

Water Resources Development and Management

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Water Institutions: Policies, Performance and Prospects

with 6 Figures and 12 Tables

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Preface

It is being increasingly realised that water is likely to be one of the most critical resource issues for the first half of the twenty-first century. Accelerating demand for water for various uses and user groups and ineffective measures to address water quality decline from point and non-point sources of pollution, have made water management more complex and difficult than ever before in human history. All the current trends indicate that water management will become even more complex in the future because of society's higher demands for good quality water, and new and emerging impacts on the water sector due to the forces of globalisation. These include the liberalisation of trade in agricultural and manufactured products, information and communication revolution, and technological developments in areas traditionally not considered to be water-oriented, like biotechnology. Impacts of these new and emerging forces on the water sector are still not fully understood or appreciated at present, but they are likely to change water use practices dramatically in many countries of the world during the coming decades.

While it is now generally accepted that water management in terms of quantity and quality will be a very difficult and complex task in the coming years because of accelerating human activities, it is a curious anomaly that studies and analyses of institutions (both public and private) which manage water, have been a most neglected subject in the past. This is difficult to understand, since in the final analysis how efficiently and equitably water is managed in different parts of the world primarily depends on the capacities of the institutions that plan and manage them.

If water management is to become efficient globally, nationally and sub-nationally, there is no question that the institutions that manage this resource must become increasingly more and more competent. Unless water management institutions become more efficient, improvements in the governance of water are likely to be at best slow and incremental. As the World Commission on Water for the 21st Century, of which one of the Editors was a member, has noted in its recent (2001) report: "... ... with current institutional arrangements and current technologies, the arithmetic of water doesn't add up." The Commission then goes on to say that only rapid and imaginative institutional and technological innovations can avoid a water crisis.

Because of the facts that institutions play a most critical role in water management, and that objective studies and analyses of water institutions have been a most neglected subject in the past, it was decided to prepare a book which addresses comprehensively and authoritatively some of the fundamental aspects of institutions that manage water from different parts of the world.

The term “institutions” has often been defined differently by different authors. In the present context, we have taken a broad approach toward institutions by incorporating the key elements identified in seminal writings on institutions that span several decades. For the purposes of this volume, institutions are viewed as having three essential components: water organizations and agencies at the local, state, and national levels entrusted with the delivery, allocation, transfer, and management of water among uses and users; the laws, rules, regulations, ordinances, etc. that govern the ownership and allocation of water; and the cultural, political, and technological settings in which the water organizations are embedded and through which the water laws are shaped.

This book consists of nine original papers by a team of scholars and experts in water institutions and policies. The first chapter by Gopalakrishnan presents a review and discussion of the concept of institutions and the idea of institutional entropy by appraising Hawaii’s water institutions. It sets the stage for the discussions and analyses in the chapters that follow. The next three chapters by Biswas, Saleth, and Nickum explore the central issues pertaining to water institutions in three Asian countries of Sri Lanka, India, and China, respectively, and offer suggestions for institutional reforms and strengthening. Chapter 5 by Tortajada and Contreras-Moreno provides a comprehensive analysis of the evolution of river basin institutions in Mexico, their restructuring and overall performances during the past half century. The next chapter by Beaumont gives an evolutionary perspective and analysis of water institutions in the Middle East. Post-apartheid institutional developments in the South African river basins are reviewed and analysed by Turton and Earle in Chapter 7. The final two chapters deal with water institutions in the Western United States. In Chapter 8, Howe explores property rights and water rights in the context of the changing configuration of water allocation and use. Chapter 9 by Huffaker is an analysis and critique of the role of the Doctrine of Prior Appropriation in meeting the changing and challenging water needs of the Western United States.

In essence, institutional innovations could play a decisive part in improving water management practices and processes in the world, and also in improving the human welfare and quality of life in the developing world. The literature on the role of institutional innovations and change as they pertain to natural resources in general, and water in particular, is sparse. This volume is intended to address this gap. The papers selected for inclusion in this book examine both the conceptual and empirical dimensions of institutional innovations, through the design and implementation of sustainable institutions for water resources planning, development and management. The findings from these analyses should have a good measure of applicability to institutional design for the management of other natural resources, as well, in local, regional, and international settings and scales.

Most of the issues discussed in these pages will continue to be of concern to developing countries as well as economically advanced countries during this dec-

ade and beyond. As such, comprehensive and in-depth investigations and analyses of many aspects only briefly touched on in this book are clearly warranted. We hope that this volume will spark the interest of the water professionals and others to undertake further research on the institutional dimensions of water resources management, a subject that has been conspicuous by its absence thus far. Studies of water institutions, and especially how they should respond successfully to the changing global, regional and national scenes, are urgently needed.

This volume is primarily aimed at a wide-ranging constituency of water professionals. This broad group includes hydrologists, economists, policy analysts, planners, administrators, lawyers, historians, governmental and non-governmental entities, international agencies, environmental groups, funding agencies, and academics and students from water-related disciplines.

The editors would like to express their special appreciation to Ms. Thania Gómez of the Third World Centre for Water Management for putting the entire manuscript in the format required by the publisher.

Chennat Gopalakrishnan
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Water Allocation and Management in Hawaii: A Case of Institutional Entropy

Chennat Gopalakrishnan

1.1 Introduction

Recent years have seen a sharp increase in the demand for water in Hawaii. Many factors account for this growth. These include population growth, expansion in the visitor industry, and increasing water demands in the environmental, urban, and industrial sectors, among others. The increase in water demand has intensified and accelerated the competition for the state's water resources. This rapidly changing configuration of water demand has resulted in a number of conflicts in the allocation of water among its competing uses and users, largely because of the failure of Hawaii's water institutions, which are responsible for the planning, allocation, and management of the state's water resources. This chapter is a first attempt to study the evolution, structure, performance, and prospects of Hawaii's water institutions in terms of the concept of "institutional entropy" (see 1.3 below). The term "water institutions", for the purposes of this paper, is defined as consisting of three elements: water laws; political processes; and water administration.

Following the Introduction (Part 1.1), Part 1.2 gives an overview of important recent discourse on the notion of institutions. The concept of institutional entropy is defined and discussed in part 1.3. Part 1.4 describes and evaluates the three components of Hawaii's water institutions – water laws, political processes, and water administration. Then, Part 1.5 reviews and critically evaluates the performance of water institutions in Hawaii today, using a specific case study. Drawing on the study findings, Part 1.6, provides an original critique of Hawaii's water institutions using the concept of institutional entropy. The future directions for Hawaii's water institutions are set forth in Part 1.7.

1.2 Institutions: An Overview

There is no single, universally accepted definition of the term "institutions". A survey of the literature on this topic shows a pronounced diversity and range of thinking on the concept of institutions. Nevertheless, a careful scrutiny will reveal a few common themes. In the rest of this section, I present a sampling of this discourse.

Commons (1968) conceives of institutions in terms of “What the individuals must or must not do (compulsion or duty), or what they may do without interference from other individuals (permission or liberty), what they can do with the aid of the collective power (capacity or right), and what they cannot expect the collective power to do in their behalf (incapacity or exposure).”

Ruttan and Hayami (1984) view “institutions (as) the rules of a society or of organizations that facilitate coordination among people by helping them form expectations which each person can reasonably hold in dealing with others.”

According to North (1989), “Institutions are rules, enforcement characteristics of rules, and norms of behaviour that structure repeated human interaction.” He defines rules as “Constitutions, statutes and common laws, and contracts (which) specify in formal terms the rules of the game, from the most general constitutional ones to the specific terms of a particular exchange.” Norms are defined as “informal constraints on behaviour that are in part derivative of formal rules; that is, they are extensions of such rules and apply to specific issues.” North goes on to point out that norms, more importantly, are “codes of conduct, taboos, standards of behaviour that are in part derived from perceptions that all individuals form both to explain and to evaluate the world around them. Some of these perceptions are shaped and moulded by organized ideologies (religions, social and political values, etc.). Others are honed by experience, which leads to the reaffirmation or rejection of earlier norms.”

Ostrom et al. (1993) consider institutions as people and the patterns of regular repetitive interactions among them that transform inputs into outputs. They offer as examples of institutions, families, private firms, government agencies, and local communities, among others.

Pejovich (1995) defines institutions “as the legal, administrative, and customary arrangements for repeated human interactions. Their major function is to enhance the predictability of human behaviour”.

Aoki (2001) states that “An institution is a self-sustaining system of shared beliefs about how the game is played. Its substance is a compressed representation of the salient, invariant failures of an equilibrium path, perceived by almost all the agents in the domain as relevant to their own strategic choices. As such, it governs the strategic interactions of agents in a self-enforcing manner, and in turn, reproduced by their actual choices in a continually exchanging environment.”

Nabli and Nugent (1989) have identified the following characteristics of institutions: 1) organizational content i.e. the extent to which organizations and institutions coincide; 2) degree of formal or informal arrangement; 3) specificity of time, place and means; 4) embeddedness in other institutions; 5) universality of the interests they serve; 6) impact on public good; and 7) link to technology.

Aoki (2001) identifies five characteristics that are implicit in this conceptualization: endogeneity, information compression or summary representation, robustness or durability with respect to continual environmental changes and agents' minor deviance from the implied rules, universality of relevance to all agents in a domain, and multiplicity.

In the analysis that follows, we will review and critique Hawaii's water institutions as they have evolved over time using some of the ideas presented here. Clearly, institutions are the products of the societies in which they are embedded, and thus may have unique characteristics and dimensions that do not necessarily come under or fit into the typology noted above. This fact will be given due attention in this analysis.

1.3 Institutional Entropy

The concept of entropy as embodied in the second law of thermodynamics tells us that matter undergoes an incremental diminution in quality with each successive use (Greven, Keller and Warnacke 2003). This concept captures a truth not necessarily limited to physical phenomena, but also has compelling relevance to social institutions (Guiasu and Guiasu 2003; Karmeshu 2003; Rifkin 1989). In the context of institutions, the idea of entropy refers to the progressive decrease in effectiveness and efficiency in performing the goals and objectives as originally envisioned and set forth. I argue in this paper that this "dysfunctionality" of institutions is largely attributable to the intrusion of entropy, which causes disarray in the inner workings of the affected institutions and thus renders them diminished in their ability to perform at peak efficiency.

In this chapter, I attempt to identify the constraints that might lead to institutional entropy. This is a preliminary profile and is not intended as a complete listing of all possible contributory factors. First, as changes in politics, economics, technology, and lifestyle occur in a society, the institutions which are embedded in it, must have the flexibility or adaptability to cope with these changes. Absent such flexibility, the ability for effective performance will be compromised. Second, a key feature or attribute of an effective institution is autonomy. The institution should be free from internal as well as external pressures to manipulate water policy. Lack of autonomy, thus, will force institutions to stray from the optimal decision-making path and lead to undesirable outcomes. Third, full and free access to all pertinent information and data that may have a bearing on making efficient and equitable decisions must be an indispensable attribute of optimal institutions. In terms of both quality and quantity, the empirical and policy data should be reliable, verifiable, and timely. Lack of access to such information inevitably leads to the onset of institutional entropy. A fourth feature of institutional entropy is a gradual erosion in what I would call "cultural calibration". By this term, I mean that the institutions must be firmly anchored in the local cultural milieu in order to

effectively capture and absorb the aspirations, preferences, and unique sensibilities of the multiple stakeholders in a given community, of which the institution is an integral part.

In many countries, resource management institutions initially designed to perform at top efficiency have failed to make adequate and appropriate adjustments to allow for the many changes – political, technological, legal, and cultural – that inevitably accompany the passage of time. As a result, there is, I hypothesize, an incremental accumulation of entropy that would render the institutions progressively dysfunctional. In some instances, the institutions could become altogether obsolete and thus outlive their utility.

Examples of institutions rendered partially or totally ineffective abound in the literature on institutions. The Doctrine of Prior Appropriation, the legal doctrine governing water ownership, allocation, and management in the western United States, is a compelling case in point (Huffaker et al. 2000; Gardner 2003; Howe 2004). Other examples include water institutions in India (Vaidyanathan 1993; Saleth 2004), Sri Lanka (Gunatilake and Gopalakrishnan 2002), Middle East (Beaumont 2004), and China (Nickum 2004), among others. Later in this chapter, using the criteria noted above, I will evaluate Hawaii’s water institutions and demonstrate how they have been severely constrained by institutional entropy.

1.4 Hawaii’s Water Institutions: An Evolutionary Perspective

In this section, I provide a historical perspective of the origins, evolution, and development of Hawaii’s water institutions in terms of their three components: 1) water laws, customs, and traditions from the ancient Hawaiian period to the present; 2) the political processes that have influenced and shaped the rules and regulations governing water ownership, allocation, and management; and 3) state, local, and national agencies, as well as private groups, that have played formal and informal roles in the context of water administration.

1.4.1 Water Laws: Formal and Informal

The ancient Hawaiian system of water rights was unique in that it acknowledged water as a public good, a natural bounty that belonged to the people, and accorded the rulers the role of custodians entrusted with the task of managing it effectively and equitably. The Hawaiian word for water is “wai” and the term for wealth is “wai wai”, thus signifying the importance given by the ancient Hawaiians to water by equating water with wealth.

Watershed management in Hawaii can be traced to the original settlers of the islands. “Many scholars believed that the first inhabitants arrived in Hawaii from the Marquesas Islands between 300 and 600 A.D., although Hawaiian oral tradition indicates it may have been as early as the 1st century A.D. Archaeological evidence suggests that the early migrants settled along the coast near fresh water resources, primarily in the windward valleys, and practiced a mixture of shifting cultivation agriculture and subsistence fishing (Kirch 1985).” (Derrickson et al. 2002)

The present system of water laws in Hawaii, for analytical purposes, can be described in terms of four periods: pre-contact, pre-McBryde, post-McBryde, and Water Code and after (Table 1.1).

Table 1.1. Hawaii’s water laws: An evolutionary perspective

Period	Prevailing water rights
Pre-Contact (Early Hawaiian)	“Konohiki” rights
Pre-McBryde (1848-1959)	Appurtenant rights Prescriptive rights “Konohiki” rights Riparian rights Correlative rights
Post-McBryde (1959-1987)	Appurtenant rights Prescriptive rights “Konohiki” rights Riparian rights Correlative rights
Water Code and after (1987 onwards)	Appurtenant rights “Konohiki” rights Riparian rights Correlative rights

The rationale for the classification in Table 1.1 has to do with the landmark case of *McBryde v. Robinson*, a judicial decision that has significantly affected the evolution and operation of the water rights in Hawaii. The case started in 1959 as the continuation of a dispute between two water users about the diversion of surface waters from the Hanapepe River on Kauai. The crux of the dispute pertained to the private right to control vs. the state’s right to control surface water. This long-drawn-out litigation has a chequered history of decisions reversed and appealed a number of times with the final decision rendered by the Ninth Circuit Court of Appeals in 1989, after the state Water Code was enacted in 1987. The Court ruled that “the power to regulate water use and sort out disputes over control of water rights properly belongs with local officials and state courts”. This deci-

sion was hailed by the then Hawaii State Attorney General as a “landmark victory for Hawaii’s people against some of the largest corporations in the state”.

Another noteworthy case that has had a major impact on the shaping of water rights in post-McBryde and Water Code periods is *Reppun v. Board of Water Supply* (1983). In this case, the State Supreme Court directed the Honolulu Board of Water Supply to reduce its groundwater pumping, since the pumping decreased the flow of Waihe’ stream, adversely impacting downstream crops.

A brief discussion of each water right noted in Table 1.1 follows. *Konohiki* right, an ancient Hawaiian water right, was formalized during the period of land reform in the mid-1800s. This right designates surface water rights that accompany royal grants of large land areas to the chiefs.

Appurtenant water rights originate from the ancient Hawaiian agricultural practices. These rights confer an entitlement to the quantity of water in use immediately prior to the time the land passed into private ownership. The water rights, basically, are rights to water needed to grow taro on land historically used for this purpose. This customary right became a legal right upon the award of land titles by the Land Commission in 1845.

A *prescriptive* water right is one that is acquired by adverse use. The requirements for acquiring such rights are “that the use of water be actual, open, notorious, hostile to the rightful holder of the water right, and continuous for a statutory length of time, for example, 20 years. If all of these elements are proved, the person has acquired a prescriptive right to use the water” (Castle and Murakami 1991). Such rights are also attached to land, even more vaguely than appurtenant rights.

Riparian water rights are attached only to land through or along which surface water flows. The doctrine is derived from the common law of England. “The owner of the riparian right has only a right of use or a ‘usufruct’ while the water flows past the owner’s property. Each riparian owner is entitled to the natural flow of the stream, diminished only by the reasonable use of others” (Castle and Murakami 1991).

The *correlative* rights pertaining to groundwater use, under common law, implies that overlying lands can legally withdraw water that lies underneath, so long as similar use by adjacent lands over the same aquifer is not injured.

During the pre-contact period (early Hawaiian), the responsibility for the allocation, transfer, and management of water for taro cultivation and other purposes was entrusted by the king to the konohikis or land agents. The konohikis, in effect, served as absentee-landlords and water masters. During this period, non-Hawaiians were not allowed to own water and land. The Great Mahele of 1848 allowed non-Hawaiians, for the first time, to own water and land. During the pre-

McBryde period (1848-1959), a constellation of water rights prevailed: appurtenant rights, prescriptive rights, Konohiki rights, riparian rights (for surface water), and correlative rights (for groundwater). During the period that followed (1959-1987), the same rights that existed during the preceding period, more or less, continued in place.

In reviewing the evolution of water rights in Hawaii, the essential point that needs to be highlighted is the fact that under the ancient Hawaiian system, the concept of private ownership of water simply did not exist. Water was treated as a natural bounty and a public good and the only right that could be ascribed to it was the right to use it, rather than its outright ownership. With the advent of the western settlers in Hawaii, who acquired the right to own land under the Great Mahele in 1848, there arose a major effort to establish private water rights. This effort was aided and abetted by the Konohikis, the Territorial government, private landowners, and assorted other vested interests. Especially noteworthy, in this context, is the long-drawn-out legal battles instigated mostly by the sugar plantations and the big corporations to acquire private rights in Hawaii's public waters. They succeeded in this effort as a result of numerous favourable judicial rulings, until the landmark McBryde ruling in 1989, which, once and for all, settled the question by upholding the state's right in water allocation in Hawaii over private rights.

The 1987 Water Code (Hawaii Revised Statutes, Ch. 174C) represents the culmination of many years' efforts on the part of Hawaii's legislators to enact rules and regulations that would govern the ownership, allocation, and use of Hawaii's surface- and groundwaters. Attempts at any form of regulation, from the outset, were met with strong opposition from the big corporations and oligopolistic landowners. From this perspective, the passage of the Water Code in 1987 has to be viewed as a real breakthrough.

The basic provisions of the Water Code are the following. It provides an administrative mechanism for water resources, consisting of a six-person Commission on Water Resources Management (CWRM), under the jurisdiction of the Department of Land and Natural Resources (DLNR). It designates water management areas where there are indications of potential shortages or decreased quality. All users must file a declaration of use. The Code also provides for regulation of existing wells or diversions and requires permits for the installation of new wells or pumps. In addition, the Code grants the Commission the power to establish rules and gives it jurisdiction of water issues. It allows the state to acquire land for flood control, water management or water-related conservation including streams, beaches, channels, or other measures. Under the Code, the Commission is responsible for gathering hydrologic data and establishing sustainable yields. It allows the Commission to declare water shortages and gives the responsibility to protect water quality and in-stream water uses. Finally, the Code entrusts the Commission with the protection of Native Hawaiian rights.

As it stands, the Code grants considerable power to the state government to regulate water allocation and management through a cumbersome permit and review process. It is unlikely that the landowners are particularly happy with this aspect. However, the Code does allow unlimited duration of use permits; this aspect could soothe landowners fearful of suddenly having their water simply cut off.

Hawaii's Water Code is deficient in many respects. One observer described it as "too little, too late". The major problems with the current Water Code are:

- (1) it contains no definition of water rights and water ownership;
- (2) provisions governing the sale of water and water transfer (to new uses) are highly restrictive;
- (3) there is an overemphasis on 'original use', which curtails flexibility;
- (4) the designation of so-called 'Water Management Areas' is fraught with problems;
- (5) the Code provides no basis for cost-benefit assessment in monetary terms;
- (6) the status of groundwater rights is left unclear.

There is, thus, considerable room for further modification and clarification of the prevailing water rights system in Hawaii.

1.4.2 Political Processes

In this section, a brief historical perspective of the political factors that have governed and shaped freshwater use in Hawaii is given. The politics of water in Hawaii has its roots in a pattern of land ownership unique to Hawaii: oligopoly. Approximately 25 percent of the land in Hawaii is owned by seven large corporations: Alexander & Baldwin, Bishop Estate, C Brewer & Co., Campbell Estate, Dole Food Co., Damon Estate and the Parker Ranch. These big landowners have a pronounced vested interest in the control of Hawaii's waters, since they own most of the sugar plantations and virtually all the pineapple plantations in the state. Sugar and pineapple are both heavily irrigated crops and together, historically (until their recent decline in production), have used about 24 percent of the fresh water consumed.

A review of the pattern of ownership of Hawaii's sugar plantations shows that four major corporations have, historically, owned and cultivated almost 80 percent of Hawaii's sugar plantations. In 1993, 87,000 acres of Hawaii's 126,000 acres of sugar-cane land (69 percent) were irrigated (Hawaiian Sugar Planters Association 1994). The sugar industry applied about 278 million gallons per day (mgd) to cane fields. This amounted to roughly 19 percent of the total water use in the state of Hawaii.

The corporations which dominated Hawaii's sugar industry have over the years sunk their roots far and wide in the ownership, control and appropriation of the state's surface- and groundwaters. The extent of such corporate 'water lordship' is

readily apparent from the following facts: “The industry’s irrigation systems included about 115 fresh and brackish wells as well as 11 hydroelectric installations, 350 miles of major ditches, and 120 miles of tunnels” (Hawaiian Sugar Planters Association 1994). The replacement cost of the sugar industry’s water system in current dollars is estimated to be \$1.25 billion (Ibid).

A review of the pattern of fresh water use in Hawaii has shown that agriculture has been the principal user of fresh water in the state, significantly surpassing other uses (64 percent in 1985, 55 percent in 1990, and 54 percent in 2003). This situation has a special bearing, given the fact that sugar and pineapple, largely privately owned and heavily irrigated, have accounted for a substantial part (43 percent) of agricultural water use in the state. This clearly points to the dominance and control of a vital public resource by a few big corporations: a classic case of oligopoly in action.

A closer scrutiny of the make-up of agricultural water use discloses further disturbing patterns. A case in point relates to water consumption by Hawaii’s golf courses, many of them under corporate ownership. Water use by golf courses is included in agricultural water use. In 1994, there were approximately 60 privately owned golf courses, which consumed 40 mgd. In 2002, water consumption by private golf courses significantly increased. There were a total of 36 golf courses on the island of Oahu alone. The golf courses consumed, in 2002, an average of 67 mgd (Gopalakrishnan and Cox 2003). Water consumption by golf courses is expected to further increase in the years ahead, based on a projected increase in the number of golf courses. The rapid escalation in the demand for water to meet the growing needs of golf courses has cut into the water available for other uses and has been a continuing source of friction and concern in many communities in Hawaii.

How does the oligopolistic ownership of land and the consequent control of water impact on the state of Hawaii in terms of lost or foregone revenues? What is the monetary impact of the private control of a public resource (in this case, Hawaii’s limited fresh water supply with many competing demands, and therefore, clearly constituting an economic good)? To answer this question, Gopalakrishnan et al. (1996) have relied on the concept of a hypothetical water market, and using actual water prices obtained from authentic sources we have developed preliminary estimates of the potential loss of revenues resulting from the oligopolistic control of the state’s water resources. This initial effort is not necessarily a precise quantification of the monetary damages to the state, but a reasonable approximation of such losses and could be the basis for further scrutiny, refinement and analysis.

The estimated quantity and value of water used by the sugar plantations of Hawaii during the period 1930-92 are presented in Table 1.2. Using the prices charged by the Honolulu Board of Water Supply (\$0.75 per thousand gallons), it was estimated that the value of free water consumed during the 60-year period un-

der review amounts to \$6.4 billion involving the use of 8,583 billion gallons of water for the irrigation of almost 8 million acres.

Table 1.2. Estimated quantity and value of free water consumed, based on Honolulu Board of Water Supply (BWS) charges, 1930-1992

Years	Irrigated acres	Water use (billion gal- lons)	Value of water use (\$ million)
1930-39	1,430,930	1,576.000	1,182.00
1940-39	1,337,570	1,473.200	1,104.90
1950-59	1,235,070	1,360.300	1,020.23
1960-69	1,277,820	1,407.400	1,055.55
1970-79	1,207,308	1,312.469	984.35
1980-89	1,119,704	1,164.284	873.21
1990-92	281,632	289.871	217.40
Total	7,890,034	8,583.520	6,437.64

Source: Gopalakrishnan et al. 1996

It should be clear from the above analysis that sugar companies have had the 'free' use of a public resource, namely, the fresh water supply of the state of Hawaii, for several decades largely because of the unclear status of water rights stemming from the absence of a State Water Code clearly delineating the ownership and allocation of the state's surface- and groundwaters. The delay in the enactment of such water legislation to a large measure can be attributed to the political clout of the oligopolists who were in no hurry to write themselves out of the 'free use' they have been enjoying for decades of a public resource.

Our analysis of the close interrelationship between land and water clearly suggests that land ownership without water rights or ready access to water would be of little or no consequence. Given this premise, it becomes readily apparent as to why the big corporations have always wanted a substantial say in the disposition of Hawaii's waters. They have managed to do this for many decades, from the territorial days through to Hawaii's statehood in 1959, dominated largely by the Republicans, and subsequently under largely Democratic administration up until the present.

The big corporations have managed to exercise a substantial measure of influence on the executive and legislative branches of the state government and, in some instances, have reached out even into the judicial arena in eliciting decisions favourable to them with regard to the ownership, allocation and control of water. Key political and administrative positions were routinely held by individuals with direct links to the major corporations (see Gopalakrishnan et al. 1996, for details).

1.4.3 Water Administration

The single most important agency responsible for the allocation and management of water in Hawaii is the state Department of Land and Natural Resources (DLNR). More specifically, the responsibility is entrusted with the Commission on Water Resources Management (CWRM). The broad mission of the Water Commission is to protect and enhance Hawaii's water resources through judicious and responsible management. The Commission consists of six members (Commissioners). Two are ex-officio members and the other four are political appointees of the governor. Although autonomous, it is administratively housed in the Water Resource Management Division of DLNR.

Another important state agency is the state Department of Health, especially its Safe Drinking Water Branch, which is responsible for monitoring water quality. The state Department of Agriculture, especially its Pesticides Branch, is also concerned with water quality.

Federal agencies involved in the management and conservation of water in Hawaii include the Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), and the Natural Resources Conservation Service (NRCS). In this connection, the largely federally funded University of Hawaii Water Resources Research Centre (WRRC), whose main mission is water-related research and its dissemination, also deserves mention.

The major local agency supplying water to the growing population of Honolulu, the largest city and the major population centre of the state of Hawaii, is the Honolulu Board of Water Supply. Especially important is its role in the supply of municipal, residential, and visitor industry water needs.

At the local level, there are also a number of programmes concerned with water quality and conservation. These include work done by the county extension agents, irrigation districts, wellhead protection programmes, associations of agricultural producers, such as Hawaiian Sugar Planters Association (HSPA) and Hawaiian Pineapple Growers Association (HPGA), and owners and operators of private ditches.

Agencies responsible for water allocation and management in Hawaii suffer from serious constraints, most notably at the state level. The Water Commission currently lacks autonomy. To ensure autonomy, the Commission, currently housed in DLNR, should be moved out of it and set up as a separate agency, entrusted with the responsibility for all aspects of water administration. The Commission, presently, is severely understaffed and under-funded, especially given its state-wide responsibilities for water allocation and management. Thus, a clear need exists for legislative appropriations to significantly augment the Commission's manpower and financial resources.

Taking into account the changing configuration of water demands and the potential that it generates for escalating conflicts among different water uses and users, the necessity to elicit and incorporate the concerns and suggestions of multiple stakeholders becomes compelling. In Hawaii today, there is no specific mechanism to achieve this goal, other than the routine public hearing process on contested water issues, which is far from adequate. We can thus conclude that a major revamping of Hawaii's water administration agencies is essential to enhance the effectiveness of water allocation, planning, and management in the state.

1.5 Performance of Hawaii's Water Institutions: A Case Study

The purpose of this section is to review and assess the effectiveness and efficiency of the water institutions that are currently in place in Hawaii in the planning, allocation, and management of water resources. This is accomplished by a detailed case study of a heavily contested case involving water allocation by the state among multiple stakeholders. All three components of water institutions viz. water laws, political processes, and water agencies, noted in the previous section, figure prominently in this case study and thus it provides an excellent opportunity to examine and evaluate the performance of Hawaii's water institutions in terms of well-defined criteria.

This case study deals with the 1997 allocation of the Waiahole Ditch waters on Oahu, the major economic and population centre and visitor destination of Hawaii. The Waiahole ditch and tunnel system was built in 1916 by the Oahu Sugar Company for transporting water from the wet, windward side to the arid leeward plain of Oahu for irrigating its extensive sugar plantation spread over some 4,000 acres. For almost 80 years, approximately 27 mgd of water was being diverted through this 25-mile tunnel for the exclusive use of Oahu Sugar Company. The closing down of sugar operation at the end of 1995 freed this water for alternate uses.

1.5.1 The Problem

The central issue in the Waiahole ditch controversy boils down to the question of how best to reallocate this water among competing and often conflicting demands. The Hawaii Commission on Water Resources Management (hereinafter called the Water Commission) became responsible for the reallocation of the surplus 27 mgd of water among uses and users claiming a share in it. There are many stakeholders in this water bonanza. These include, on the leeward side, large landowners (Bishop, Castle, Campbell and Robinson Estates), and big resort-, golf-course-, and housing-developers. On the windward side, the claimants include small farmers, community associations, neighbourhood boards, Native Hawaiian Associations, and assorted environmental groups.