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HAWAII'S SYSTEM OF WATER RIGHTS: AN ECONOMIC EVALUATION

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Hawaii's system of water rights consist of a "bundle of rights" which are variously attached to fresh surface waters and to artesian ground waters. Surface water rights are for the most part "unique" to Hawaii and are based on ancient customs and traditions of the islands. On the other hand, the correlative rights doctrine which applies to most ground-water basins in the western world also applies (since 1929) to artesian ground waters in Hawaii. In general, Hawaiian surface water rights are fairly well defined and offer greater investment security than the correlative rights doctrine with its inherent tenure uncertainty. Unlike the case of the correlative rights doctrine, flexibility for surface water reallocations to alternative uses is not necessarily gained at the expense of security.
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INTRODUCTION

Water rights, like land rights, can be regarded as sub-class rights within the total "bundle of rights" which make up the concept of property. Property is primary economic institution which transforms a natural resource with purely physical characteristics into one with economic character as well. When water resources take on the institutional characteristics of property, economic values can be capitalized in the legal rights to use and the possibility for a useful economic analysis within the framework of the economics of natural resource conservation presents itself.¹

The case of Hawaii's system of water rights offers an interesting opportunity. Twenty-five years have elapsed since a comprehensive legal study of Hawaii's water rights was completed by Wells A. Hutchins² which still remains as the best published source of compiled legal information on water rights in Hawaii. Since the report was released in 1946, Hawaii has moved from a territorial to statehood status. Over this period of dynamic institutional change, no economic evaluation of its water rights system has been undertaken.

A SUMMARY REVIEW OF WATER RIGHTS IN HAWAII

Historical Relation to Land Tenure System

Hawaii has a unique system of water rights which reflects its varied


² Hutchins, Wells A., The Hawaiian System of Water Rights, Board of Water Supply, City and County of Honolulu, 1946, pp. 277. All references in this paper to court cases and to other matters of Hawaiian water law up to 1946 are drawn from Hutchins' report.
history.\textsuperscript{1} Once only populated by Polynesians, Hawaii came under the influence of the British following Captain Cook's "discovery" of Hawaii in 1778. It subsequently became a territory of the United States and finally a state in 1959. Hawaii's water rights are thus a blend of ancient Hawaiian customs, English Common Law, and, to a lesser extent, more recent American developments.

The Hawaiian system of water rights is intimately related to the land title system so that some knowledge of the historical development of land titles is necessary for an understanding of the water rights system. Under the ancient, unwritten Hawaiian code, the kings were trustees of the land for the gods—in effect, all land was "common property" with the king serving as sovereign. This land, in turn, was allotted to the chiefs to be subdivided among lower chiefs who subdivided it further until it reached the cultivators (\textit{hoaainas}), the common people. Upon the death of the chief, the land was reverted to the king. Thus, the king remained the "landlord" while the chiefs and people had the status of "tenants."

The most common designation of land put into the possession of a chief by the king was the \textit{ahupuaa}, usually a wedge-shaped tract of land radiating from near the mountain top and extending with increasing width to the shore, thereby giving the chief access to the forest, wildbirds, running water, arable land, and a section of the seashore for fishing. Those \textit{ahupuaa}s were of varying sizes ranging from less than 1,000 acres to over 100,000 acres. The rights of the landlords were, in general, subject to the rights of the tenants.

Another important designation of land was the \textit{ili kupono}. These were usually choice lands of irregular sizes and shapes given to loyal followers.

\textsuperscript{1} Each state has the right to determine for itself which system of water rights it wants to adopt.
of a high chief for extraordinary service. Both in their locations and jurisdictions, the ili kuponas were independent from the ahupuaas. An ili kupono might have been located entirely within one ahupuaa, across more than one, or even consisted of separated areas within one or more ahupuaas. In any event, the ili kuponas were governed by different chiefs.

A third designation of land was the kuleana which was generally a small plot within an ahupuaa or ili. These kuleanas were improved or cultivated by the commoner (hoaaina) and his family for their own use. The hoaaina, however, was not bound to the land and could move to another area either under the same chieftan or under another chieftain, if accepted. Also trading among persons working different kuleanas occurred rather freely with fish from arid shoreline kuleanas being exchanged for poi, the starchy Hawaiian staple taro, from wetter upland kuleanas.

With respect to water supply, a little ground water was developed by digging shallow wells in arid coastal areas and sometimes fresh water was captured in gourds from springs that surfaced in the shoreline seawaters. By far the most important source of water, however, was surface streams and the early Hawaiians constructed rather extensive systems of small dams and ditches to store and transport these waters to irrigate their taro patches.

The chief who donated the most men to the construction of these systems was designated overseer or luna. No natural watercourse was ever completely cut off, and no more than half of the flow was ever diverted out of respect for the water requirements of the downstream inhabitants.

The rules (kana wai) governing the "rights" to these waters are aptly described by Marion Kelley (1956) as follows:

The share of water that could be claimed depended upon the number of men each cultivator (hoa'aina) contributed to the construction of the irrigation system. Thus the water was divided according
to the labor donated with the proviso that no landlord could
claim more water than was necessary for the irrigation of his taro.

Claims for water were rotated, allowing so many days, nights, or
fraction thereof for each cultivator. When the proper time came
for man to irrigate his land, he walked up to the watercourse,
clearing it as he went, checked with the superintendent (*luna wai*)
at the dam, then returning along the ditch, shut off the patches
which had received their share and opened the gates where water was
to flow for the next period. The burden of maintaining the ditches
fell upon those whose lands were being watered. Failure to contribute
due share of service rendered the delinquent cultivator subject to
temporary suspension, to deprivation of water rights, or even total
dispossession of land.

Judge Antonio Perry wrote that in dry seasons the right to juggle
the irrigation schedule was reserved for the superintendent's
judgment. However, 'for unjustifiable interference with a dam
it was permissible for anyone to kill the offender and to place
the body in the breach made by him in the dam as a reminder to
others.' In matters that affected the welfare of the community
such as the law of water rights the Hawaiians maintained an un­
yielding attitude toward antisocial acts. Thus disputes were
rare. The aim of the superintendent was to secure equal rights
for all and to avoid quarrels.

Under pressure for fee simple lands from contacts with Westerners in
the first half of the 19th Century, a number of changes took place in the
land tenure system which eventually culminated in the *Great Mahele* or land
division whereby land became private property.

In 1778 when Captain Cook landed in Hawaii, the eight main islands
were ruled by four chieftans (equivalent in jurisdiction to the four counties
in the state today). Under King Kamehameha I the islands were united into
one kingdom. Kamehameha I changed the system whereby land was reverted to
the king upon the death of the chieftans. Tenure security was given to the
chief's heirs by assigning the lands to them. The king, however, was still
sovereign.

Despite pressures from foreigners for fee simple lands, the Hawaiian
kings refused to sell their lands as private property. Leases, however, were
allowed. In 1838 in a treaty with the United States, ten-year leases were
permitted, and in 1841 a proclamation by King Kamehameha III extended leases to 50 years.

In 1840, King Kamehameha III introduced the first Constitution which ruled that the land belonged in common to the chiefs and the people over whom the king was head. This was an acknowledgement by the "sovereign" that the people had not only the right to use but also some degree of "ownership."

In a proclamation of 1842, King Kamehameha III stipulated that "the government has not relinquished its rights in the soil." Leases for foreigners were made secure by the presence, from time to time, of gunboats from the French, British, and American navies "protecting their citizens' rights."

In 1846 a Land Commission was established which issued awards confirming the validity of land and related water use claims. The government, however, still retained an interest on the land and the water that went with it which could be commuted by paying to the Ministry of the Interior one-third of the value of the unimproved land. In return, the applicant received a royal patent in fee simple.

In 1848 the chiefs presented their claims at the Great Mahele or voluntary division of the land between the king and the chiefs. The 1848 land division left most of the lands with the king, but were later divided into government lands and crown lands. Upon formation of the Republic in 1894, crown lands, private property of the king, became the property of the Hawaiian government.¹

¹As a result of the Mahele, the lands that were divided out were apportioned somewhat unequally. Crown land and government land allocations were 100,000 acres (about 24 percent) and 1,500,000 acres (about 36 percent), respectively, and the chiefs received just over 1,500,000 acres (about 39 percent). The common people were allocated only 30,000 acres (about 0.7 percent), although they were valuable acres, since Hawaiian water law provided for appurtenant water rights to irrigate their staple crop--taro. The quality of the land was high--a very important factor in an area which has considerable acreages of mountainous and dry lands.
The rights of tenants were confirmed in a resolution by the Legislature in 1850 through the Kuleana Grant Laws. Tenant enjoyed inter-alia, the right to running water. On all lands granted in fee simple the springs of water and running water were to be free to all except for wells and water-courses which individuals had provided for their own use.

The System of Water Rights in Hawaii

The system of water rights in Hawaii may be categorized according to those defined rights which have been superimposed upon surface water and ground water. Such a categorization has its limitations when one encounters the transition areas between well defined and indefinite water rights and also between surface and ground waters. Nevertheless, this familiar separation still serves as a convenient and useful point of departure for further consideration of Hawaii's water rights system.

Surface Water Rights. The basic portion of the rights to surface waters in Hawaii is derived from ancient customs relating to ownership and usage of land. In general, the right to use water is inherent in the ownership of the original unit of land. Therefore, water rights are both public and private: the government holds water rights incident to its lands just as does an individual. Furthermore, surface water rights apply equally to artificial watercourses constructed by the ancient Hawaiians as well as to natural water courses.

There is no administrative procedure by which appropriate rights are acquired as in the western United States. The only ways in which title to water rights may be acquired are by original acquisition, or grant from the public or private owner, or by prescription or condemnation. There is a special statutory procedure for judicial settlement of water controversies and the principles governing surface-water rights have been established by
a number of court decisions. Over time, the types of rights that have come to apply in varying degrees of operational significance are rights to spring waters, to waters of "normal flow," and to "surplus waters."

(1) Rights to Spring Waters. Spring water is owned by the landowner where the spring originates subject only to the rights that others may have acquired such as by ancient usage or by prescription. To this extent, spring water rights are junior to other previously acquired rights. Although this is a clear statement of a property right, there nevertheless exist areas of uncertainty which will be discussed in a later section.

(2) Rights to Waters of "Normal Flow" - Ancient Appurtenant Water Rights. Throughout the royal, republican, and territorial regimes, it was consistently held, as a fundamental principle of Hawaiian water law, that lands which from time immemorial have enjoyed the use of water are entitled to that use as a matter of right. The waters used in accord with ancient Hawaiian practices have been legally referred to as waters of "normal flow" and the rights which apply to these waters are called ancient appurtenant rights.

It was the custom to have water turned into taro patches in the highest terrace and the overflow from one terrace flooded the terrace below. Even though little taro is grown nowadays, the ancient appurtenant rights still remain as the right to the water for other uses. Ancient kula or dry unirrigated lands had no water rights. Water obtained under ancient appurtenant rights could only be transferred to kula lands if other persons legally entitled to the water were not injured by the change. In the absence of such injury the same quantity of water to which the cultivator is entitled by usage on irrigated taro land could be transferred to kula lands or even to another ahupuaa.

(3) Rights to "Surplus Waters" - Konohiki Water Rights and Riparian
Rights. "Surplus waters" are those in excess of the quantities required to satisfy the established rights in the waters of a stream including ancient appurtenant rights, prescriptive rights, and rights conveyed by deed. For legal purposes, two kinds of surplus waters have been distinguished, although experience is proving their operational distinction to be small. The two kinds of surplus waters are "surplus waters of normal flow" subject to konohiki water rights and "surplus waters of abnormal flow" subject to riparian rights but perhaps in a more limited sense.

Early controversies related to small uses of water required for domestic and taro irrigation purposes. However, with the drastic decline in demand for taro and the growth of the rice industry, later to be supplanted by the sugar industry, controversies arose over whether ancient taro watering rights could be transferred to the irrigation of the new crops. The numbers and size of the controversies grew in proportion to the increase in importance of the sugarcane industry. Since more water than that covered by the appurtenant rights to taro lands was required for the vastly increased lands going into irrigated sugarcane, new principles relating to the use of surplus waters were developed. These surplus waters were of great importance to the new irrigation economy of the Islands. The present principles, which have been developed by the Supreme Court of Hawaii in various decisions, determine the extent of the right to use surplus waters, in terms of quantity and time.

(a) "Surplus Waters of Normal Flow" - Konohiki Water Rights. "Surplus waters of normal flow" are entirely owned by the landowner of the unit within which they arise. However, these rights, known as konohiki water rights, are not appurtenant to any part of his lands so that the water may be conveyed for use elsewhere as long as the holders of established rights
statutory period of limitations. In 1892, it was settled that a prescriptive right could be acquired only by adverse and continuous use for twenty years. Six years later, in 1898, the statutory period of limitations was reduced to ten years, where it apparently still stands today.

GROUND-WATER RIGHTS. Although surface-water rights have been relatively well defined through a number of past court decisions, there still remains a considerable degree of uncertainty with respect to ground waters. A system of correlative rights have been superimposed upon artesian ground waters, but the question of rights in non-artesian waters appears to remain unsettled.

For legal purposes, three classes of ground water have been distinguished (i) artesian ground water, (ii) non-artesian and percolating ground water, and (iii) water flowing in definite underground streams. Again, as in the case of surface waters, these three classes of ground water exhibit different degrees of operational significance.

(1) Artesian Ground Water - Correlative Rights. In the well-known City Mill case of 1929,¹ the state Supreme Court decided that property rights to artesian ground water would be vested in common with the owners of the overlying land. This correlative rights doctrine in essence states that each overlying landowner has a co-equal right to a reasonable use of the water with due regard to similar rights of other co-owners and is limited to a reasonable use of the water in time of actual or threatened shortage of water. What constitutes "reasonable use" is not precisely defined but left for court determination according to the circumstances surrounding each case.

(2) Non-Artesian and Percolating Water. The City Mill case settled the legal status only for artesian waters and left the situation with respect

¹ City Mill Co. v. Honolulu Sewer and Water Commission, 30 HAW, 912 (1929) p. 933.
are properly safeguarded. This was the adjudication of a 1930 case. Quoting a portion of the syllabus by the court:

The normal surplus water . . . is the property of the konohiki of the ili, to do with as he pleases, even though, if left unrestrained by man, it would flow through a lower ahupuaa before reaching the sea.

The common-law doctrine of riparian rights is not in force in Hawaii with reference to the surplus waters of the normal flow of a stream. [Quoted from Hutchins who cites Territory of Hawaii v. Gay, 31 HAW, 1930]

(b) "Surplus Waters of Abnormal Flow" - Riparian Rights. Surplus water stemming from floods, freshet or storm flow are, however, subject to the common law doctrine of riparian rights. This was criticized in the Gay case but not overruled. The riparian doctrine followed in the eastern states grants the owners of riparian lands the right to have water flow by or through their lands undiminished in quantity, undisturbed in time of flow, and unchanged in quality, except for its use by upstream riparian owners for domestic purposes. Its limited applicability in Hawaii will be discussed in a later section.

(4) Prescriptive Rights. Originally ancient appurtenant rights were often confused with "prescriptive" rights, but this was a misnomer since true prescriptive rights are based on adverse use, whereas the ancient rights were essentially permissive in nature.

The legal effect of suffering another to possess one's land adversely for the statutory period is not only to bar the remedy of the owner of the proper title, but actually to divert his estate and to vest it in the adverse party, who obtains a title in fee simple as perfect as a title by deed. [Quoted from Hutchins who cites Waianae Co. v. Kaiwilei, 24 HAW, 1, 7(1917), citing Leialoha v. Walter, 21 HAW, 624, 630 (1913).]

This same principle of prescription applies to water rights. To establish a prescriptive title to a water right, there must have been an "actual, open, notorious, continuous and hostile" use of the water for the
to non-artesian waters undecided. Some difficult problems have emerged from this uncertain situation. If the ground water-level is lowered, some wells that were under artesian pressure are no longer so. Does this mean that the law no longer applies? Also, non-artesian ground water is quite common in Hawaii. There are large quantities of perched and diked water which have no legal decision systems surrounding them.

As for percolating water, Hutchins (1946, p. 173) came to the opinion that "the court . . . apparently approved of the doctrine that 'rights cannot be acquired in subterranean, unknown, percolating water.'"

(3) Definite Underground Streams. The State Supreme Court has not specifically detailed what constitutes a definite underground stream. Nor has it delineated the rights in such a stream, except to say that they are different from those that govern percolating ground water. Yet it appears that one who asserts a right in a definite underground stream must first prove the existence of such a stream. To date, none has been charted.

In Hutchins' view, "the holders of established rights to the waters of springs that are fed by definite underground streams, would be entitled to the uninterrupted flow of such tributary subterranean stream to the same extent as would be the case if the tributary stream were on the surface." But unless it is possible to prove injury to a holder's water right, he cannot enjoin an alleged interference with his sources of supply.

Rights in springs fed by percolating water are not protected from interference in the ground-water supply as no rights have been defined for percolating water.

ECONOMIC EVALUATION OF HAWAII'S WATER RIGHTS

Decisions concerning water development and allocation in Hawaii are conditioned not so much by a market for water as by a system of property
rights. This water rights system in effect serves as a surrogate for the market and, accordingly, has important economic functions.

For water development policy, water rights must ensure security for investment in the development and distribution of the resource, otherwise, such investments will not be undertaken. Likewise, for water allocation policy, water rights must be flexible for future reallocation to higher value uses. Flexibility is desirable because the optimum use of water at a particular point in time may not be the optimum at another point in time. Whereas, security is generally necessary in the early stages of economic development of water in a region, once the major sources of water have been tapped, flexibility, or transferability, or reallocation, emerges as an important concern.

The two criteria, security and flexibility, are not necessarily conflicting. Usually, a viable system of water rights exhibits both attributes and such a system adapts over time towards an optimum combination in order to enhance its survival value.

SECURITY. In the United States, property rights are given security by the U.S. Constitution. In the water resources system, property rights are called, "water rights," and by this method security is given to investments. However, since the adoption of water rights is a state responsibility, and, therefore, varies from state to state, it is necessary to specifically evaluate the Hawaiian system of water rights in terms of the security that it has to offer.

Is there security of investment in water development in Hawaii? At first glance the answer would be yes because huge investments have been made in water development and transmission. Indeed, the single most important event in the economic history of Hawaii is the extensive investments in water that have made its export-based agriculture possible.
(1) Surface Waters. Spring water is owned by the landowner where the spring originates subject only to the rights that other may have acquired such as by ancient usage or by prescription. Although this is a clear statement of property right, there nevertheless exist tenure and legal uncertainties.¹ Springs are fed by underground sources of water which, according Hawaiian law, may be either "percolating" or in a "definite underground stream."

Suppose, for example, the flow of water from the spring is cut off or reduced due to the actions of others in developing the parent ground-water source and, furthermore, that the spring flow is reduced sufficiently to cause injury to the owner of the spring. In such a case, the law rules that the spring owner has the burden of proving that the spring is fed by "a definite underground stream" in which case he can have recompense against those who withdrew water from such a stream. But, if the spring is fed by percolating water, recompense is not possible as no rights have been defined as yet for percolating waters.

As Hutchins points out (p. 175): "If, then, there is a rule in Hawaii that non-artesian ground waters, even though physically tributary to springs

¹ For the purpose of economic analysis of water rights, it is useful to clearly separate out the various major sources of uncertainties which affect economic decision-making. "Tenure uncertainty" refers to the protection against variability over time of the quantity of water usable under a legal right due to the lawful acts of others who may be individuals or groups, private or public. "Legal uncertainty," on the other hand, refers to protection against unlawful acts by others and such as is a characteristic of judicial decisions which is often subject to "rule uncertainty" and "fact uncertainty." These types of uncertainty are in contrast to other forms of uncertainty which have also been identified, such as the "physical uncertainty" of seasonal variability of natural ground-water recharge and the more general forms of uncertainty due to changes in technology, institutions, and social preferences. S.V. Ciriacy-Wantrup, "Concepts Used as Economic Criteria for a System of Water Rights," Land Economics, Nov. 1956, pp. 295-312.
or water courses, are not legally tributary thereto unless proved to be flowing in known and definite channels, such rule is an inferential result of several decisions of the supreme courts but has not yet been the basis of any decision concerning the right to use of physically tributary percolating water."

This is still the case in Hawaii so that there exists both "rule" and "fact" uncertainty in the ownership of spring water.

 Ancient appurtenant rights are well defined in terms of both quantity and time. Quantity is determined according to the amount of water that was customarily used when the legal right accrued. They are also secure physically as they are a first call on the water supply after domestic uses.

 Although originally tenant rights, the ancient appurtenant rights were secured against their landlords (konohikis) by land commission awards of fee simple titles free of commutation (called kuleana awards). The Land Commission was required by law to render its decisions in accordance with civil code principles and native usage which, among other things, related to "water privileges." Although the Land Commission did not specifically award water rights as such, the State Supreme Court in most cases has held that such rights were undoubtedly intended to pass.

 Security within this class of rights itself is on a basis of equality with respect to each other, that is, these ancient appurtenant rights have priority over newer rights and, in times of shortage, if the total supply is

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1 However, there exists fact uncertainty here as the quantity may not be known. In a recent case (McBryde Sugar Co. v. Alymer Robinson, et al., SP No. 108) the Circuit Court judge, after hearing evidence from experts that conflicted as to how much water the ancient Hawaiians used for taro production, made a decision that lay between the various estimates. This case was appealed to the State Supreme Court and no decision has been rendered as of this writing.
still insufficient to meet the usual requirements of these senior rights, all
must be reduced proportionately. This holds true in principle at least,
regardless of the actual time of initial use or the date of award or patent,
as long as the use was being made at the time of land title transfers.

Ancient appurtenant rights may be involuntarily lost by condemnation
or prescription. In the first case, there is monetary compensation and, in
the latter, loss can easily be prevented by the holder of the appurtenant
right exercising his right. However, for a sovereign body, exercising its
right is not necessary, hence, the state cannot lose its water rights
by prescription.

Surplus waters are those waters in excess of established ancient
appurtenant rights, prescriptive rights, or other water rights conveyed
by deed and, hence, the security in rights to surplus water is first depend­
ent upon the exercise of previously acquired rights. In this regard, the
right of any part of an ahupuaa or ili kupono, which by ancient use was
irrigated land, was equal to that of irrigated kuleana lands.

Beyond this, the holder of a konohiki water right has the unqualified
right to use as he pleases, the "surplus waters of normal flow" originating
on his lands. He may use such waters entirely within or outside his land
unit, since these waters are not appurtenant to any particular portion of
land. This creates some difficulties for downstream landowners in that their
konohiki water rights are junior to similar rights upstream. Security in
konohiki water rights tends to diminish successively with distance downstream
and with greater severity than would be the case with riparian rights which
are appurtenant to land.

Only to the extent that "surplus flood waters" can be operationally
defined are the upstream landowners subject to the principles of riparian
doctrine. Since by definition these floodwaters become available only in
times of abnormal flows, however, there is little physical certainty
attached to them. Legally, the quantity available would be known only
after the courts have adjudicated on the question. But this is a long and
costly process and with the variable nature of floods and the requirements
of riparian landowners changing in importance over time, there would always
be little security attached to such waters for downstream riparians. In
practice with the likely absence of adjudication, downstream users tend
to be entirely at the mercy of upstream users. However, since on Hawaii's
narrow plains the short drainage catchment areas from the mountains to the
coast are often in single ownership, the potential for riparian controversies
is minimal, and so investments have commonly occurred in small upstream
reservoirs.

(2) Ground Water. Ground water is an important source of water in
Hawaii. It accounts for about 95 percent of the total municipal water supply
of the City and County of Honolulu where the bulk of the state's population
and economic activities is centered and represents about 40 percent of the
total water production of the state. The high storage and transmission
capacities of the natural aquifers make them more reliable sources of water
than surface sources. However, because it was only late in the 19th century
that ground water was extensively developed, ancient Hawaiian practices do
not determine the system of rights for ground water.

Correlative rights are co-equal to each other and in the absence of a
long and costly adjudication or of a voluntary agreement are always somewhat
uncertain as to tenure. Such uncertainties may be reduced by making more
water available through direct surface deliveries or by increasing recharge
rates of excess surface waters into the ground-water aquifer. However,
in order to bring about greater efficiency in the conjunctive use of surface and ground waters, large investments are required and such investments, even though technologically feasible, may be deferred as long as an imbalance of costs and benefits exists. The considerable costs incurred in recharging may not benefit the recharger, but may instead accrue to other owners of ground-water rights.

Artificial recharge occurs as a by-product of irrigation rather than by design in Hawaii, e.g., Oahu Sugar Company brings in surface waters to irrigate sugarcane fields overlying the Pearl Harbor aquifer and a substantial portion of this water percolates into the aquifer. Where recharging is carried out by design, the surface waters and the ground waters are usually under unified control, e.g., the state's project on Molokai where the state more or less has control over both the surface and ground waters within its project area.

Water withdrawals from some aquifers such as in the Pearl Harbor area may be limited below the social optimum by the pattern of draft. Proper location of wells and shafts and an alteration of pumping patterns in accordance with the physical functioning of the aquifers may increase the amount of good water available over time. However, while the relocation of pumping stations and changes in pumping rates may be both technologically feasible and socially desirable, they are unlikely to come about because the distribution of the social costs and benefits of such changes may not accrue equitably to all parties involved. This is an unhappy example of how the imbalance in the distribution of social costs and revenues stemming from an institutional inadequacy in property rights definition may tend to deplete a potential water supply and thereby indirectly affect social welfare.

Rights to percolating water apparently cannot be acquired. Similarly,
ground water that is not in a definite underground stream or found under artesian pressure has no defined water rights. In this present institutional void, percolating water in Hawaii may be considered to be a fugitive resource (without an owner) which must be captured or reduced to possession before it takes on the nature of property and thereby acquire security to the rightful use of such waters.

**Definite underground streams** and the rights that exist in them have yet to be precisely defined by the courts of Hawaii. References to the existence of definite underground streams have been negative, e.g., "this is not a definite underground stream." Although rights are not well defined, the situation is somewhat more secure than that of percolating water. Rights apparently do exist although not the same as that which apply to other ground waters and considerable legal uncertainty prevails in the absence of well-defined rights.

**FLEXIBILITY.** The corollary of security is flexibility. In Hawaii, water may be physically transferred from one locale to another with or without the legal transfer of a water right. When water is reallocated among different uses within a right, whether by a single owner or by several owners of the same type of right, such changes in water use are referred to as "transfers within a right." Water transfers or reallocation to different uses are possible as long as it is technologically and economically feasible to do so and no injury is caused to another's legal rights. But the legal transfer of water rights is another matter and it has an important influence on reallocation decisions. Water transfers may be voluntary or involuntary and much depends upon the particular type of water right that is involved.

(1) **Voluntary Transfers.** Voluntary transfers of water such as through
sale or leases refer to those changes in ownership or use of water which come about through the free will and mutual consent of the parties involved rather than under some compulsion of law. Such voluntary transfers may be accomplished either with or without corresponding transfers of land to which the rights are attached. In general, the better defined in quantity, priority, point of diversion, etc. water is, the better suited it is for separate transfer. In these regards, ancient appurtenant rights and konohiki rights are quite well defined and they both may be severed in ownership and use from the land by separate sale or lease of the water right. On the other hand, riparian and correlative rights are not as well defined and may not be separated from the lands to which they are attached.

Therefore, to the extent that the opportunities for continuous reallocation of water from lower to higher marginal value product uses depend upon how firmly water rights are bound to land titles, the ancient appurtenant and konohiki rights exhibit greater flexibility than the two common law doctrines. However, there is still considerable flexibility for transfers within a right in the common law doctrines, because legally permissible withdrawal rates depend upon the court's interpretation of "reasonable" and "beneficial" use. Until such time as adjudication takes place, then, a wide latitude for admitting new uses within the rights exists. Over time, new demands, more pressing than others, may be satisfied without confronting the possibilities of excessive legal specifications which may act as constraints to reallocation.

1 A water right may also be voluntarily abandoned. However, the "alleged abandonment of an easement presents a question of intention and of fact, the burden of proof being upon the party making the allegation." Carter v. Territory of Hawaii, 24 HAW, 47, 55 (1917).

2 For instance, the reallocation of water from one use to another use all within the correlative rights doctrine.
The leasing of water rights has been of greater importance to the economic development of Hawaii than the practice of selling separate water rights. With the concentrated pattern of land ownership in the government and among a few estates and also the general reluctance to part with fee ownership of land, a considerable amount of leasing of water rights and land, has taken place in Hawaii. Leasing takes place both within the private sector and from the public to the private sectors. For example, there is extensive leasing of water rights from the state's lands by the Board of Land and Natural Resources.

The state water leases are sold at public auctions and, in the past, at term periods usually of 21 years but in more recent years, the term periods have been extended to around 25 to 30 years. Provisions for compensation for improvements may be included with water leases. Such compensations are made either by direct cash payments or by the lowering of the lease rental rates. The details of compensation provisions vary with each lease contract that is agreed upon. Despite the concentrated pattern of land ownership in Hawaii, the potential for periodic reallocation exists through the practice of limited term leasing of water rights.

(2) Involuntary Transfers. Involuntary transfers of water rights to those changes in ownership for the use of water which is brought about under some compulsion of law such as through prescription or government exercise of eminent domain and police powers.

Prescription or the open and adverse possession and use on the part of another without the water rights for a statutory period of limitations is a method by which a water right may be lost. However, a sovereign body, such as the state, cannot lose its water right by prescription. In addition, "no right, title or interest in the use of any of the ground water resources
of this state can be acquired by means of prescription" (Ch. 177-3 Hawaii Revised Statutes). This method of involuntary transfer adds some flexibility for reallocation of water but only within some important restrictive limits.

The power of eminent domain is possessed by sovereign bodies by virtue of their sovereignty. The power can be delegated to other bodies, including private companies, although all must adhere to the following Constitutional rules - (a) the taking of private property must be done only after due process, (b) such taking must be for a "public purpose," (c) no other feasible alternatives are readily available, and (d) "just compensation" must be paid.

In Hawaii, the Board of Land and Natural Resources and the various county Boards of Water Supply have all been granted powers of eminent domain. In addition, irrigation companies have been given a limited power for condemning rights of way for their transmission systems. The existence of the power of eminent domain with its requirement for compensation also introduces flexibility into the water resources system and, in this instance, does it without necessarily reducing security.

Police powers may interfere incidentally with private rights when government exercises such powers and compensation may not be payable. This condition applies to water at the federal, state, and local levels.

At the federal level, the power to regulate the use of navigable waters in terms of both quantity and quality stems from the interstate commerce clause of the U.S. Constitution. When the federal government exercises its so called "navigational servitude" and interferes with existing private uses of navigable waters, the compensation rule may not apply since the federal government does not recognize the existence of private rights in such waters and, therefore, the federal action does not constitute a taking. This
federal power is also referred to as the dominant navigational servitude because, even if state-defined private rights exist, the federal interests still dominate.

Although servitude as a means of involuntary transfer of water from private to public uses introduces flexibility into the water system, it does so at the cost of security in private investments. The American Bar Association on the matter of public land use in 1967 exclaimed that servitude has inhibited the development of navigable waterfront area by private enterprise. In Hawaii, however, the insecurity that is introduced by the servitude doctrine is affected by the following factors: (i) Congress can opt to pay compensation by making it mandatory in the Act under which its agencies work--and it has done this with all federal agencies operating west of the 98th meridian, (ii) there are few navigable fresh waters in Hawaii and it is difficult to imagine any important situation where private rights in practice would be taken, (iii) the most likely rights to be affected--riparian rights--are of lesser importance in Hawaii than in most mainland states, and (iv) except for a few remaining konohiki fishing rights, the navigable coastal waters are already the common property of the state and the federal sovereigns. The state has jurisdiction from the mean high water mark up to the 3-mile limit and the federal government from 3 miles up to the 12-mile limit.

At the state level, the government of Hawaii can exercise its police powers in the area of water resources in at least two laws concerning ground water. Under the Hawaii Revised Statutes 178, "Wells Generally" limits the freedom of a holder of ground-water rights who develops a well by (1) requiring his well to be fitted with a mechanical device to prevent waste, (2) allowing an inspector from the Board of Land and Natural Resources access to his property to inspect the well at all times, (3) requiring
boring records, and (4) prohibiting waste. None of these provisions, however, have much direct relevance for transferability of water.

However, Hawaii Revised Statutes 177, the "Ground Water Use Act," is a different matter. Through this Act, power is given to the Board of Land and Natural Resources to designate a ground-water area if the aquifer is threatened by overdraft and consequent salt-water encroachment, pollution, and depletion. Flexibility considerations enter into the allocation of scarce water through the establishment of preference classes and the likelihood of involuntary transfers within a right. In Hawaii, as is the case universally in areas where preference classes have been established, domestic use is given the highest priority. In addition, when a ground-water basin is officially designated, the following preference ordering comes into force: domestic, municipal, and military uses must first be satisfied; then preserved uses before permitted uses among which priority in time is the basis for establishing further use priorities.

At the county level, which is a legal subdivision of the state government, but which still possesses some aspects of quasi-sovereignty, the various county boards of water supply have been delegated not only eminent domain powers, but also the police power to protect their waterworks. The City and County of Honolulu's Board of Water Supply, with its unique semi-autonomous status, has been granted some specific additional authorities. It may issue regulations to prevent waste and pollution of the public water

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1 Domestic use which is defined in Hawaii Revised Statutes 177-2(4) as "the use of water by an individual or by a family unit or household for drinking, cooking, laundering, sanitation and other personal comforts and necessities; for the watering of stock used in operating a farm or as food for family or household; or for the irrigation of the lawn or family garden not exceeding half an acre in area," is always a higher use. That domestic use is a superior use to other uses under ancient appurtenant rights in Hawaii was held in a 1917 case (Carter v. Territory of Hawaii, 24 HAW).
supplies and to achieve these ends, it coordinates with the Department of Land and Natural Resources and the Department of Health in their respective areas of responsibilities.

A problem of water scarcity, which has been developing for some time in the Pearl Harbor area, has recently surfaced in some of its institutional aspects. The Honolulu Board of Water Supply in times of water shortage and/or threat to the potability of its ground water supplies, may restrict "the drawing of water in all wells supplied from such (ground water) basin on a basis proportionate to the proper and beneficial uses served by them respectively" [Section 8-105(j), Charter of the City and County of Honolulu].

In light of similar authority existing in the hands of the State Department of Land and Natural Resources through its Ground Water Use Act, some interesting questions may be raised, such as: Who should do the regulating assuming that some form of regulation is necessary? Should the regulations which control pumping be based on sound scientific principles of hydrology which would allow for the optimum use of the resource over time rather than on a "proportionate to beneficial uses" basis for each well? To what extent can such regulations interfere with private rights without the payment of compensation? Although these issues may appear to be more a matter of law and the underlying politics of government functioning, there are nevertheless important economic aspects of the problem which need to be clearly separated out.

From the standpoint of economics, the fundamental problem of managing a ground-water basin over which the common law doctrine of correlative rights have been superimposed is tenure uncertainty, i.e., the uncertainties which stem from the lawful use of water by overlying landowners. Tenure uncertainty exists because, even though property rights to the overlying land may be well
defined, there is still considerable indefiniteness in the rights to the ground water below. Under these conditions, definite water rights belong only to those who possess the water. This leads every user to protect himself against others by acquiring ownership through capture and the result is an imbalance in the incidence of social costs and benefits and an incentive system which tends toward the gradual depletion of the water resource.

The approaches to correcting this problem are various and differ from one situation to another. In some cases, water resource tenure has been made definite through long and costly court adjudications. In other cases, control over the use of the resources has been brought under some form of unified management. One of the approaches credited with some of the most far-reaching institutional innovations in ground-water management is the case of the Orange County Water District in Southern California, where such fiscal devices as the property tax, replenishment assessments, and an equity pool have been successfully implemented. These devices have been used to distribute the cost of successive improvements in the physical management of the resource in an equitable manner thereby making it possible for Orange County to systematically reduce the uncertainty. All of this was accomplished without the necessity of going through the time consuming and costly efforts of adjudication and still leaving the correlative rights doctrine intact. The possibility of reducing uncertainty by institutional innovations also appear to exist in Hawaii and in other areas confronted with similar ground water depletion problems.

CONCLUSIONS

SURFACE WATER RIGHTS. Hawaii's unique system of water rights refers primarily to ancient appurtenant rights based on Hawaiian customs and also to
konohiki rights which supplemented ancient appurtenant rights in the transformation of an irrigated taro culture into an irrigated sugarcane culture during the late 19th and 20th centuries. The appropriations doctrine has never been adopted for Hawaii and the riparian doctrine has little significance because of its limited applicability to a legalistic but impractical definition of "surplus waters of abnormal flow." Rights to spring water belong to landowners on which the spring originates subject to previously acquired rights. However, this type of spring water rights is not necessarily unique to Hawaii.

GROUND-WATER RIGHTS. The correlative rights doctrine which applies to most ground-water basins in the western world also applies to artesian ground waters in Hawaii. No defined rights exist, however, for non-artesian or percolating ground water and for substantial quantities of high-level waters in diked lava tubes. A legalistic distinction again exists with respect to "definite underground streams," but without much practical significance in Hawaii because no such streams have ever been charted.

SECURITY. In general, surface-water rights are relatively well defined and stable, but with some significant legal uncertainties which exist relevant to riparian rights and springs not fed by "definite underground streams." Although ancient appurtenant and konohiki water rights can be lost by prescription or abandonment, all that is necessary to secure them is to exercise the rights. Investment security, therefore, is generally present with respect to the development of surface waters.

For ground waters, however, the situation is quite different. Although the correlative rights doctrine has been superimposed upon artesian ground waters since 1929, tenure uncertainty, due to the lawful exercise of other rights, still prevails. For example, rights of "definite underground
streams" is uncertain since rights to waters from this source are not well defined. Similarly, an institutional void exists with regard to non-artesian or percolating ground water for which there are no water rights at all.

**FLEXIBILITY.** There is a considerable degree of flexibility in the water rights system of Hawaii. The reallocation of water to higher marginal value uses over time may come about through a myriad of ways which we have categorized under voluntary and involuntary transfers. Opportunities for voluntary transfers exist through the sale and lease of water rights. To the extent that these voluntary transfers depend upon how firmly bound water rights are to land titles, the ancient appurtenant and konohiki rights are more flexible than the common law, riparian, and correlative rights doctrines. On the other hand, there is still considerable flexibility for transfers within a right in the common law doctrines because such undefined terms as *reasonable* and *beneficial* allow wide latitude for admitting new uses over time until legal limits are defined through adjudication.

Involuntary transfers are possible through prescription and the government exercise of eminent domain and police powers. Prescription is limited in that it is viable only where surface waters are concerned but not for ground water and water owned by the state and federal sovereigns. Some or all strands in the *bundle of rights* to water may be *taken* by the government through a condemnation procedure which requires compensation, or such rights may be *interfered with* through regulations without compensation. However, the difference between the *taking of* and *interference with* in property rights is a matter of degree which is further softened by the requirement for compensation when private property is *damaged*.

In addition, for the City and County of Honolulu possible complications
may be brought about by the existence of what appears to be two overlapping statutes, the State's Ground Water Use Act under Department of Land and Natural Resources and the Charter of the City and County of Honolulu which authorizes broad regulatory powers over ground-water use to the Honolulu Board of Water Supply. Both laws would have to be enforced under the police power of the state which implies that the compensation principle need not apply. Nevertheless, these laws are institutional safeguards against critical overdrafts of valuable underground aquifers and they may also eventually serve to reduce the imbalance in the incidence of social costs and benefits through greater controls over the use of the ground-water resource in conjunction with increased efforts to integrate quantity and quality management.
REFERENCES


