and reporting, and improving knowledge of use;
- enforcement of permit conditions and pumpage allocations; and
- water use efficiency criteria for consumptive use permits (CUPs)[14]

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8. "The governing board or the department by regulation shall formulate a plan for implementation during periods of water shortage." FLA. STAT. § 373.246(1) (1991). "Governing board" refers to the "governing board of a water management district." *Id.* § 373.019(3).

9. *See, e.g.*, Harry G. Rodis & Douglas A. Munch, *Potentiometric Surface of the Floridan Aquifer and Its Use in Management of Water Resources, St. Johns River Water Management District, Florida*, U.S. Geological Survey Water-Resources Investigations 83-4176 (1983); *see also* SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT, GROUND-WATER RESOURCE AVAILABILITY INVENTORY: HILLSBOROUGH COUNTY, FLORIDA 55-59, 132-33 (April 1988) [hereinafter *Ground-Water Resource Availability Inventory*]. "'Potentiometric surface' is a surface that represents the total head in an aquifer. It is determined by the height above the datum plane to which water will rise in tightly cased wells that penetrate the aquifer." *Id.* at 159.

10. *See, e.g.*, Gary L. Mahon, *Potential for Saltwater Intrusion into the Upper Floridan Aquifer, Hernando and Manatee Counties, Florida*, U.S. Geological Survey Water-Resources Investigations 88-4171 (1989); Charles H. Tibbals, *Availability of Ground Water in Seminole County and Vicinity, Florida*, U.S. Geological Survey Water-Resources Investigations 76-97 (1976).

11. *See, e.g.*, FLA. ADMIN. CODE ANN. r. 40D-2.381(3)(m) (1989).

12. *Ground-Water Resource Availability Inventory*, *supra* note 9, at 74.

13. *See* C.W. FETTER, APPLIED HYDROLOGY (1988). That is, regional rainfall recharge net of natural outflows from springs and seepage.

14. *See* Harper & Ross, *supra* note 2, at 68, 70; Roy R. Carriker, *State Water Management Policy: The Florida Experience*, *in* NATURAL RESOURCE AND ENVIRONMENTAL POLICY ANALYSIS: CASES IN APPLIED ECONOMICS (George M. Johnston et al. eds., 1988).

Some nontechnical measures have also been implemented, such as requiring municipal water utility conservation rate structures as a condition of permit,[15] public awareness campaigns, promotion of xeriscape,[16] water conservation planning advice to local governments,[17] and conflict resolution processes.[18]

In their technical criteria, the water management districts have amended CUP regulations and processes to require water saving irrigation equipment and municipal domestic fixtures.[19] CUP application quantities are carefully shaved of any perceived excess and are reduced when requested withdrawals are projected to interfere with existing user wells.[20] Permit durations are reduced.[21] The ultimate response has been evoked from the Southwest Florida Water Management District in the application of its definition of a most impacted area in the East Tampa Bay Water Use Caution Area (WUCA): since October of 1989 no new withdrawals are permitted from freshwater confined aquifers within the WUCA.[22]

These changing conditions of water use increase transaction costs[23] as a consequence of the uncertainty of how much water the applicant may use and of whether the applicant will be granted a permit at all.[24] Consequently, heightened conflicts result between the water district and water applicants as well as among the applicants themselves.[25]

Such symptoms of chronic scarcity demonstrate increasing interdependence among water users, rising incremental costs of water withdrawal, and sharpened competition, all of which are

15. Interview with Elizabeth Ross, Senior Counsel, South Florida Water Management District (Mar. 23, 1992).

16. "Xeriscape is the use of drought tolerant plants to conserve water." Harper & Ross, *supra* note 2, at 69 n.26.

17. *See, e.g.*, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT, WATER CONSERVATION OPPORTUNITIES FOR LOCAL GOVERNMENTS Tech. Inf. Planning Series 88-1 (August 1988).

18. Jeffrey C. Elledge, *Water Use Permitting in Florida: An Effective Program for Allocating Water*, *in* WATER: LAWS AND MANAGEMENT 4B.17, 4B-23 to -26 (1989).

19. *See, e.g.*, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT, WATER USE PERMIT INFORMATION MANUAL B-9 to B-10, B-66 to B-69 (Oct. 1989) [hereinafter SWFWMD, WATER USE PERMIT INFORMATION MANUAL].

20. *See, e.g.*, FLA. ADMIN. CODE ANN. r. 40D-2.101 (1989).

21. *See, e.g.*, FLA. ADMIN. CODE ANN. r. 40D-2.321 (1989); *see also* Carriker, *supra* note 14.

22. SWFWMD, WATER USE PERMIT INFORMATION MANUAL, *supra* note 19, at B-123.

23. The transaction costs that increase include financial costs related to water district personnel increases, consultants used by applicants, and delays, as well as social costs related to delays and frustrations.

24. *See infra* note 102 and accompanying text.

25. *See* Harper & Ross, *supra* note 2, at 68; Lynne et al., *supra* note 5, at 340.

characteristics of a maturing water economy.[26] Under these conditions, social conflict increases and, to the extent that water use rights lack flexibility for transfer, the social benefit of water use is less than its potential. Rising community awareness of the need to address water as a scarce resource, rather than a free good, however, will reduce conflict to tolerable levels[27] and will facilitate a move toward maximizing social benefit. The authors of the Model Water Code[28] (Code), from which the Act is largely drawn,[29] recognized the impending scarcity and the need to design nontechnical measures by altering the structure of Florida's water institution to resolve conflict and to maximize social benefit.[30] The Act can be used to protect the long term integrity of the resource and water-dependent ecosystems and recreational activities.[31] It is unclear, however, how well the Act actually works to resolve conflict or to insure long term integrity and maximize social benefit under scarcity, especially among the economic uses of water.[32] The problems may rest in the nontechnical or institutional measures that have been implemented.

At least two recommendations have been made for new institutions to handle increased competition among water use applicants. First, Earl and Ankersen focus on the public interest standard of the competing applications section of the Act,[33] which they feel does not provide for predictable and impartial decision-making, either by private water users or the districts.[34] They suggest that the problem of competing applications can be resolved by clarifying the public interest standard through legislative action establishing a hierarchy of use preferences or through water management district rulemaking.[35] Use preferences

26. Alan Randall, *Property Entitlements and Pricing Policies for a Maturing Water Economy*, AUSTRALIAN J. OF AGRIC. ECON. 195, 196 (1981).

27. *See generally* Harper & Ross, *supra* note 2, at 68.

28. *See generally* FRANK E. MALONEY ET AL., A MODEL WATER CODE (1972).

29. Ausness, *supra* note 6, at 557; Lynne et al., *supra* note 5, at 341.

30. *See* FRANK E. MALONEY ET AL., FLORIDA WATER LAW 1980, 206-08 (1980).

31. *See* Frank J. Trelease, *The Model Water Code, the Wise Administrator and the Goddam Bureaucrat*, 14 NAT. RESOURCES J. 207, 208-09 (1974).

32. Trelease, *supra* note 31, at 215; Lynne et al., *supra* note 5, at 348; *see also* Gary D. Lynne et al., *Identifying and Measuring Potential Conflict in Water Institutions*, 26 WATER RES. BULL. 669, 675 (1990) [hereinafter Lynne et al., *Potential Conflict in Water Institutions*]; Gary D. Lynne & Jeffrey Burkhardt, *The Evolution of Water Institutions in Florida: A Neoinstitutionalist Perspective*, 24 J. OF ECON. ISSUES 1059, 1073 (1990); Gary D. Lynne, *Agricultural Water Modeling and Economic Information Needs Under the Model Water Code*, 24 WATER RES. BULL. 95 (1988) [hereinafter Lynne, *Agricultural Water Modeling*].

33. *See* FLA. STAT. § 373.233 (1991).

34. William L. Earl & Thomas T. Ankersen, *Slicing the Water Supply Pie: Competing Applications Under Florida's Water Resources Act*, FLA. B.J., June 1987, at 87, 90.

35. *Id.*

were anticipated in the Code as a part of the state water plan, but the existing state water plan does not include use preferences.[36]

Second, Harper and Ross focus on the reasonable-beneficial use (RBU) standard[37] as it is variously interpreted and applied by the districts to maximize water resource development.[38] They suggest that through detailed water use and management planning, as well as aquifer assessment programs, the reasonable-beneficial use standard "should be a fundamental means of maximizing water resource development and preempting the need to determine, either by hierarchy or criteria, which uses are most in the public interest."[39]

We suggest a third institutional form with an economic point of view. The Florida water institution[40] might more equitably resolve conflict and maximize social benefit in allocating water through a greater consideration and recognition of the economic or scarcity value of water in its various uses. Market principles must be considered. The underlying institution would have to be changed to facilitate implementing such principles.

This article explores the degree to which the Code and the Act address economic efficiency as a criterion in water allocation. We first define economic efficiency. Then, because existing criteria for allocation are based primarily on the reasonable beneficial use (RBU) standard drawn from both eastern and western water law,[41] and since the RBU standard includes the riparian reasonableness

36. THE FLORIDA ADVISORY COUNCIL ON INTERGOVERNMENTAL RELATIONS, FLORIDA'S STATE WATER SUPPLY POLICY: AN EVALUATION OF ITS EVOLUTION, STATUS, AND FUTURE 5 (October 1991) [hereinafter FLORIDA'S STATE WATER SUPPLY POLICY].

37. Section 373.219(1), *Florida Statutes*, provides: "To obtain a permit pursuant to the provisions of this chapter, the applicant must establish that the proposed water: (a) Is a reasonable-beneficial use as defined in s. 373.019(4); (b) Will not interfere with any presently existing legal use of water; and (c) Is consistent with the public interest." Reasonable-beneficial use is defined in section 373.019(4), *Florida Statutes*, as "the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest."

38. *See* Harper & Ross, *supra* note 2, at 69.

39. *Id.* at 70.

40. Institutions are "the rules and conventions that define choice sets from which individuals, firms, households, and other decision-making units choose courses of action." DANIEL W. BROMLEY, ECONOMIC INTERESTS AND INSTITUTIONS 39 (1989). We are not here considering the actual entity, such as a water district or a state agency, as an institution, but rather the underlying laws, rules, and conventions that affect how individuals act. Thus, the Florida water institution as used herein includes the Act, other related legislation, the riparian and prior appropriation doctrines on which the Act is based, case law, the state and district regulations, customary practices of the districts and other agencies, social habits, and custom.

41. MALONEY ET AL., *supra* note 28, at 86-87; *see also* Frank E. Maloney et al., *Florida's "Reasonable Beneficial" Water Use Standard: Have East and West Met?* 31 U. FLA. L. REV. 253, 282-83 (1979) [hereinafter Maloney et al., *Florida's "Reasonable Beneficial" Water Use Standard*]; Harper & Ross, *supra* note 2, at 69.

standard, we also discuss the actual and implied criterion of economic efficiency in prior appropriation and riparian doctrine. We then provide a brief overview of a possible role for cost-benefit analysis and water market processes as new institutions for supplementing the current water valuing process, and thus, facilitating economic efficiency.

II. A BRIEF DEFINITION OF ECONOMIC EFFICIENCY

The concept of economic efficiency was at least an intuitive component of the eighteenth century economist. Accordingly, philosopher Adam Smith incorporated economic efficiency into his concept of the "invisible hand," guiding a myriad of individuals in a voluntary, mutually agreeable exchange. Such a process proves efficient at each step and leads to an efficient allocation of resources through individuals responding to price information. Volitional behavior is the key feature of such a process. As a result, the open unhindered marketplace yielded the greatest good for the greatest number. The philosopher and economist, Vilfredo Pareto further developed this concept of social or universal efficiency, which reflects the efficient coordination of production and consumption so that what is produced depends not only on technology and resource availability, but also on consumer preferences.[42]

As individuals seek to satisfy preferences in a Pareto-efficient manner, all parties benefit by changes in resource allocation or at least no one is any worse off at each change. Society enjoys the maximum welfare at the Pareto-efficient point, otherwise known as an envelope or locus of conditions. No change from that locus is possible without someone or some group losing benefit.[43]

The volitional quality, which is the major strength of such an idealized market process, occurs only because the parties to each transaction freely perceive some advantage resulting from the exchange. The parties directly involved in the exchange may also deem the result to be equitable. In addition, the role of government in such an economically efficient process is minimal, reduced largely to defining property rights and to facilitating free exchange.

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42. ALAN RANDALL, RESOURCE ECONOMICS: AN ECONOMIC APPROACH TO NATURAL RESOURCE AND ENVIRONMENTAL POLICY 93 (2d ed. 1987).

43. Further discussion of this technical concept is offered by most economics texts. *See, e.g.*, RANDALL, *supra* note 42, at 104-05; ROBIN BOADWAY & NEIL BRUCE, WELFARE ECONOMICS 12 (1984).

In practice, financial terms usually assess the extent which each direct participant in a resource transaction gains or loses. Economists often define gains in social welfare by an increase in real aggregate income for the community of interest, whether it be county, state, national, or global.[44] In this perspective, the Pareto criterion of mutual gain means that welfare is increased if the change in a resource allocation makes at least one party or group better off and no one or group worse off by financially compensating their losses.

In more general terms, Pareto efficiency may be interpreted as the tendency of a resource allocation or reallocation toward maximizing the public benefit[45] or the social welfare. Both terms reflect more ethereal characterizations. Additionally, these terms recognize that, although not all objectives and benefits can be measured in financial terms, gains in achieving these objectives can nevertheless be deemed economically efficient.

One way to characterize this more ethereal measure is that financial transactions may or may not accompany preference satisfaction. When preferences are satisfied, mutual gain occurs, and thus economic efficiency--a state of satisfactory social welfare, and public benefit as well. To reiterate, the concept describes a human interaction process of a very special kind. Economic efficiency describes a process entailing volitional behavior with little coercion or control, by government or otherwise. An economically efficient society is a society with considerable freedom to choose.

This idealized concept of the best way to achieve public benefit is not without its problems. Unfortunately, natural resources have some characteristics of common property or have imperfect entitlements or definition of property rights, resulting in losses created by a market transaction which are not recognized in the market. Often there are social costs that do not have a market revealed price or cost, such as pollution or well interference by another pumper. These losses, which are sometimes termed external costs, externalities, or simply social costs, are considered market failures.

Externalities may cause significant losses in welfare, measured in both financial losses and in preferences which are otherwise not being satisfied. When such losses occur, the community as represented by the government may introduce limits, quotas,

44. S.V. Ciriacy-Wantrup, *Concepts Used as Economic Criteria for a System of Water Rights*, 32 LAND ECON. 295, 307 (1956).

45. *See* Frank J. Trelease, *Policies for Water Law: Property Rights, Economic Forces, and Public Regulation*, 5 NAT. RESOURCES J. 1, 3 (1965).

coercive regulation, fees, or taxes to introduce the loss into the social allocation process for that resource. In other words, the community institutionalizes acceptable, or at least preferred, behavior, often through the law. In doing so, the government increases transaction costs and may increase or decrease efficiency. Governments may redefine property rights, thus making the allocation process and the resulting transfers potentially more efficient. Changing the structure of property rights may also elevate the interests of some groups over the interests of others without compensation, consequently making the change in property rights itself inefficient.

The Florida Legislature's enactment of the Act in 1972 redefined water use rights from riparian rights to a different type of common property managed by a comprehensive political administrative permitting system.[46] This institutional change may be interpreted as an attempt to deal with the failure of the riparian doctrine, as well as a quest for the political system to deal effectively with the multiplicity of water related objectives and the externalities of a complex modern society. The social costs of water use were not factored into the decision calculus implicit in unfettered markets.

In general terms, the Act reflects an attempt at a process by which Florida citizens may seek maximum social welfare from water use in its full ethereal sense. Significantly, the authors of the Code and the Legislature saw the economy as a substantial part of that welfare-seeking process.[47] Accordingly, they used rather strong terminology such as "maximum reasonable beneficial use" and "higher value use."

This maximizing criterion has some aspects of the economic efficiency concept. Clearly, it also has roots in the reasonable use aspect of riparian doctrine in eastern water law, and to a lesser extent, in the natural flow portion of that same doctrine. Referring to what became of the Code, as noted by Maloney, "[t]he statute modifies, but does not displace fundamental doctrines of riparianism, such as the reasonable use rule."[48] The Code also includes the beneficial use concept as defined by the western United States prior appropriation doctrine. A further review of

46. Ausness, *supra* note 6, at 557.

47. *See* FLA. STAT. § 373.036(2)(a) (1991); MALONEY ET AL., *supra* note 28, at 74-75; *see also infra* part IV.D.

48. Frank E. Maloney, *A Model Water Use Act for a Riparian State --The Florida Experience, in* CONTEMPORARY DEVELOPMENTS IN WATER LAW 1, 7 (Corwin Waggoner Johnson & Susan Hollingsworth Lewis eds., 1970).

Part II of the Act[49] reveals that the water allocation process as a whole is drawn heavily from riparian and less from prior appropriation doctrine. We now explore both doctrines in terms of their suitability for facilitating economically efficient water allocation.

III. ECONOMIC EFFICIENCY AS A CONCEPT IN THE PRIOR APPROPRIATION AND RIPARIAN DOCTRINES

Our purpose here is to discuss economic efficiency aspects of the two doctrines.[50] Trelease describes "the ultimate goal for water resource law" as providing for maximum benefits from the use of the resource, maximizing the public welfare or benefit from the water use, as distinguished from maximizing the water use itself.[51] He derives this as a corollary from the general goal of all law as described by John Dewey: "a plan for organizing otherwise independent and potentially conflicting energies into a scheme which avoids waste, a scheme allowing a maximum utilization of energy."[52] Implicit in these two statements, the goal of economic or Pareto efficiency, interpreted broadly, is a fundamental element of water law, whether riparian or prior appropriation.

A. Prior Appropriation Doctrine

Economic efficiency is possible under the prior appropriation doctrine because the "first in time, first in right" entitlement provides a secure, well defined property right, especially for senior appropriators. The extent to which efficiency is possible, however, depends on the functioning of a water market or some other Pareto efficient process for transferring these rights. This process requires relatively low transaction costs and an adequate number of buyers and sellers.[53] The fact that not all states with prior appropriation market water suggests that economic efficiency does not necessarily follow from the mere existence of prior appropriation.

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49. FLA. STAT. § 373.203-373.49 (1991).

50. For detailed discussions of prior appropriation and riparian doctrines, see JOSEPH SAX & ROBERT H. ABRAMS, LEGAL CONTROL OF WATER RESOURCES: CASES AND MATERIALS chs. 2, 4 (West 1986).

51. Trelease, *supra* note 45, at 2-3.

52. *Id.* at 3.

53. Stuart H. Burness & James P. Quirk, *Appropriative Water Rights and the Efficient Allocation of Resources* 69 AM. ECON. REV. 25-37 (1979). Noteworthy is the need for large numbers of buyers, sellers, and transactions in order to have efficient water markets.

A prior appropriation right is generally a consumptive use right. Historically, the water was not even considered to be appropriated, and therefore, no right existed until the water was diverted from the stream and applied to a beneficial use defined largely by the user. Only in recent years have most prior appropriation states recognized instream uses as beneficial.[54]

The beneficial use criterion came to be applied in order to prevent waste. In most western states, it is embedded in a hierarchy of legislatively preferred uses and specific uses which are determined to be beneficial by permitting agencies and the courts on a case-by-case basis.[55] Beneficial use is generally construed as an activity which produces some measurable benefit or income to the user and is consistent with customary local water use methods, thus attaching a limited standard of reasonableness to the use.[56] As applied by the courts, the beneficial use criterion does not preclude inefficient use of the water, and it has been ineffective in preventing water waste in the arid western states.[57] This inefficiency may be due to the lack of water markets, specifically, the inability to sell conserved water in most states.

The beneficial use criterion is not comparative in defining whether or not a use is beneficial. No consideration, therefore, is given to the economic productivity of potential alternative uses. The main concern is the benefit to the user.[58]

B. Riparian Doctrine

In contrast to the western prior appropriation law that developed since the California gold rush of the mid-nineteenth century, riparian law represents centuries of evolving English common law and almost two hundred years of application and modification in the eastern United States. Under the "ancient-use" or natural flow doctrine of the pre-industrial revolution, medieval England protected accustomed uses[59] of surface waters such as the domestic supply, fishing, transportation, and the limited mill

54. SAX & ABRAMS, *supra* note 50, at 318-19, 330.

55. Mark W. Tader, Note, *Reallocating Western Water: Beneficial Use, Property, and Politics*, 1986 U. ILL. L. REV. 277, 280.

56. *See* MALONEY ET AL., *supra* note 30, at 226.

57. Steven J. Shupe, *Waste in Western Water Law: A Blueprint for Change*, 61 OR. L. REV. 483, 483-84 (1982); *see also*, Tader, *supra* note 55, at 282-83.

58. Tader, *supra* note 55, at 282-83.

59. Accustomed uses refers to those which existed for a prescriptive period of about a generation. *See* Carol M. Rose, *Energy and Efficiency in the Realignment of Common-Law Water Rights*, 19 J. LEGAL STUDIES 261, 268 (1990).

power,[60] thus, reflecting "the traditional English view of flowing water as an amenity and not as an instrument of national development."[61] In effect, the natural flow doctrine insured that waters would not be damaged and that all uses were sustainable. These goals were quite reasonable, given that the landed gentry were allowed to continue using the water. With relatively low economic activity at the time and with plentiful rainfall characteristic of the British Isles, little surface water was diverted for any economic purposes and use conflicts centered on instream issues.

In the few cases of conflict, new uses which disturbed accustomed uses were subject to compensatory claims[62] and provided the opportunity for a Pareto-efficient condition of mutual gain or at least no losses. Thus, the ancestral common law implicitly recognized a criterion of economic efficiency.

The industrial revolution in England brought the need to use flowing streams for power and to otherwise use water as an important factor in actual production as well as an instrument for economic growth. The application of the law had shifted under the influence of William Blackstone in the mid-eighteenth century toward an "occupancy" doctrine, the basis of prior appropriation in the western states a century later, which was applied in early eastern United States water cases.[63] In the early nineteenth century, the United States abandoned occupancy as the streams of the industrializing northeast became increasingly congested with mills. The law was viewed as inflexible and unable to resolve multiple party conflicts with high transaction costs.[64]

The correlative rights doctrine of reasonable use was originally cited in *Tyler v. Wilkinson*,[65] a New York case decided in 1827 by Judge Story.[66] Judge Story reaffirmed the reasonable use approach in the 1838 case of *Webb v. Portland Manufacturing Co.*,[67] and the two cases propelled the doctrine of reasonable use into the American standard for water law.[68]

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60. *Id.*

61. Robert H. Abrams, *Charting the Course of Riparianism: An Instrumentalist Theory of Change*, 35 WAYNE L. REV. 1381, 1392 (1989); *see also*, SAX & ABRAMS, *supra* note 50, at 159.

62. Rose, *supra* note 59, at 274-77.

63. *Id.*

64. *Id.* at 282-83.

65. 24 F. Cas. 472, 474 (C.C.D.R.I. 1827) (No. 14, 312).

66. *See* Joseph L. Sax, *The Constitution, Property Rights and the Future of Water Law*, 61 U. COLO. L. REV. 257, 268 n.32 (1990); Rose, *supra* note 59, at 285-87.

67. 29 Fed. Cas. 506 (C.C.D.M.E. 1838).

68. Rose, *supra* note 59, at 286.

The reasonable use version of the riparian doctrine evolved in Britain during the next twenty-five years. The courts recognized the need for a doctrine that would maximize the total social value of the use of the river as a nonconsumptive common property resource,[69] and returned to the concern for mutual gain expressed in the natural flow doctrine. Western prior appropriation doctrine, on the other hand, evolved around uses that were consumptive in nature, focused on the benefit to the individual user rather than to the welfare of society as a whole, and required a high degree of security of tenure.

The new reasonable use concept facilitated moving water from lower to higher productivity uses, which was largely the reason behind moving away from both the natural flow and occupancy ideas. The switch favored the new and rising entrepreneurial class in both England and the United States during and after the industrial revolution. Use had to be reasonable, and everyone gained a correlative right.

This change favors the notion that water law can be described through an "instrumentalist" theory in which "water law is crafted in a manner that permits society to make an effective use of the resource, *i.e.*, in a manner in which water serves as an instrument for the improvement of man's physical and economic welfare."[70] In other words, by this theory the law is modified toward Pareto-efficiency by a judicial process which seeks to maximize human welfare over time. By definition, however, this may not be possible due to the need for free interaction among many individuals rather than only a few.[71] Riparian law, through the reasonable use criterion in particular, is a comparative system that seeks to maximize the value of the use of the waterway by allowing the transfer of the water use right to new and higher value uses.[72] The deficiency in property entitlements, the uncertainty of the case-by-case reasonable use definition, and a lack of transferability preclude the functioning of a water rights market under riparian law.[73] Many scholars of eastern water law advocate improving the transferability of riparian water use rights

69. *Id.* at 287; Abrams, *supra* note 61, at 1392.

70. Abrams, *supra* note 61, at 1385-86.

71. *Id.* at 1396; Sax, *supra* note 66, at 268-69.

72. *See* Abrams, *supra* note 61, at 1396.

73. *See generally* Lynda L. Butler, *Allocating Consumptive Water Rights in a Riparian Jurisdiction: Defining the Relationship Between Public and Private Interests*, 47 U. PITT. L. REV. 95 (1985).

in order to enhance the potential for achieving economic efficiency in the application of water resources.[74]

The Restatement (Second) of Torts, provides a modern guide while describing reasonableness as depending on consideration of the relative economic and social values of water uses, as well as compensation by the user causing harm to another user.[75] In other words, strong elements of the definition of reasonable use and reasonableness are:

(1) the determination of the more economically productive water use,
(2) the determination of the use which will provide the higher social benefit, and
(3) in the provision for compensation to a water user who is harmed, the requirement for mutual gain or at least that no one is worse off as a result of the resource transfer, a precept of Pareto efficiency.[76]

Thus, the definition of reasonable use under the riparian institution includes a mandate for the increasing economic efficiency of water use in a Pareto-efficient process over time.[77]

Therefore, we may conclude that:

(1) the riparian doctrine has as its basis an intent to maximize the social benefit of the use of a water resource through an economically efficient allocation, and
(2) the evolved definition of the reasonable use and reasonableness criteria lead to the comparative selection of the highest valued uses of the resource.[78]

"The major advantage of this [reasonable use] theory is that it tends to promote the beneficial use of water resources."[79] Further,

74. *See, e.g.*, Abrams, *supra* note 61; Ausness, *supra* note 6; Butler, *supra* note 73; Sax, *supra* note 66.

75. RESTATEMENT (SECOND) OF TORTS § 850A cmt. a (1979).

76. *See supra* note 42 and accompanying text.

77. *See* MALONEY ET AL., *supra* note 30, at 230.

78. For a history of the evolution of the reasonable use standard, see SAMUEL C. WIEL, 1 WATER RIGHTS IN THE WESTERN STATES §§ 745-50 (1911).

79. RESTATEMENT (SECOND) OF TORTS § 849 note (1979).

the reasonable use standard "embrace[s] the rights" of the general public.[80]

IV. THE CRITERION OF ECONOMIC EFFICIENCY IN THE FLORIDA WATER RESOURCES ACT

A. Legislative Change of Water Use Entitlement

The passage of the Act was in part a response to hydrologic information and in part a politically induced shift in water use entitlement from a common law riparian doctrine to a political-administrative comprehensive permit system based on the Code.[81] The resulting change in the character of property rights modified a structure of relative privilege of water use accorded to landowners/withdrawers and the limited or lack of rights of the general public. This structure works with a structure of relative rights of the public represented by government agencies and a duty by current and prospective water users to meet the rules of the agencies.[82]

The shift in water use rights from individual user privilege to public/state right and user duty also shifted economic emphasis.[83] As previously stated, while the riparian doctrine has historically facilitated a definite movement toward maximizing the total water value in use, movement in that direction occurred as a result of judicial action resulting from intensifying conflict between water users.[84] In the riparian doctrine, the possibility of an economically efficient solution existed between two competing users when there was the potential for compensation to the existing user harmed by the new user.[85]

The change in property rights has increased the focus on maximizing the social benefit of water use. It has also improved the potential for allowing directed and deliberative processes to maximize the value of water use. This creates a more dynamic institution than is possible through the courts.[86] This new process also has the benefit of expanded and enhanced availability of technical information. It is not entirely clear, however, that sufficient attention has been paid to the notion of valuing and

80. MALONEY ET AL., *supra* note 30, at 230.

81. Ausness, *supra* note 6, at 557.

82. *Id.* at 582.

83. See BROMLEY, *supra* note 40, at 44-46, 154-75, for discussion of the right/duty correlate, and for the impact of changes on economic behavior.

84. *See, e.g.*, Rose, *supra* note 59, at 276-77.

85. RESTATEMENT (SECOND) OF TORTS § 850 cmt. b (1979).

86. MALONEY ET AL., *supra* note 28, at vii.

compensation, the two key components of mutual gain in the process dynamics.

Economic efficiency by inference is a significant component of the maximum social benefit criteria of the Act and of the Florida water institution generally.[87] In fact, for the past twenty years, the Florida water allocation institution has contained an implicit and largely unrecognized allocation criterion for economic efficiency in water use.

Since the early 1950s, the momentum for modification of Florida riparian water law had been building. The Florida Water Resources Act[88] provided an opportunity for hydrologically bounded water districts and a passive rather than coercive permitting process,[89] but the law was never fully implemented. As a result of water withdrawal conflicts between St. Petersburg and Hillsborough County beginning in 1961, however, one water conservation district was formed in 1968.[90] "Experts began to conclude that water regulatory districts . . . should be established on a statewide basis."[91] With this concern in mind, a group led by Frank Maloney at the University of Florida Holland Law Center began work on the Code.[92] The urgency of conflicts created by a two-year drought in 1970 and 1971 so moved the Florida Legislature that it drafted the 1972 Act based on galley proofs of the Code.[93] There is no written record of legislative or committee discussion of the bill and no legislative context with regard to the Act's implementation,[94] other than that implied by the authorization of funding, or lack thereof, for specific portions.[95]

In the absence of documented legislative intent, and with limited supporting case law interpreting the Act, we must rely on the commentary of the Code and on publications by the drafters of the code for the definition of terms and the interpretation of intent.[96] In turn, where the Code is vague, inconsistent, or

87. *Cf.* FLA. STAT. § 373.019(4) (1991) (defining reasonable-beneficial use).

88. Ch. 57-380, § 8, 1957 Fla. Laws 855, 858-59.

89. MALONEY ET AL., *supra* note 30, at 206-07.

90. *Id.*

91. *Id.* at 207.

92. *Id.*

93. Letter from Richard Hamann to Phyllis Saarinen and Gary Lynne (Apr. 1992) (on file with authors); *see also* Richard G. Hamann, *Consumptive Water Use Permitting, in* 1 FLORIDA ENVIRONMENTAL AND LAND USE LAW ch. 10 (Mar. 1991).

94. Susan L. Fleming, *Water Allocation: The Reasonable and Beneficial Use Standards*, 53 FLA. B.J. 25, 28 (1979).

95. For example, a comprehensive state water use plan as visualized in the Model Water Code and specified in section 373.036, *Florida Statutes*, has not yet been realized. *See* MALONEY ET AL., *supra* note 30, at 217.

96. *See* Maloney, *supra* note 48, at 1-6, 25-26; MALONEY ET AL., *supra* note 30, at 230; *see generally* MALONEY ET AL., *supra* note 28.

deficient, we must turn to the riparian law as it has been adjudicated and interpreted in Florida and in other eastern states.

The Florida Supreme Court first recognized the doctrine of riparian rights in 1896 in *Tampa Waterworks v. Cline*,[97] and applied the doctrine in 1950 in *Taylor v. Tampa Coal Co.*[98] Additionally, the Florida Supreme Court cases invoked a reasonable use rule for groundwater similar to that for riparian rights in *Cason v. Florida Power Co.*[99] and *Koch v. Wick*.[100]

B. The Reasonable-Beneficial Use Standard

The central tenet of the allocation process is section 373.223, *Florida Statutes*:

> (1) To obtain a permit pursuant to the provisions of this chapter, the applicant must establish that the proposed use of water:
>
> (a) Is a reasonable-beneficial use as defined in s. 373.019(4);
>
> (b) Will not interfere with any presently existing legal use of water; and
>
> (c) Is consistent with the public interest.[101]

Reasonable-beneficial use (RBU) is defined in section 373.019(4), *Florida Statutes*:

> "Reasonable-beneficial use" means the use of water in such quantity as is necessary for economic and efficient utilization for a purpose and in a manner which is both reasonable and consistent with the public interest.[102]

Although reasonable use and beneficial use are both well established and well defined criteria in both riparian and prior allocation doctrine, the Code commentary describes reasonable-beneficial use as a "term of art" not to be confused with either the riparian or prior appropriation criteria.[103] The term "includes the standard of reasonable use but it also requires efficient economic use of water, a characteristic of beneficial use."[104]

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97. 20 So. 780 (Fla. 1896).
98. 46 So. 2d 392 (Fla. 1950).
99. 76 So. 535 (Fla. 1917).
100. 87 So. 2d 47 (Fla. 1956).
101. FLA. STAT. § 373.223(1) (1991).
102. FLA. STAT. § 373.019(4) (1991).
103. MALONEY, ET AL., *supra* note 28, at 86.
104. *Id.*

While stated to be a term of art in the commentary, the intent of the term is clearly specified by Maloney in an earlier writing before the passage of the 1972 Water Resources Act:

> The drafters' proposal . . . encompasses both the beneficial use standard and the reasonable use theories. The beneficial use standard serves to cut off waste by individual users, while retention of the reasonable use theory allows the water management district to prefer more productive over less productive uses. The reasonable use theory alone would not be as effective in stopping waste, while the beneficial use standard alone would allow the perpetuation of outmoded uses.
>
> There is yet another reason for adopting the beneficial use test. In reviewing applications for permits, the water management district has more leverage when it can consider the economy and efficiency of the applicant's proposed use, as well as its reasonableness with respect to the needs of other users, than it would have were it to rely solely on the latter test. This should prove especially helpful in the case of a lawsuit over the denial of a permit.[105]

In economic terms, the intent of the beneficial use criterion is to prefer the lowest of all possible average costs products, for example the drafters' concern for economy and efficiency.[106] To be permitted, users are required to install appropriate technology.[107] In the reasonable use criterion, water is to be moved to higher valued, more productive uses that would just naturally occur in a market economy, at least for those uses that can be valued appropriately in dollar terms. In narrow economic terms, profits and wealth gains from water must be sought, and possibly even maximized. In broad socioeconomic terms, social welfare is also to be sought, including nonmonetary values of water.

Maloney notes in his discussion leading to his presentation of the essence of the Code the need to address "preservation of minimum flows and minimum levels of lakes and groundwater."[108] While he clearly envisions withdrawals for both natural and artificial purposes, the discussion suggests that artificial withdrawals

105. Maloney, *supra* note 48, at 20. The key features of the Code were eventually drawn together to create the 1972 Act. Ausness, *supra* note 6, at 557.

106. MALONEY ET AL., *supra* note 28, at 171.

107. *Cf.* FLA. STAT. § 373.413 (1991).

108. Maloney, *supra* note 48, at 5. Noteworthy is Maloney's concern over excessive drainage and with "excessive withdrawals of water in some localities exceeded or threatened to exceed natural replenishment, and as a result continuance of the supply was jeopardized by salt-water intrusion and other problems." *Id.* at 3. Clearly public goods are of concern in the Code.

must be limited. In addition, a certain minimum level and flow should be maintained in perpetuity.

Unfortunately, the terminology in the commentary on these matters is confusing. The way the terms "economic and efficient utilization" and "efficient economic use of water" are used have no particular meaning in and of themselves in economics. We have to depend on the clearest statement by Maloney which suggested that "economic and efficient utilization" might be interpreted to mean cost-effective.[109] We also suspect "efficient economic use" is intended to mean the same thing, but it could also mean maximum profit and value generated from the use, which is also a partial intent of reasonable use in the riparian doctrine. Maloney states that the authors of the Code intended the RBU standard "to include a standard of reasonable use which embraced the rights of the general public as well as the rights of riparians and to require *efficient economic* use of water regardless of the sufficiency of available water."[110] This interpretation is more consistent with the cost-effective notion.

Some further clarification is provided in a later paper by Maloney and his colleagues:

> If the sentence defining 'reasonable beneficial use' . . . were broken up into its component parts the resulting list of factors . . . would bear a striking resemblance to the key words in the Restatement (2D)'s list of factors. This resemblance is consistent with and lends further support to the conclusion that the legislature intended to employ the term 'reasonable' use in its technical sense, pregnant with common law factors . . . .[111]

This would appear to confirm the intent of the Code's authors, and thus the Act, to go beyond just cost effectiveness and also to include the mutual gain/maximizing social benefit characteristics of riparian reasonable use doctrine. Elsewhere in the same article, however, the opportunity for economic efficiency is seemingly explicitly denied with the repetition of a statement which appears in the Code commentary: "The (RBU) standard would not require that a valid use be the most economical use but would require that the method of use be economically efficient."[112] This statement is patently contradictory when the referential content of these terms in economics is applied.[113]

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109. MALONEY ET AL., *supra* note 28, at 86-87.

110. MALONEY ET AL., *supra* note 30, at 230 (emphasis added) (footnote omitted).

111. Maloney et al., *Florida's "Reasonable Beneficial" Water Use Standard*, *supra* note 41, at 256 n.21.

112. *Id.* at 269.

113. *Id.*

Confusion regarding the meaning of economic efficiency is evident in Maloney's discussion of the Code[114] in which Trelease is cited as having "concluded that courts adopting the 'reasonable beneficial use' approach have assessed 'the economic relativity of specific uses and the comparative benefits to be realized from different, competing uses.'" Professor Trelease again suggests economic efficiency as necessary for maximizing social welfare. Additionally, the second listed author of the Code, Richard Ausness,[115] criticizes the lack of provision for economic efficiency and fairness in eastern water permit legislation, including that of Florida.

The commentary includes a more extensive but still somewhat muddled discussion of the RBU standard.[116] It points out two aspects as "best features" of reasonable use and beneficial use rules. First, "the quantity of water used must be efficient with respect to the use itself."[117] This is a description of irrigation efficiency for agriculture or distribution efficiency for municipal uses. It is not a test of economic efficiency as the commentary would have it. As used here, the term economic efficiency reveals that the authors do not fully understand it in the context of the discipline of economics.[118] Further, the example of use efficiency in which it is considered efficient to reduce total production costs by doubling water use assumes water is infinitely abundant to meet every possible need for the future.[119] This approach may prove cost-efficient to the user, but it is economically inefficient because it ignores the scarcity value of water. The commentary adds: "this part of the reasonable-beneficial use test allows only that quantity of water to be used as is necessary for an economically efficient operation. The value of the use itself in relation to other uses is not considered initially."[120]

Without further explanation, the word "initially" as used opens the door to future concerns. When *is* the relative value of the uses to be considered? From an economic viewpoint, the relative value

114. *Id.* at 270. *See generally* Frank J. Trelease, *The Concept of Reasonable-Beneficial Use in the Law of Surface Streams*, 12 WYO. LAW J. 1 (1957).

115. Ausness, *supra* note 6, at 576-77.

116. MALONEY ET AL., *supra* note 28, at 170-73.

117. *Id.* at 171.

118. "A well recognized canon of statutory construction requires that legal terms used in a statute are to be given their technical meaning unless the contrary plainly appears to have been intended by the legislature." Maloney et al., *Florida's "Reasonable Beneficial" Water Use Standard*, *supra* note 41, at 276. Conceivably, significant terms with specific meanings in other disciplines would also receive their generally recognized and technical meanings and those who use such terms would understand their meanings.

119. *See* MALONEY ET AL., *supra* note 28, at 171.

120. *Id.*

is considered when water is recognized as scarce, or when the water management district must address competing applications. At that point, economic efficiency in comparative terms, as an economist would define it, becomes part of the RBU criterion. Some regions of the state have been at that point for several years. If a water management district chooses, under current law, an administrator could determine the value of the allocation with incomplete and imperfect information in a limited, imperfect, status quo biased cost-benefit analysis.

The information problem in water management is fundamental and it has several dimensions.[121] While the districts have to varying degrees compiled reliable hydrologic descriptions of Florida's aquifers, the state's primary water source, little information is available describing the value of water over alternative spatial and temporal uses which would be necessary for a reconciliation of demand and supply by an administrative decision maker.[122] Thus, the district administrators and governing board members are all in the uncomfortable and inescapable position of having to represent the ethical and economic values of all persons who will be affected by the decision, present and future. In addition, administrators and boards are making an assessment of hydrologic uncertainty of water quality and availability for present and future populations.

Also, the decision is based on assumptions of impacts on ecological systems and interdependent water systems as well as the value society assigns them. It seems unlikely that even a knowledgeable and well meaning water management district employee or board member will be able to make a decision with a Pareto-efficient outcome, and this decision-making does not meet the criteria for a Pareto-efficient process of mutual gain.[123] A few people simply cannot know all the relevant social value information. Value evolves over time, in a complex interaction among all affected parties, including but not limited to district staffs and governing boards.

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121. *See generally* ASIT K. BISWAS, SYSTEMS APPROACH TO WATER MANAGEMENT 1-14 (Asit K. Biswas ed., 1976).

122. Lynne, *Agricultural Water Modeling*, *supra* note 32.

123. We note, however, that implicit criteria for economic efficiency may be embedded in technical standards adopted by the management districts as a part of their RBU definition, such as the "two in ten" year drought agricultural withdrawal criterion. The social constructs of district board members and staff as members of a western democratic culture probably include a high value for mutual gain in their decisions as does the process of debate and interaction through which the boards make decisions. To the extent that the water allocation process involves everyone in noncoerced interaction about what is valuable, arguably the process is Pareto-efficient.

The second aspect of the "best features" of reasonable use and beneficial use rules described in the commentary is the requirement that "the purpose be reasonable in relation to other uses. This criterion does not require that the use be the most economical use of water possible, but only that the use not be detrimental to other users . . . ."[124] If the reasonable use definition is taken from riparian law, as was stipulated in the commentary,[125] then it includes a strong element of economic efficiency, particularly when the resource is scarce; that is, reasonable use includes a criterion that the use to which water is allocated should represent an improvement in the total economic or social value of the community. Therefore, a discrepancy exists among the statement in the commentary that reasonable use does not mean that the use must be the most economical possible, the underlying, evolving riparian definition of reasonable use, and the goal of maximizing social benefits of the use of water.

In summary, and with the hope of reducing confusion regarding economic efficiency in the Code and the Act, a three pronged concern must be addressed: (1) insure long-term integrity of the hydrologic system and related ecosystems (themes reminiscent of natural flow theory); (2) induce water users not to waste water by using cost-effective technology (beneficial use criterion); and (3) insure that unproductive, low valued uses are discouraged in favor of higher valued, more productive uses (reasonable use criterion). "Low value" and "high value" uses are not limited to dollar representations of water's value, but neither are monetized versions of value excluded.

In passing, the following observations are noteworthy: (1) long term sustainability of the hydrologic and related ecosystem is necessary to a viable economy; (2) coerced investment is inconsistent with such an economy, but rather water users should have volition and incentives to adopt water saving technologies; and (3) the freedom of thousands of individuals to choose how water will be used over and above minimum water levels for resource sustainability purposes is the economic interpretation of reasonable use. From an economic view, only individuals can possibly know low as compared to highly productive uses because value evolves in a process of free interaction among these individuals. The latter point proves especially salient with respect to competing applications.

124. MALONEY ET AL., *supra* note 28, at 171.
125. *Id.* at 86.

C. *Competing Applications*

The Act addresses allocation under scarcity in section 373.233, *Florida Statutes*:

> (1) If two or more applications which otherwise comply with the provisions of this part are pending for a quantity of water that is inadequate for both or all, or which for any other reason are in conflict, the governing board or the department shall have the right to approve or modify the application which best serves the public interest.
>
> (2) In the event that two or more competing applications qualify equally under the provisions of subsection (1), the governing board or the department shall give preference to a renewal application over an initial application.[126]

The test for allocation under scarcity conditions operates in a political process, depending on an interpretation of water value and of the public interest, by a district staff and board. The interpretation may be modified over time by case law established through challenges. The commentary on competing applications, while admitting vagueness, directs the governing board to consider relative benefits to the public and suggests that economically more productive uses should be preferred without providing direction for how to determine those uses.[127] Through some process, the board discovers how thousands of users value water *ex ante*, or before the water is actually put to productive use, which in principle is impossible. One might also interpret the charge to these boards as conducting a cost-benefit analysis, although this is not specified and apparently has not been used by any of the water management districts for deciding on water allocations.

The State Comprehensive Plan of 1985 declares a goal for water resources: "Florida shall assure the availability of an adequate supply of water for all *competing uses* deemed reasonable and beneficial . . . ."[128] Importantly, compensated transfer of water in an open market serves as the only possible way to insure an adequate supply of water for all competing uses for a less than infinite quantity of water. Again, the reason rests in the character of the human valuing processes: values evolve through time in a process of human interaction, possibly through markets, or through a more generalized political process. In principle, it is

126. FLA. STAT. § 373.233 (1991).
127. MALONEY ET AL., *supra* note 28, at 188.
128. FLA. STAT. § 187.201(8)(a) (1991).

impossible to know value *ex ante*, as the Code expects of the districts and boards, or *ex post*, as riparian law asks of the court system. The economic view suggests that value must evolve *in process, through time*; it cannot be known before the fact, and has little meaning after, as it continues to evolve.

If the denial of permit renewal occurs due to a preference decision by the district board in accordance with section 373.233, *Florida Statutes*, for a use which is deemed more valuable, then riparian doctrine and economic efficiency would indicate that the new user should compensate the displaced user. Allowing the voluntary compensated transfer of permits among users would provide flexibility in response to changing economic conditions. The district may also occasionally enter such a market. If denial occurs because of a public interest requirement to protect the condition of the water resource or the ecology dependent upon it, then the public, in the form of the water management district, should compensate the displaced user in order to meet the win/win condition of the criterion for economic efficiency.

D. Specific Use of Terms for Economic Efficiency

Two final points regarding the economic efficiency or Pareto-efficient requirements of the Code and the Act are noteworthy. First, the term "maximum reasonable-beneficial use" is used to describe an area of consideration of the state water use plan. Specifically, in the formulation of the plan objectives include "[t]he attainment of maximum reasonable-beneficial use of water."[129] "Maximum reasonable-beneficial use" implies a goal of maximum social welfare from the use of water or at least economic efficiency in its various uses. Moreover, in their commentary, the authors of the Code discuss the importance of transferring water to increasingly more economically productive and efficient uses in order to improve public welfare.[130] "Long-range plans must not only anticipate such changes in water use patterns, but must actually induce transfers to higher value uses."[131] Further, they note that "water resources management, . . . includes . . . reallocation of water to more productive uses."[132]

Second, in an interpretation of the Act by an author of the Code, "[t]he specific purposes sought to be achieved by the Florida Water Resources Act . . . express legislative intent *to realize the full*

129. FLA. STAT. § 373.036(2)(a) (1991); MALONEY ET AL., *supra* note 28, at 9.
130. MALONEY ET AL., *supra* note 28, at 74-75.
131. *Id.* at 75.
132. *Id.* at 74.

beneficial use of the waters of the state."[133] We believe this statement mandates an allocation process which has as an outcome the economically efficient use of water.

Clearly, an awareness exists in the Code and the Act of the importance of improving the economic productivity and the value of water use over time, in order to maximize the social benefit of water use. While the issue is not addressed clearly, it is nonetheless definitely a criterion for water allocation under the Florida Water Resources Act.

V. TWO OPTIONS FOR MOVING TOWARD ECONOMIC EFFICIENCY IN WATER ALLOCATION

To supplement the present water valuing process, two approaches must be explored that move toward efficiency in water allocation. First, this part examines the role of cost-benefit analysis in determining efficient water resource allocations. Second, the part focuses on the impact of open water markets in water use entitlements on the current valuing process.

A. Cost-Benefit Analysis

Cost-benefit analysis was developed in the administration of the Federal Flood Control Act of 1936 and has since served as a source of debate in the economics discipline.[134] Some believe the technique can isolate and ultimately select economically efficient resource allocations.

Trelease suggests that cost-benefit analysis of proposed allocations can cause movement toward economic efficiency.[135] Similarly, the Code commentary specifies that for competing applications the more economically productive use should be preferred, suggesting a cost-benefit analysis.[136] Although not mentioned in either, it is reasonable to assume that what is proposed is to compare cost-benefit analyses (net present values) of competing applications in order to allocate the water to the highest value use.

While such an approach may result in some efficiency for the outcome of each comparison exercise, it does not account for the need for a highly interactive, moving, or dynamic process for all

133. Maloney et al., *Florida's "Reasonable Beneficial" Water Use Standard*, *supra* note 41, at 277 (emphasis added).

134. MAYNARD M. HUFSCHMIDT ET AL., ENVIRONMENT, NATURAL SYSTEMS, AND DEVELOPMENT 3 (1983).

135 Trelease, *supra* note 45, at 12.

136. MALONEY ET AL., *supra* note 28, at 188.

comparisons over time or for the change in social relations (distribution of wealth and power) resulting from the allocation or reallocation of water. The very concept of economic efficiency hinges upon thousands of freely choosing individual entities interacting in markets for mutual gain, or other efficient processes, *through time.* Thus, cost-benefit analysis *at some point in time* can give only some indication of possible relative values that might evolve in a market process over time. Of even more concern, a cost-benefit analysis tends to preserve the status quo because it uses prices and values from a past period of time to suggest how the future should appear.

The cost-benefit approach does not, then, recognize the dependence of the future on decisions made today. In other words, the welfare of the next generation is assumed to be independent of the decisions of the present generation. Thus, the highest priority is given to those projects which provide the greatest net present valued economic payoffs as valued by those now living, not to those which provide for the greatest benefit over the longest time period. Some attempts have been made to overcome this shortcoming.

The Krutilla-Fisher model, as modified by Porter,[137] attempts to address temporal effects beyond the traditional discount rate. The model includes as a variable the flow of foregone real net preservation benefits and as parameters the rate of decay of development benefits, the rate of growth of preservation benefits, and the social rate of discount or time preference in addition to the opportunity cost of capital habitually used as the discount rate.

Performed in a manner that would improve community welfare toward the maximum social value, an analysis using the Krutilla-Fisher model would prove highly complex, involving not only the net present value of the competing uses, but also opportunity costs, dependent biosystem values, effects on resource integrity, extensive secondary benefits in backward and forward economic linkages, social costs of displacement,[138] and marginal user costs. Further, such an analysis would introduce a market-monetary bias that discounts nonmarket and nonmonetary

137. Richard E. Porter, *The New Approach to Wilderness Preservation through Benefit-Cost Analysis* 9 J. ENVTL. ECON. & MGMT. 54 (1982).

138. Victor Brajer and Wade E. Martin, *Water Rights Markets: Social and Legal Considerations,* 49 AM. J. ECON. & SOC. 35 (1990).

aspects[139] and results in an intangible cost of creating involuntary "have nots" in water use.[140]

Adopting any cost-benefit approach invokes the "moral poverty of discounting"[141] and asserts the privilege of the present over the interests of the future. Perhaps minimizing maximum regret would prove a better approach to representing the interests of the future.[142] In any case, applying new judicially and empirically untested techniques would make the process vulnerable to challenge. The cost-benefit method most likely to be accepted would not address social, resource, and intergenerational equity issues. The goal of maximizing social benefit would not be realized.

B. Open Water Rights Markets

Many prominent resource economists argue for markets in water use entitlements.[143] Under the theory of competitive markets, economic efficiency in water use would be achieved such that the marginal value product of water is equal across all uses and their ratios equal to the marginal rate of substitution of the consumers.[144] That is, the value of each unit of product made by the most recent gallon of water applied in all uses is equal for all products, resources, and services.[145]

Needless to say, these idealized, perfectly competitive markets do not exist nor does the equilibrium position of efficiency. Rather, because we are dealing with an imperfect world with imperfect information quite different from the theoretically perfect competitive market, the theory of markets provides only a starting framework that acts as a guide toward improving efficiency and social welfare. In the markets for water rights that operate in the western United States, several significant issues have become apparent: resource integrity (quantity and quality issues), third

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139. Bromley, *supra* note 40, at 22-23.

140. C. Dirck Ditwiler, *Water Problems and Property Rights--An Economic Perspective*, 15 NAT. RESOURCES J. 663, 678 (1975).

141. Dan W. Bromley, *Entitlements, Missing Markets, and Environmental Uncertainty*, 17 J. ENVTL. ECON. & MGMT. 181, 183 (1989).

142. *Id.* at 190

143. *See, e.g.*, TERRY ANDERSON, WATER CRISIS: ENDING THE POLICY DROUGHT 5-9 (1983); Charles W. Howe et al., *Innovative Approaches to Water Allocation: The Potential for Water Markets*, 22 WATER RESOURCES 439 (1986); BONNIE SALIBA & DAVID B. BUSH, WATER MARKETS IN THEORY AND PRACTICE: MARKET TRANSFERS, WATER VALUES, AND PUBLIC POLICY 12-14 (1987).

144. L.M. Hartman & D.A. Seastone, *Efficiency Criteria for Market Transfers of Water*, 1 WATER RESOURCES RES. 165, 167 (1965).

145. The water uses vary from growing strawberries, oranges, or green lawns to producing fertilizer or cleaning cars.

party effects (losses to local economies and community values), distributional equity, intertemporal equity, and biosystem values. Several western states have addressed these issues through legislated adjustments in water law and imposed central permitting requirements. Pro-marketers argue these externalities arise from imperfect property rights and can be corrected by restructuring the rights;[146] others see increasing transaction costs as a means by which society addresses the issues.[147]

VI. CONCLUSION

The Florida Water Resources Act, supported by the Model Water Code and commentary, and the economic efficiency criterion of the reasonable use definition of the riparian doctrine together provide a criterion for relative economic benefit or economic efficiency in the water allocation law in Florida. Nevertheless, at least two reasons exist for why it is not possible to include relative economic benefit as an allocation criterion under the existing interpretation of Act and the policies and regulations of the water management districts.

First, the information required to determine relative economic value and its application in an allocation process is far beyond the capacity of a central agency to collect and use effectively, as it was for the courts under the previous water law. The reality of the information problem in an economy has become clear with the collapse of the central planning systems of eastern Europe and the Commonwealth of Independent States, due in large part to faulty information, control of information, and largely inadequate ways for evolving value information. Relative value of water uses can be determined only through a highly interactive process of voluntary exchange among thousands of water users. A water staff, governing board, and consultants cannot set beforehand the value of the permit and the water. Rather, value evolves in a process of negotiating many transactions among many parties. The value of the permit at any point in time would differ by location, season, water quality, water yield, well depth, alternative productive uses, market interest rate, energy costs, tomato yields in Mexico, demand for water in Florida's tourist industry, citrus crop solids imported from Brazil, and Tropicana's advertising budget, to list just a few factors. An individual would bring a set of information about these factors to the water market. Such factors can only be resolved where voluntary transfers are possible,

146. ANDERSON, *supra* note 143, at 70-71.
147. SALIBA & BUSH, *supra* note 143, at 200.

and cannot be determined by a central administrator or by the courts.

Second, economic efficiency, achieved through a process of mutual gain or win/win results, cannot exist in an allocation process based on relatively short duration permits, or those less than the life of the investment, with no compensation for nonrenewal of a permit. The Code commentary describes a maximum twenty-year permit as being long enough to "at least partially" amortize capital investment,[148] with apparently no concern for the injustice of allowing a business only partially to recover investment and without any additional discussion of the type of facility considered by such a comment.

Possibly of even more concern, most districts give six to seven year permits which probably affect investment in Florida's economy. As water scarcity is recognized and competing applications become more common, the water management districts have decreased permit durations to address uncertainty in rainfall and geohydrology as well as to provide flexibility in allocation. At the same time, the districts require greater investment in water saving technology, such as drip irrigation systems, as a way of maximizing the resource. The result is less of an opportunity to recover higher investment costs. Some question also arises as to whether coercive investment is good investment. The conflict generated by the denial of a permit renewal under these circumstances could produce legal challenges on the takings issue, to which some scholars feel the law may be vulnerable.[149]

"To the extent that water law allocates any rights or privileges to private (water) users, the state recognizes that private development of water resources is a desirable form of human activity from the standpoint of the public."[150] If a noncompensated, though legal, transfer takes place a loss has occurred; to say the user has lost nothing because he or she never had a right to expect a continuation of the use ignores the reality that the land or the factory is now less productive. Society has lost benefit, and the mandate of economic efficiency in water use is violated. It is unreasonable to assume all investment has been amortized, all future income flows are zero, and thus no value has been lost when a permit is denied.

In conclusion, therefore, a serious conflict exists in the Act among the imperative for economic efficiency expressed in the

148. MALONEY ET AL., *supra* note 28, at 189.

149. MALONEY ET AL., *supra* note 30, at 282-83.

150. Trelease, *supra* note 45, at 37.

reasonable use standard inherent in the riparian doctrine, the impossibility of a water management district to meet that imperative because of the enormity of the information requirements on water values, and the denial of compensated transfers and permit durations insufficient to allow investment recovery. While we applaud the implicit return to the natural flow doctrine, in the sense that the Act expresses priority for the specification of minimum levels and flows and otherwise insures long term integrity of natural water systems, our concern is that economic development and growth may be unduly constrained and ultimately misguided by agency staff and governing boards.

Fundamentally, we are arguing for consideration of a more reasonable mix of market and market-like processes, as well as improved administrative processes for allocating water. For that portion of the water in excess of minimum levels and flows which essentially represents the portion of the water set aside for economic purposes, it seems reasonable at least to consider allowing the water economy to operate.

We offer a cautionary note, however: cost-benefit analysis and open unfettered markets in water use entitlements do not appear to provide satisfactory solutions for introducing economic efficiency as an allocation criterion. As a result, dialogue and research should focus on the possibility of some limited trade in certificates in an administered water market. Such certificates could be issued by the water management districts and would carry more certain entitlement and more freedom to transfer by sale than by consumptive use permits.[151] Yet another possibility is a margin or proportion of the water assigned to each individually held CUP which could be traded among current and potential water users. Experience in the Northern Colorado Water Conservancy District water market over fifty years demonstrates that just a small margin of highly flexible tradable rights allows for most of the efficiency gains possible in water market allocation.[152] We can postulate that tradable certificates or tradable margins of CUPs could well provide the flexibility needed for economic efficiency in the Florida water economy. Nonmarket social and environmental values, as well as future equity, still could be protected by the rules of the institution already in place. Further research is recommended.

151. Clyde Kiker & Gary D. Lynne, *Water Allocation Under Administrative Regulation: Some Economic Considerations*, S. J. AGRIC. ECON., Dec. 1976, at 57.

152. Howe et al., *supra* note 143.

Whatever institutional changes are ultimately selected to better accommodate the mandate for economic efficiency, the predominant water user at the time must understand the potential for mutual gain. Just as in Florida, any legislated water allocation institution is highly vulnerable to political change. If the dominant water users see the change in the process as a threat to their position, they will be highly resistant. For example, it was not until 1983 that all water management districts were required to implement a permitting program.[153] Furthermore, there has been an annual legislative discussion regarding how to reduce the power of the water management districts and how to reform or expedite the permitting process. These are manifestations of resistance to the changes in the structure of water entitlements induced by the Act; those changes are only lately being felt as water becomes a scarce resource.

We cannot help but believe, however, that the resistance to district water allocation activities will increase with the growing perception of water scarcity in this maturing Florida water economy. In fact, the conflict may increase to such a pitch as to endanger the many good features of the Act, or even result in losing the Act altogether. Then it may not be possible to continue to rely on allocation processes that do not facilitate volitional expression through free choice with the purpose of finding mutual gains in the use of water. These fundamental aspects of the human experience are at the base of the common law and the democratic process.

153. Ch. 82-101, § 8, 1982 Fla. Laws 264, 267 (codified at FLA. STAT. § 373.216).