Community-based watershed planning and management on the island of Pohnpei, Federated States of Micronesia

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Abstract

Pohnpei is a volcanic island located in the western tropical Pacific (land area 129 sq. mi.). The island is surrounded by an extensive barrier reef and coastal areas bordered by mangrove forest. The mountainous interior is heavily forested with the main over-story trees being *Campnosperma brevipetiolata* and *Eleocarpus carolensis. Large,* almost pure stands of the endemic palm *Clinostigma ponapensis* are also found at higher elevations. In 1987 the Pohnpei state government designated a forest reserves covering 5,100 ha of upland forest and 5,525 ha of mangrove. Early on there was considerable resistance by communities and resource users to state enclosure of forest areas as a reserve where access and use of resources would be regulated. This led to the formation in 1989 of an inter-agency Watershed Steering Committee which began developing a community-based approach. With some external assistance the Committee initiated an education program that visited all villages on the island and worked with traditional leaders to develop consensus for the need for forest resource conservation. Some community-based organizations were formed during this process and the formation of additional organizations to cover all communities on the island is being encouraged. Clearing of forest to plant kava (Pohnpeian: *sakau, Piper methysiticum),* a traditionally important and increasingly commercial crop, emerged as a major issue in terms of forest loss. In 1994, with substantial assistance from the Asian Development Bank, the U.S. private non-profit conservation organization The Nature Conservancy, and the South Pacific Regional Environment Program, a program of community-based watershed management planning was initiated. A team from the State Division of Forestry will work with communities to develop management plans for local watersheds using a participatory planning approach. It is expected that village level management organizations will also be substantially involved in management and enforcement once the planning phase is complete. This paper reports on the progress and results of this process to date.

Introduction

Property relations directly affect the way in which natural resources are managed. A reductionist view might argue that systems of management are all about the regulation

of access and withdrawal of resources. In this sense they bear a close kinship with property regimes which similarly define rights of use, albeit to fixed territories.

The dilemma of common pool resources —"natural or man-made resources sufficiently large that it is costly to exclude users from obtaining subtractable resource-units" (Ostrom, 1992, p. 295)— has been at the core of much debate over effective management. Hardin's (1968) famous paper describing the "tragedy of the commons" crystallized a paradigm that long held sway among economists and policy makers (although the basic argument had been articulated more formally somewhat earlier, see Gordon, 1954). This 'tragedy' was the inability of resource users to effectively engage in self-monitoring and regulation. Thus state intervention, the Hobbsian 'Leviathan' (Ostrom, 1990, pp. 8-9), was seen as the only effective means of ensuring sustainable use.

This view, based on Western experience and neoclassical economic theorization, began to be contradicted by evidence from a variety of settings. Property rights regimes in Oceania, where resources, especially marine resources, have often come under corporate or even individual control within indigenous social systems, were important sources of information supporting a change in thought. This documentation of 'marine tenure' (c.f, Ruddle, Hviding and Johannes, 1992;) supported a new appreciation that natural resources can be sustainably managed within a common property regime. Along with evidence from other systems of common property resource management, this 'field data' has contributed to a growing body of theoretical literature on common property (c.f. Feeny, et.al.,1990).

This paper reviews a watershed management program on the Pacific island of Pohnpei that seeks to apply some of these ideas through a community-based approach. In such an approach there is a need to understand how territory is conceptualized and develop management approaches that recognize those ideas.

Pohnpei

Pohnpei island and six outlying atolls comprise Pohnpei State, one of the four constituent states of the Federated States of Micronesia (the FSM). In 1987, the FSM, formerly part of the Trust Territory of the Pacific Islands, achieved political sovereignty within the context of a special relationship with the United States upon ratification of a Compact of Free Association. This relationship assures substantial aid to the nation for the fifteen year duration of the Compact and accords the U.S. certain rights and obligations regarding military use and defense of the area. The 1990 population of Pohnpei island was 30,816. A large proportion of the population lives in the single urban center, Kolonia, and its environs. While native Pohnpeians are the dominant group on the island many islanders from outlying atolls have migrated to Pohnpei over the last seventy years.

Pohnpei, although the third largest island in Micronesia, is relatively small, 129 square miles. The center of the island is mountainous and forested. Vegetation in coastal areas is primarily agroforest or grassland. The shoreline is fringed by mangrove forest

around almost its entire extent and an offshore barrier reef forms a lagoon around all but the southeast quadrant of the island where the barrier reef is replaced by a broad fringing reef (see Figure 1). The climate is humid tropical with annual rainfall averaging 194 inches (3090 mm).

Before humans arrived on Pohnpei, the entire island and most of the basaltic islets of the lagoon were covered by rain forest (Glassman, 1952). In coastal areas the vegetation has been extensively modified by human residence over the last 2,000 years. While traditional agroforestry practice on Pohnpei emphasizes the maintenance of forest cover, the species composition is altered in favor of plants with social or economic value. However, a combination of strong traditional respect for the upland forest, heavy human depopulation during the last century, and relatively difficult access to inland areas have spared the upland forests of Pohnpei from much of the disturbance and destruction that has occurred in the island's lowlands and on other Micronesian islands. These, along with the relative age and isolation of the island make the flora of Pohnpei's upland forests some of the most diverse in Micronesia, with a high level of endemicity. Most of the plant families represented amongst the indigenous and endemic plants of the island are of Indo-Malayan origin *{ibid).*

Several forest types make up the upland forest resource. These types are determined mainly by altitude. Broadleaf forest is most widespread and dominated by *Campnosperma brevipetiolata* (Pohnpeian: *dohng), Elaeocarpus spp. (sadak), Parinari laurina (ais), Myristica insularis (fcarara), Eugenia carolinensis {kehpap)* and *E. stelechantha (kirek en wel),* and other tree species. Palm forest on upper elevation ridges dominated by the endemic palm *Clinostigma ponapensis (kotop)* is unique in Micronesia and is found only on Pohnpei. Upland swamp forest occurs in small patches scattered in broadleaf forest and is dominated by the endemic ivory nut palm, *Metroxylon amicarum (oahs),* pandanus, *P. patina (piht).* Epiphyte covered, stunted cloud or dwarf forest occurs on mountain tops and ridges Indicative species include tree ferns, *Cyathea spp., (katar), Cmnamomum carolinense, Gynothroches axillaris (ahk en wel*—a mangrove [Rhizophoraceae] species), *Eurya nitida,* and *Astronidium ponapensis.* Of 767 plant species recorded on Pohnpei, 264 species (34.4%) are found chiefly in the upland forests. Of the total number of plant species 111 species (14.6%) are endemic to Pohnpei, 101 or 90% of these found mainly in the upland forests. Major endemic families include Euphorbiaceae (7 species), Orchidaceae (35 species), Polypodiaceae (10 species), and Rubiaceae (10 species).

Watershed Management Program

Pohnpei has had a complex history in relation to the use of natural resources. Prior to Western contact there were was a period of political centralization when resources of would have been more intensively exploited to support a large political and religious elite (Haun, 1984). During this period and the succeeding era of decentralized control (which in terms of traditional political organization extends into the present) the economy was based on exchange mediated by the chiefs through tribute, feasting and

redistribution. Hanlon (1988) succinctly describes these relations. Subjects served their chiefs through tribute and labor. In return

> [t]he *nahmwarki* [high chief] acknowledged the work of the people with gifts called *kepin koanat.* While usually referring to direct gifts of food, the term *kepin kocmoat* in a broader sense implied any gesture of recognition by the *nahnmwarki.* Titles, land rights, the settlement of disputes, and chiefly consent were all, in a sense, *kepin koanoat.* (pp 70-71)

While population had probably already declined from a pre-contact high by the time Westerners first reached the island's shores in the early nineteenth century, post-contact depopulation was much more precipitous due to contagious diseases introduced by Westerners. Population did not begin to significantly rebound until after World War II. However, during the Japanese colonial era, from 1916 to 1945 parts of the island were intensively developed for commercial agriculture. Renewable resources, including fisheries and forestry, were also intensively exploited to support an export based economy.

At the end of the Second World War the U.S. occupied Micronesia; however, its interest was primarily strategic. Until 1986 the islands were administered by the U.S. as a strategic Trust Territory under U.N. auspices. Rather than investing in Micronesia to extract economic value the U.S. fostered political development that would ensure a close political relationship between Micronesia and the U.S. (Peoples, 1985, 15-19). While the FSM achieved a form of sovereignty through Free Association, its economy is almost entirely dependent on U.S. aid. As consequence natural resources were relatively lightly used until fairly recently. But a growing population and an expanding cash economy (due to higher short-term aid levels under a treaty with the U.S.) have meant that natural resources are being more intensively used.

Issues

Three broad issues can be discerned in relation to natural resources use on Pohnpei. A wide variety of both terrestrial and coastal marine resources contribute to cash and subsistence economic production. With little regulation of resource exploitation the sustainability of renewable resources harvests is called into question. Land clearance, especially where it leads to permanent loss of vegetative cover (for example, in the case of un-sealed roads), increases soil erosion. Soil fertility loss is less of an issue than the downstream impacts of sediment: coral reefs, an ecosystem particularly vulnerable to suspended sediments, are in close proximity to runoff sources because of the small size of the island system. (The distance from the highest point on the island to outer barrier reef is everywhere less than 10 miles.) Finally, forest conversion can result in loss of species biodiversity. As noted above, terrestrial endemism is relatively high. Thus local extinction of a species would in some cases be equivalent to its complete loss.

A number of activities exacerbate the three issues outlined above. Planting of the shrub *Piper methysticum,* locally known as *sakau,* has emerged as perhaps the foremost problem. The roots of this plant are used to make a narcotic beverage that has long been of central cultural importance on Pohnpei. The consumption of *sakau* was at one time

reserved for the higher ranking members of this socially stratified society. However, since World War II the prohibitions against consumption by the general populace have been relaxed. Within the last twenty years the penetration of the cash economy has led to the commercialization of the growing and marketing of *sakau.* For the majority of the island's population who have little prospect of finding wage employment, the growing and selling *of sakau* represents one of the only ways to make money. Most commercial *sakau* production typically involves clearing upland forest areas. Richer soils and a moist environment in the uplands favors the plant's growth. Since *sakau* prefers direct sunlight, the forest canopy is opened up by felling or ring-barking over-story trees. Since surface vegetative cover is usually retained, chronic and severe soil erosion does not generally result. However, because *sakau* is shallow rooted, when planted on steep slopes in shallow soils, it may promote mass wasting during major storm events. Of more concern from a biodiversity perspective is the loss of forest habitat. Because the upland forest is relatively small to begin with (estimated to be 12,548 hectares in 1983 [MacClean, et. al., 1986]) it may be already close to a critical threshold in terms of habitat value.

Upland forest is being converted on an even more permanent basis as a result of increased settlement in upland areas. The interior of the island is public land administered by the government. While a significant portion of this area is includes a Watershed Forest Reserve (WFR), there also exist public lands outside of the Reserve. Increased population and maldistribution of land forces people to illegally settle on public lands, including upland areas adjacent to and within the Reserve.

More intensive exploitation of renewable resources, especially with regards to certain highly valued terrestrial and marine species, is also recognized as a major problem. More effective capture technology—the availability of small caliber rifles to hunt birds and monofiliment gill nets for harvesting coastal fish—makes harvest more efficient. Population growth and commercialization stimulate demand. Poorly regulated and in some cases illegal export of desired species including the Micronesian pigeon *(Ducula oceanica),* fruit bat *(Pteropus molossinus)* and mangrove crab *(Scylla serrata)* hasten the decline of these species.

Although roads are banned from the Watershed Forest Reserve, many existing and planned (already funded) secondary and tertiary roads reach the vicinity of or into the watershed. These roads are or will be nearly all un-designed, and in most cases have virtually no surfacing materials. Roads gradients are often extreme, usually going directly up-slope to save on limited budgets and to minimize property disputes. Lack of design and construction expertise, culverts, sub-grade, and surfacing exacerbate the problem (Zeimer and Megahan, 1991). As a result, these roads contribute substantially to sediment load in streams from erosion from the roadbed. In addition, roads always encourage more people to move into previously undeveloped areas, which in turn increases the demand for more roads and gives access for heavy equipment.

History of **the management program**

As early as 1983, when the USDA Forest Service and local foresters teamed up to do a vegetation survey (MacLean et. al., 1986), it was evident that inland movement and deforestation in the island interior was rapidly increasing. The Pohnpei State Division of Forestry requested assistance from the Pacific Islands Forester Office (USDA Forest Service Institute of Pacific Islands Forestry- Honolulu) to delineate and develop legislation to establish a watershed area made up of much of the interior upland forests located on public lands and also to provide for the protection of the coastal mangrove forests. Utilizing 1975 aerial photos of Pohnpei, a 1982 soil survey (Laird, 1982.), and aerial reconnaissance, the actual watershed boundaries were determined by "carefully mapping, from the air, places [on Public lands] where people have not yet settled on the highly erodible soils" (Anson, et. al., 1985). The two agencies also closely cooperated in developing the legislation through a series of drafts, with the result that in 1987, the Pohnpei State Legislature enacted "The Pohnpei Watershed Forest Reserve and Mangrove Protection Act of 1987" (S.L. 1L-128-87). The law assigns all watershed and mangrove forest management responsibilities to the Division of Forestry of the Pohnpei State Department of Conservation and Resource Surveillance (D.C.&R.S.). The creation of the Watershed Forest Reserve also specified that all utilization of the area by residents of any particular municipality must be coordinated with State officials. In other words, continued expansion of homestead farms, agroforestry and *sakau* cultivation was meant to be restrained.

However, it became evident during initial extension and education efforts by the Division of Forestry that communities had not been adequately involved in the development of the law. Community awareness was virtually nonexistent, and the proposed rules and regulations, failing to recognize traditional Pohnpeian resource use in the upland forest areas, were almost universally rejected. Boundary survey teams made up of Department of Lands and Division of Forestry employees were turned back in many areas of the island, and several near-violent incidences occurred. These setbacks led to the formation in 1989 of the Watershed Steering Committee (WSC), an interagency task force made up of representatives from various state government and non-government agencies. This group sought to help implement the legislation both by coordinating government actions and seeking the involvement of communities and their traditional leaders.

With funding from the USDA Forest Service and subsequently the South Pacific Regional Environment Program a pilot watershed extension project was begun by the WSC in late 1991. Representatives from government agencies involved with natural resources and land management visited each village on the island several times to discuss the value of forest resources and the details of the 1987 legislation. During this process, which was not finished until early 1993, proponents of the legislation became increasingly convinced that the small communities *(kousqpw)* that are at the core of daily life on Pohnpei should play a leading role in decision making about and management of forest resources. This was reflected in increased participation by village chiefs in the program, both as members of the WSC and in coordinating the education program. The education

effort was in many ways a sustained dialogue with local leaders and resource users. Through this dialogue it was also realized that conceptually the need to manage or regulate use should somehow be extended beyond the relatively narrow focus of the Watershed Reserve. When confronted with the possibility that the government might in fact assist communities to gain some measure of control over local resources, interest increased in the management of lowland and coastal marine areas.

Beginning in 1992, the government's effort to develop a management program that placed community participation at its center began to attract additional outside interest. The Nature Conservancy, a large U.S. conservation organization, which had already begun activities in the Micronesia, hired a local field representative to assist the Forestry Division in implementing a community-based approach to management. At this time the South Pacific Regional Environmental Program provided assistance for the FSM to develop a National Environmental Management Strategy. Pohnpei state's watershed management program was identified and given high priority within the document. As a consequence, the Asian Development Bank, which had funded preparation of the Strategy, advanced a technical assistance package that included five main components: (1) development of computer-based geographic information system (GIS); (2) provision for new aerial photography, (3) technical assistance to develop a detailed integrated watershed management plan, (4) identification of sustainable income generating opportunities and preparation of a prefeasibility study for future loans, and (5) funding to establish a project office. This technical assistance program began in 1994 and has a two year duration. The South Pacific Regional Environmental Program, through its South Pacific Biodiversity Conservation Program, is also providing comprehensive support over a four year duration. SPREP funding, rather than focusing on technical aspects of the program, is intended to facilitate community-based activities. An important component includes salary for a Conservation Area Support Officer within the Pohnpei State Division of Forestry who can devote full time to the community involvement aspect of the program.

Community-Based Planning

A two week workshop in July, 1994 explored the possibility of using and adapting techniques variously described as rural appraisal, participatory appraisal and participatory research (hereafter termed PRA for 'participatory rural appraisal') as a basis for community involvement. The workshop included a field component undertaken in one of the island's watersheds, involving the five *kousapw* in that area. Subsequent development of a process to facilitate community involvement and participation in decision making about resource use has focused on this area to explore and test methods.

PRA, as a philosophy and a suite of techniques, has emerged out of a growing appreciation of the need to fully involve the beneficiaries of development programs in their design and implementation. Parallel changes have occurred with regards to natural resources management and conservation (for example, West and Brechin, 1981). The recent attention to sustainable development demonstrates the linkage between conservation and development; it is perhaps unsurprising that changes in thinking should

occur in both fields. PRA stresses a 'bottom-up' approach that focuses on understanding the needs of the target audience and demands their involvement as a source of information and often as a participant in decision making. PRA is not a substitute for a broader program to manage watershed resources; rather it is a set of techniques that can be used in many of the planning phases of a community-based watershed management program. In addition, the philosophy of PRA, that local people should be actively involved in the planning and implementation of programs that affect them, fits with a community-based approach.

As a result of this work with PRA, four goals have emerged for developing a community-based approach. First, communities must identify and addressed the major social, economic and environmental problems that are affecting them. The search for cash income is one of the main factors driving more intensive exploitation of resources. Thus, an environmental management program has to simultaneously address development issues. "Village action plans" will summarize action-oriented responses that address these problems. Communities must also develop the institutional structure necessary to allow them to effectively manage adjacent common property resources. Third, a set of guidelines has to be developed cooperatively by community members knowledgeable in traditional methods of resource use and scientific experts that outlines how resources can be exploited sustainably and with minimal secondary impacts. Finally, all of the communities will have to agree on what constitutes the Watershed Forest Reserve so that a core area of undisturbed upland forest is maintained. The boundaries of this area may not correspond precisely to those defined by legislation, but should be equivalent in extent and range of forest types that are encompassed.

Developing the community-level institutions that will be responsible for management is perhaps the goal most crucial to a successful program. In the past ten years there has been considerable research on common property resource[1] institutions. Ostrom (1992) provides a very useful summary of the characteristics of successful institutions (what she calls "appropriator organizations"). She offers the following definition:

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[1]**Bromley (1992) notes:**

> **The literature is full of casual references to "common-property resources," as if this were a universal and immutable classification—almost, indeed, as if the prevailing institutional form were somehow inherent in a natural resource. Never mind that in one setting trees and fish and range forage are controlled and managed as private property, in another they are controlled and managed as state property, in another they are controlled and managed as common property, and in others they are not controlled or managed at all but are instead used by anyone who so desires to use them. There is no such thing as a common property *resource;* there are only resources controlled and managed as common property, or as state property or as private property. Or—and this where confusion persists in the literature—there are resources over which *no property rights* have been recognized. We call these latter "open-access resources" *(res nullius,* which is Latin for "no one's property"), (pgs. 3-4, emphasis original)**

> A set of appropriators [that is, resource users] is considered to be organized whenever it shares common understandings about:
>
> - who is and is not a member
> - the type of access to a CPR [common pool resource] conveyed by membership or other grounds for such rights (the rights, duties, liberties, and exposures of different individuals, for example)
> - how decisions will be made that affect the development of coordinated strategies for appropriating from or providing for a CPR
> - how conflicts over these patterns will be resolved
>
> AOs [appropriator organizations] vary from relatively informal, meeting occasionally for appropriators to discuss how their individual strategies affect one another, to formal organizations with written rules clearly specifying mutual rights and duties and procedures for making binding decisions on all members. An AO could be a village governed by local oligarchs or by open democratic processes, (p. 297-298)

People will only go to the bother of organizing common property resource management institutions if they believe that it will be worth their trouble. As Ostrom (*ibid.,* p. 301) points out, people have to believe that current actions will seriously harm a resource that is important to them and that they can develop rules to regulate use of the resource that most everybody will follow. In general, the cost of decision making must not outweigh the benefits of regulating access and use.

Prior to the colonial era resource use in commons areas on Pohnpei was nominally controlled through the indigenous, localized political hierarchy. But both Japanese and American colonial administrations declared these areas 'public' land (or water); or to use Bromley's terminology open access resources (see footnote). The sorts of institutions that are developed will reflect this history. Thus, it is assumed that the leadership of local organizations will be drawn from village chiefs and that they will act as co-managers of forest resources with the Division of Forestry. Whatever the nature of the organization, it must provide both a level of trust and communication among resource users and an assurance of sanctions for violators. This suggests that primary resource users (which the chiefs may not necessarily be) should also participate in decision-making. Conflict between localized AOs is the most likely problem with a community-based approach. Some kind of super-executive that coordinates and negotiates between AOs will also undoubtedly be necessary.

AOs must have some authority to regulate access to and use of territorially-defined resources. These are powers granted by the state because it legally controls the use and disposition of public lands. An arrangement where the state grants an important set of

property rights to AOs[2] could also be one basis for state participation in community-based management. The state reserves the right of alienation and thus the ability to withdraw the rights it has granted to AOs. This right would allow the state intervention as necessary to ensure that larger interests (like biodiversity conservation) are maintained.

The territorial extent of AOs will be a key defining characteristic. An appreciation of how resources are conceived in terms of environmental zones and territories that legitimize access is necessary in developing this aspects of AOs. There must be a good match between pre-existing social institutions, sets of resource users, and the resources they exploit. While it is assumed that resources on public land are essentially open-access, it is likely that both practical factors and deeply embedded social conceptions affect what forest resources people use. With its strong community focus the watershed management program has to take into account this conception of tenure in developing management strategies.

This conception exists in parallel with the legally codified system of land tenure. However, the formal, legal conception is more explicit because it is recorded in a form that makes it amenable to abstract representation through survey and registration using Cartesian referents to define discrete boundaries. The watershed management program has adopted three practical categories for planning purposes that try to reflect these parallel conceptions. These categories are (1) "government lands," areas such as the WFR, legally managed by the state government; (2) "public lands, which are not legally under any special government management control, but nevertheless are not private lands"; and, (3) "private lands" for which various instruments of individual ownership (titles issued by colonial and post-colonial governments, lease agreements, etc.) exist (TNC, 1995, p. 28).

The government has successively diminishing authority to regulate resource use activities within these three categories. The watershed legislation gives the Division of Forestry broad regulatory powers on 'government lands'; while the state government controls 'public land[1], they have no specific authority to regulate non-permanent use; 'private lands' are only subject to development-related environmental regulations. It is also important to recognize that the capacity of government to actually carry out those regulatory functions accorded to it is still further constrained both by limits on institutional resources and the perceived legitimacy of its claims of ownership.

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[2]Ostrom and Schlager (1993, p. 14-16) suggest 'ownership' can be decomposed into five general kinds of rights: access to a physical space that contains the resource, withdrawal of resource products, management of use activities, the ability to determine who has access (the right of exclusion), and the right to sell or lease the above sets of rights (alienation). It is recommended that AO be what Ostrom would call 'proprietors' in that they would hold all rights except for alienation.

Emic categories: classification of the landscape

A more complicated system of classification can also be described; one that suggests the parallel conception of territory indicated above. Such a system can be understood in terms of Pohnpeian locative nouns used to describe and classify the environment and unique place names. Because the language has developed in the restricted location of a single island, locational nouns can have greater specificity, reflecting the relatively narrow range of morphological expression of the landscape on Pohnpei; and—as with many Pacific islands—the density of place names is extremely high with many small features being named.

Five major concentric zones are recognized: *ncmmadau,* the open ocean beyond the surf zone on the barrier reef; *named,* the lagoon; *naniak,* the mangrove forest; *nansapw,* settled lands; and *nanwel,* the forest. Each zone can be sub-divided using areal locative nouns or geographic features. *Nansed* (lagoon) is morphologically complex and not really subject to areal classification beyond the distinction between reef and open water areas. A great diversity of reef types and lagoon areas are recognized. *Naniak* (mangrove forest) forms the next major concentric zone. *Naniak* is a really sub-divided by watercourses since the forest is regularly cut by major channels (*dau* or *dauen naniak)* associated with river outlets. The forest between these channels can be differentiated into forest sections called *peliniak.*

Like inshore marine areas, the land is divided into two major zones. While these zones can be differentiated in ecological terms, the social and psychological dimension is much more relevant. Pohnpeians identify themselves as a coastal dwelling people. Petersen (1990, pp. 13-14) notes this dichotomy between *nansapw* and *nanwel. Nanwel* (forest areas) are outside of human authority and inhabited by spirits. Various groups of mythical inland dwellers, the Sokele or the Liet for example, are characterized in wholly negative terms. They may flout cultural norms (by engaging in cannibalism), attack people living on the shore and are non-human: "the evil authochtons of Pohnpei, those he [Petersen's source] calls the people from under the earth, lived in the interior" (*ibid.,* p. 13). The division between *nansapw* and *nanwel* is hardly immutable; it can be altered through human agency. Forest can be transformed into *nansapw* by the works of man. This transformation is not merely physical, it is spiritual as well. The 'other' is brought into the human domain.

There is a radial, politically-based classification that overlies these concentric environmental zones. A central ridge system cuts the island into a a series of wedge-like coastal valleys. Valleys are extended into the marine environment as they form channels in the lagoon and through the barrier reef. These valleys, unsurprisingly, correspond roughly to the major political subdivisions of the island. These wedges are further divided by lateral ridges that form relatively narrow radial valleys. Together, the major ridge system, *(nan nahna),* and the lateral ridges *(uluhl),* impose land forms that cut across the concentric divisions of *nanwel* and *nansapw.* Each wedge, the *wou,* or valley, contains a heterogeneous collection of environments including adjacent marine environments such as

peliniak (mangrove stands) and *nansed* (lagoon). Today's municipalities (except for Kolonia) correspond to the largest traditional political sub-division, the *wehi,* with territories covering major valley systems (or *mwasangap)* and cutting across emic environmental zones *(nansed, naniak, nansapw* and *nanwel).* Many centralized Pacific island societies organized political territory in a similar manner, with surpluses supporting an island-wide political elite. *Wehi* are further sub-divided into 'sections' and the fundamental socio-political unit on Pohnpei, the *kousapw.* Sections are a post-contact phenomenon organized to facilitate ceremonial feasting of the high chiefs. They have also assumed some civil functions as village chiefs within a section may meet to discuss affairs of common interest.

According to Petersen (1990, p. 44) *kousapw,* the basic level of political organization, reflect the strong emphasis on a decentralized political system that evolved after the demise of a politically centralized island-wide political hierarchy in the mid-sixteenth century. They are the "fundamental building blocks of Pohnpei political life" *(ibid).* They are formed from a collection of families and their land holdings *(paliensapw)* that work to together to serve the paramount chiefs *(nahnmwarki).* Petersen continues: "Because so much of modern Pohnpei political life hinges upon the processes of decentralization and fissioning... it is crucial that we recognize the point at which unity is celebrated: in the voluntary coming together of people to create local chiefdoms" *(ibid.,* p. 47). A *kousapw* has its own dual line of titles and Riesenberg (1968, p. 21) claims "On a miniature scale they parallel the organization of the tribe *[wehi]."* This dual line represents the local political hierarchy surmounted by the local chief *(kauen en kousapw* or *soumas en kousapw).* Fischer (1958, pp. 83-84) suggests that tenure and inheritance of land was slowly evolving away from a matrilineal, clan based system at the time of contact; this was accelerated by colonial rule.

Like the *wehi,* a *kousapw* should ideally form a wedge cutting across environmental zones and encompassing forest resources, *kapw* (upland communal farming areas), *pil* (rivers), *kepindau* or *sekere* (channel ends or canoe landings) for access to the marine environment and adjacent mangrove and lagoon resources. Haun (1984, p. 206) notes "Paralleling the geographic distribution of districts *[wehi],* sections *[kousapw]* comprise strips of land extending from the interior to the coast although some land-locked sections exist." Political integration at higher levels (such as the section) allows some access to resources not found within a given *kousapw.*

The foregoing discussion suggests a system of classification based on socio-political divisions of the island that cut across and provide access to different resource zones. This system can be seen as a hierarchy of nested spaces. A compendium of bounded contiguous areas at one level comprise the next level of organization (e.g., a *kousapw* is formed from contiguous *paliensapw,* a *wehi* is formed by contiguous *kousapw)* as is often true of civil subdivisions elsewhere. *Nansapw,* the settled lands, can be seen as a ring with commons, or 'wilderness,' at its front and back; these areas are not under human control and also less discretely bounded. This is reflected in Shimizu's (1982) description of the relationship between nature and natural areas and the social-political structure of Pohnpeian society. While people may use resources from various

environments from interior *(nanwel)* to exterior *(named)* social life and the social organization of subsistence production is organized laterally within the concentric band of *nansapw*. He summarizes:

> Our analysis of people's everyday lives is endorsed by an idiom which provides instruction for the proper orientation of houses. A homestead is usually composed of two kinds of buildings: the main dwelling *(imwëlap [ihmw lap]*—literally, great house) in which people's domestic lives are lived and the feast house *(nahs)*. The idiom says that the ridge beam of the main dwelling should not be oriented so that it crosses the ridge-line of the foothill *[uluhl]* on which, or on the extension line of which, the homestead is situated. This means the main dwelling should not interfere with the normal order of nature. Streams which shape valleys and ridges usually run directly toward the sea. To recapitulate in terms of our graphic figure, the ridge-lines of foothills and the ridge beams of main dwellings may be drawn centrifugally along a radius. On the other hand, the same idiom says that the feast house should neither front *nansed* (the sea) or *nanwoal [nanwel]* (mountains). This means that along with the activities held in it (i.e. the *kamadipw* feasts), it should be oriented toward human society and the chiefdom... The idiom implies that the people's everyday and social lives, each oriented toward nature and society, respectively, are integrated and constitute the life of each family. (p. 210)

Zones outside *of nansapw* (i.e., *nanwel, naniak, nansed)* are common property for which access is defined in terms of residence. As such boundaries are less clearly defined and the sub-division of areas less consistent.

To these radial political and concentric environmental zones can be added a large vocabulary of descriptive nouns for landscape features. Feature descriptors, or locative nouns, do not fill all available space and often do not have discrete boundaries. Thus a particular location may be described by more than one feature and at the same time be perceived as not fully characteristic of a particular feature. Landscape features may have discrete, variable, or fuzzy boundaries. Discrete boundaries are common in the marine environment. Reefs have precise edges, so a reef structure (e.g., *madepei,* a patch reef in the lagoon) can be clearly specified as can the edges of larger reef formations (e.g., by *keilin nahmw,* the edge of a reef hole or lagoon area). Variable boundaries change over time. (It could be argued that all boundaries, whether a social attribute or intrinsic of a geographic entity, vary over time. Perhaps it more a matter of whether the boundary is conceptualized as stable or subject to change that has personal and social relevance.) For example, the boundary between *nansapw* and *nanwel* is changed through conscious human agency. Haun (1984) argues that intention determines how converted forest lands are classified:

> Active land *(nansapw)* is *sapwkapw* when first cleared and may become *weliwel* after the second or third year of cultivation. It is significant that the term *weliwel* (bushy land) is not considered resting land if a forest phase

> *(nanwel)* will not be permitted to occur. Thus, a *weliwel* stage may be considered as either *nansapw* or *kewella* [secondary vegetation returning to forest] depending upon the farmers (sic) intentions (p. 141)

Boundaries may also be naturally variable. The mangrove forest border may prograde or recede due to changes in sediment input and sea level. *Nan keleu* (area of *Hibiscus tilliaceus)* or *nan kipar* (area of *Pandanus spp.)* may change due to natural vegetational succession. Finally, some features have fuzzy borders. For example, *nan nahna* is variously described as the high mountains or the cloud forest found at higher elevations. Because there is no distinct demarcation between upland forest vegetation and cloud forest vegetation (which on Pohnpei is more characterized by changes in plant phenotypes and to a lesser degree floral associations) a fuzzy boundary is created by continuous variation in biota. Fuzzy borders are variable across space; at any one time there is not a distinct inflection or demarcation dividing conceptually separate areas.

In principle any feature capable of being described by a locative noun can possess a unique identifier, or place name. Place names serve a utilitarian function in discourse. They serve as referents to communicate information about location. But they also have an equally important affective dimension. Place names are evocative because of personally and socially constructed meanings that are attached to them.

This affective dimension is very important in Pohnpeian culture. Long and stable residence within the limited domain of a small island has motivated deep social, political and spiritual connection with the land. It is often hard for Westerners, who see land as a fungible commodity, to understand this multi-dimensional relationship. Residence and lineage are intertwined; thus place and the social definition of the self are joined facets. The political hierarchy is reified through its ability to intensify production and direct its output through tribute and re-distribution. Production is firmly based on natural endowment, the 'fruits of the land.' Naming is the concrete act that unites collective experience with environment through the lens of history.

Landscape, concepts of territory, and management

An important dimension of the institutional structure of common pool resources management is the concept of territory. As the preceding discussion suggests, territory is a conception of bounded space that may be realized in both concrete and abstract ways. Boundaries vary in their precision because of differences in the way geographic features are conceived and in relation to social and material value. Landscape features may 'contain' ideas about values. For example, reference to a named feature, such as a mountain top *(dot),* can also store information about resource uses in a general region that includes the slopes of the mountain. Knowledge may be instrumental, related to valued resources in an area for example, or it can be the kind of social knowledge that ties history and cosmology to a place. In either case, knowledge will not be distributed uniformly through all members of society. People have specialized knowledge because of residence and life skills. For example, the story associated with a sacred site may only be known in detail by a particular group, whether associated by residence, lineage, or social status. In the

same way, detailed knowledge about the location of an area may be held by a limited group. Secrecy may be an attempt to limit access to valued resources (so that a productive fishing spot is not divulged) or, in the case of specialized social knowledge, a source of enhanced status (thus powerful magic spells are not divulged). Emic classification of the landscape is the nexus where ideas about value are mapped onto space. A system of referents—locative nouns and place namesi—allows knowledge about the distribution of values to be shared. The notion of territory relates to a shared understanding of legitimate access to these places. The legitimacy of—or degree of consensus about—territories varies and is reinforced by the willingness and capacity to defend them. The unequal apportionment of knowledge about the distribution of value in the landscape is one defensive strategy. (And the sharing of this knowledge can in itself become a source of power.)

The state legitimizes one conception of territory through the legally defined system of tenure. This may be different from, perhaps even at odds with, other conceptions. On Pohnpei the state government exists in parallel with the 'traditional' socio-political hierarchy that pre-dates it. Ideas about tenure vary in society and reflect accommodation and antagonism between indigenous ideas about the commons and the state's assertion of 'ownership' of public land. Because of its inability to defend this territory, public land has become, *defacto,* open access. The watershed management program is attempting to reassert a concept of territory based on, but perhaps not identical to, a traditional' or indigenous set of beliefs about the commons. It cannot be identical because the traditional political hierarchy has been weakened both by the assumption of real power by the state and the penetration of market relations. New institutions have to evolve that revive the participation of local chiefs in decision making about the commons. These institutions must reach an accommodation with the state because of the reality of its power (legitimated through a constitutional-legal system of governance) to define and regulate property relations.

It is envisioned that this will be achieved through the development of local appropriator organizations that will participate in designating areas of different intensities of use. This process will result in a 'spatial plan' for Pohnpei that integrates scientific knowledge (and values) about resources with indigenous knowledge and values. Land suitability analysis using topographic, geomorphologic, and habitat-related data will form the basis of community decision making (which should accommodate indigenous knowledge and values) to designate areas of differential use. Tenure (as legally constituted and as conceived) forms the second axis of a matrix that generates six management approaches (TNC, 1995, p. 29; see Figure 2). This matrix uses the tenure designations discussed earlier (government, public, and private lands). Two options, the Watershed Forest Reserve and development, are fairly self-evident. However, it may be that the boundary of the WFR is modified somewhat from its legal definition to reflect perceptions about the environment. There is sentiment for designating forest *(namvel)* outside of the legal boundaries of the Reserve as reserve areas. By the same token, areas being actively used would become limited use Reserve areas in which specified activities with limited impacts would be permitted. This might include gathering of forest products and regulated hunting. Community supported reserves have the same management goals

as the WFR. These are areas outside the legally defined reserve and areas that communities consider traditionally under their jurisdiction. In reality, much of the WFR may be perceived this way. Since the same approach would have to be taken for these Reserve areas as well, much of the WFR may in fact be equivalent to these community supported reserves. In the same way, community-based management areas are analogous to limited use Reserve areas. Again, at a practical level there may be little to distinguish the two if the government must depend on community involvement to regulate limited use Reserve areas. On private land management will have to rely wholly on voluntary compliance. Landowner education' is the anticipated strategy.

It is evident that the development of an effective community-based management program still has a long way to go on Pohnpei. There is always the temptation to rely on top-down approaches, Ostrom's 'Leviathan' (1990, p. 8-9), because they appear to be a simpler approach to management. When there is some sufficiency of governmental resources the Leviathan can be considered, even if it proves ultimately to fail. On Pohnpei, as perhaps with many places in the world, it is clearly evident that the government has neither the capacity, nor the legitimacy in the eyes of resource users, to effectively manage the island's natural resources. There is no choice but to search for ways that involve resource users and draw on their self-interest. At this point it is hard to say whether self-interest (and sentiment, a deep allegiance to the land) will be strong enough to foster the difficult process of building institutions that have legitimacy and the willingness to regulate and sanction. But it is clear that the 'only way' (to again paraphrase Ostrom) must rely on institutions more intimate than centralized control by the state.

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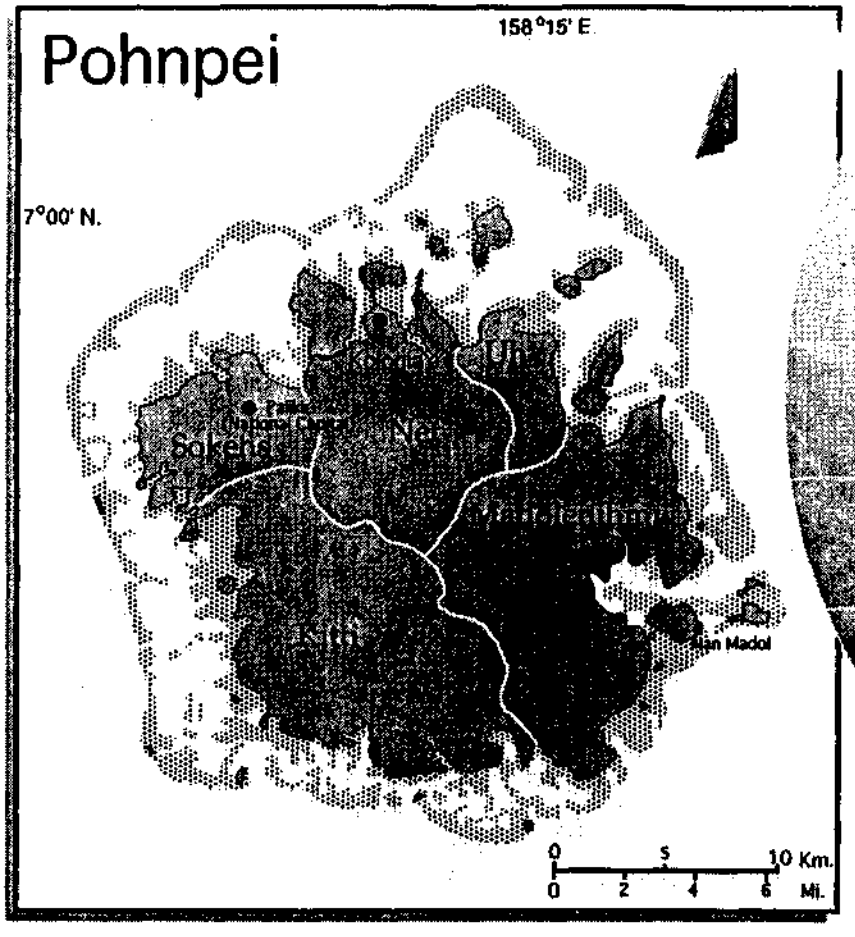

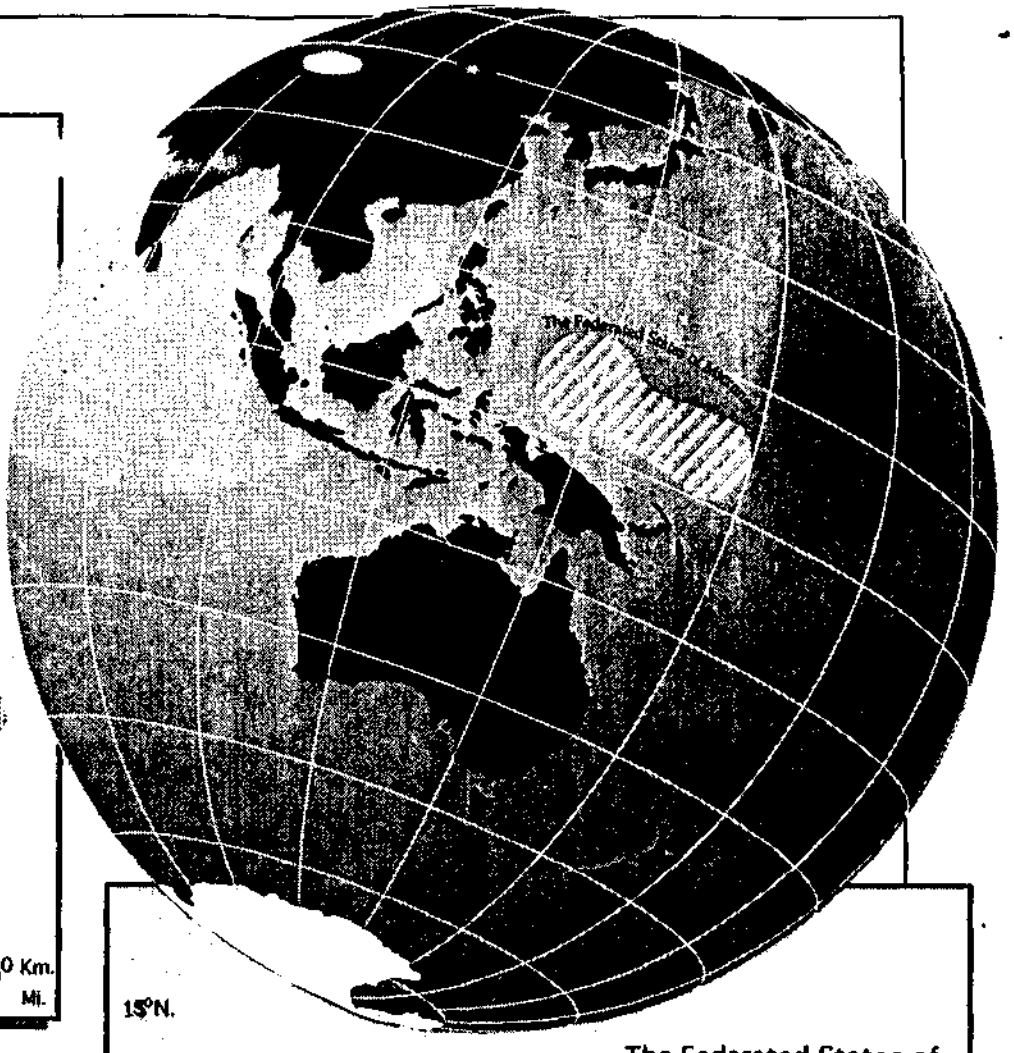

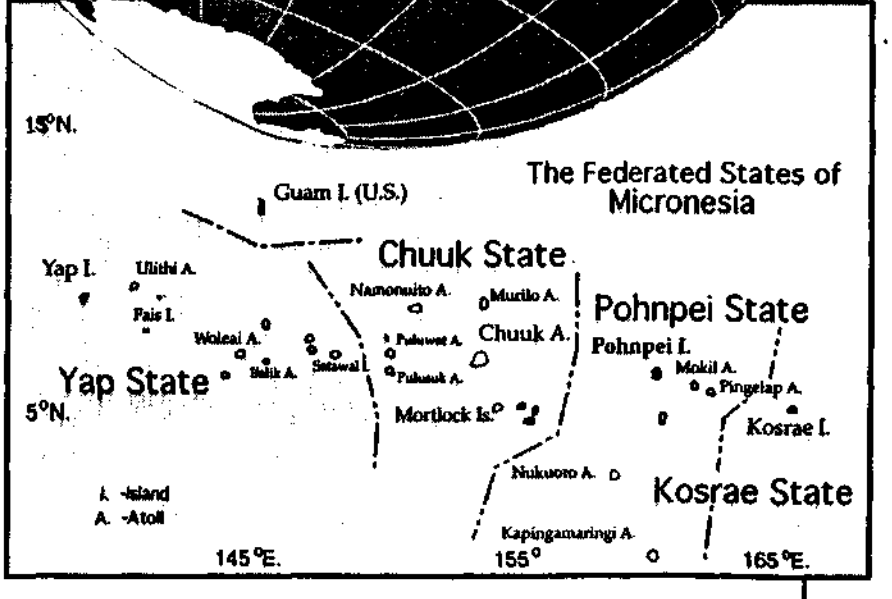

Pohnpei Island

Federated States of Micronesia

Figure 1: Pohnpei

Use/Tenure	Government	Public	Private
Conservation	forest reserve	community supported preserve	landowner education
Limited Use	limited use reserve	community-based management	landowner education
Intensive use	development	development	development

Figure 2: Spatial Planning Matrix (Source: TNC, 1995)