1989

Mangrove systems and their management

Peter Saenger
Southern Cross University

Publication details

Saenger, P 1989, 'Mangrove systems and their management', in AV Arakel (ed.), *Proceedings of 1988 workshop on coastal zone management*, Lismore, NSW, 1-3 September, Queensland University of Technology, Brisbane, Qld., pp. 210-214.

MANGROVE SYSTEMS AND THEIR MANAGEMENT

PETER SAENGER

Centre for Coastal Management,
Northern Rivers College of Advanced Education,
P.O. Box 157,
Lismore, NSW 2480.

ABSTRACT

Concern for Australian mangrove systems has led increasingly for calls for improved management, and in this context, two aspects of management are recognised and discussed. These include those calls for political activity and those that require technical action. Both aspects must be provided for if efficient and effective systems of management are to be developed for these important coastal resources.

INTRODUCTION

Australian mangrove systems have suffered little at the hands of our modern technological society when compared with those of other regions (Saenger *et al.,* 1983). Nevertheless, there is growing concern for mangrove systems in Australia and increasing calls for their management. In this context, calls for management include two distinct approaches i.e. calls for political activity on the one hand, and demands for technical action on the other. Both of these approaches need to be considered by the resource manager and they are discussed below.

POLITICAL ASPECTS OF MANAGEMENT

Several political areas will be considered in relation to the management of mangrove systems. These include the following:

The Public Perception of Mangrove Systems

Many management problems associated with mangrove systems arise from the still pervasive view that mangroves are low-lying swamplands in need of reclamation (Saenger, 1986). The pressures on mangrove systems resulting from such perceptions are high and part of the political management strategy for the systems requires an enlightenment of public (and therefore politicians) attitudes. Recent trends suggest that at least among certain sections of decision makers, these attitudes towards mangroves are changing, albeit slowly (Adam *et al.,* 1985).

Legislative Framework

While mangroves are protected in all mainland states, generally under the respective fisheries acts, the legislative framework as it currently exists is that mangrove systems are not recognized as ecological entities and consequently they are treated along legalistic rather than ecological lines (Saenger, 1981). As a result, many mangrove systems are divided by low water level lines into areas under Commonwealth or State jurisdiction (e.g. in Queensland where some mangrove systems come under the Queensland Marine Parks Act while others are encompassed by the Great Barrier Reef Marine Park Act). Similarly at high water mark, jurisdictional transitions occur from one State Government department to another.

Such fragmentation of the legislative reponsibility makes ecologically coherent management of these systems difficult and provides the opportunity for 'buck-passing' among government instrumentalities. Ecologically defined legislation, containing flexible boundaries as, for example, the Beach Protection Act (Qld.) 1968, is required to recognise the functional boundaries of these systems.

Administrative Fragmentation

Like the legislative situation, the administrative framework is equally divisive, with management responsibilities allocated on the basis of regulatory duties rather than on the basis of ecological function. For example, in Queensland, the Lands Administration Commission provides permission for mangrove land reclamation, the Department of Primiary Industries, Fisheries Branch controls the cutting down of mangroves while permission to develop canal estates in mangrove areas requires a permit from the Department of Harbour and Marine. Similarly, waste discharges to mangroves areas are controlled by a range of government instrumentalities: the discharge of liquid wastes is controlled by the Water Quality Council, gaseous wastes by the Clean Air Council, solid wastes by the Department of Local Government and radiological wastes by the Health Department.

Each of these departments have varying permit requirements and are able to make final decisions without necessarily referring to the other instrumentalities which may have an interest, or to the Fisheries Branch, which has the primary responsibility for the mangroves themselves.

Similarly cumbersome and fragmented control over mangroves exist in other states as well, and while such arrangements may be politically expedient, they ensure ecologically unsound decision-making.

Sealevel Considerations

Although a relatively new area, sealevel considerations can be treated as essentially political. The vertical (and therefore the lateral) distribution of mangrove systems is limited by sealevel height (Hutchings and Saenger, 1987). Any rise in sealevel will cause the mangrove and saltmarsh systems to move inland (Vanderzee, 1988). In this sense, little management of these systems is feasible or, indeed necessary. However, if the areas landward of the present limits of mangrove systems are occupied and dedicated to a particular land-use, then the occupiers might be expected to resist the encroachment of their land by mangrove and saltmarsh systems.

Providing space to allow for the landward readjustment of mangrove systems in response to any sealevel rise, clearly introduces a land-use conflict that can only be resolved by political means.

TECHNICAL ASPECTS OF MANAGEMENT

There are four major areas where the technicians (ecologists, geomorphologists, chemists, hydrologists) must be involved in the management of mangrove systems. These include:

Identifying Objectives & Strategies

Initially, these technicians need to provide input in terms suited to determining management objectives for the mangrove systems (Saenger, 1985). What are the values or services that should be derived from these systems? Can these values and services be met and, if so, what are the overriding strategies that need to be employed to secure them in the long-term?

Several attempts have been made to provide overall objectives and strategies for the protection and sustainability of mangrove systems (e.g. AMSA, 1977; Hegerl, 1982; Saenger, 1987; Burchett, 1987) and, while there is no overall agreement, some broad management objectives (Table 1) have been agreed on. However, to attain these objectives, the technicians need to address such questions as - what is the sustainable yield for a particular product or resource? how do we ensure the permanent provision of the useful services provided by mangrove systems? what is adequate habitat for conservation purposes? and what are the essential purposes which could justify conversion (in-filling) of mangrove communities?

Defining Boundaries

Because of the importance of various hydrological processes to the functioning of mangrove systems, the ecological boundaries of these systems may extend well beyond the usually recognized vegetational boundaries. Often, this has led to defining inappropriate management boundaries, thereby endangering the continued functioning of the systems. A prime example of the inappropriateness of boundaries to protect coastal wetlands is evident in the approach used to delineate these systems for the State Environmental Planning Policy No. 14 ('Wetlands Policy') promulgated by the then Department of Environment and Planning (NSW). Selected vegetation types were simply mapped from airphotos and gazetted as declared wetlands without any determination as to whether or not various essential processes (hydrological, chemical or ecological) occurring outside of these immediate areas were responsible for maintaining the wetlands - and thus be included within the wetland boundaries.

In most situations, unintended 'downstream' effects on mangrove systems can be avoided or at least minimised by recognising the ecological boundaries of these systems. As these boundaries may shift according to seasonal and other time patterns, detailed technical studies are required over extended time-frames.

Biological Tactics To Minimise System Disruption

The most critical processes involved in the continued functioning of mangrove systems depend on an adequate supply of water, an adequate supply of nutrients and the stability of the substrate. Minor or temporary manipulation of these factors is feasible and can be gainfully employed to minimize disruption to mangrove systems when essential activities must be undertaken within these systems. The well planned use of such tactics, can virtually eliminate unintended impacts and will reduce adverse side effects of disruption.

The development of such tactics is the responsibility of the technicians and a number of measures are already used in a routine way. For example, the installation of temporary drainage for mangroves where the tidal channels are temporarily blocked or the placement of protective structures to provide short-term protection from wave and current action while mangrove replanting is carried out.

Rehabilitation Approaches

Where damage has occurred in the past or where natural changes have adversely affected a mangrove system, several rehabilitation measures can be used to provide a cost-effective management solution. Experience with such rehabilitation techniques has shown that artificial mangrove systems can

provide many values and services comparable to natural mangrove systems and that the results often exceed those obtainable using alternative (e.g. engineering) approaches. For example, mangrove replanting was employed around the new Brisbane Airport as a means of stabilising the flood channel. The success of these plantations and the costs involved (Table 2) suggest that this approach is effective and economical, and was certainly preferred to an engineering solution in this instance (Dept. of Housing and Construction, pers. comm.).

Both New South Wales and Queensland authorities have now adopted the concept of 'environmental compensation' for disruption to mangrove and other tidal wetland systems. In New South Wales, the general approach is that for any area of tidal wetlands destroyed, an equivalent area should be replanted by the developer elsewhere on his land. In Queensland, 'environmental compensation' may take the form of a payment to the fisheries authorities who will employ the funds collected in this way either to research mangrove replanting techniques or to actually replant or manage other degraded areas. Either approach recognises the ecological (and thus economic) value of these systems and ensures that the cost to the community is negligible.

DISCUSSION

As indicated above, there are two important aspects involved in the management of mangrove systems and the resource manager must address both if mangrove systems are to be adequately managed. This is particularly pressing in view of the demographic trends in the Australian coastal zone (Yapp, 1986) and the likely sealevel changes to the year 2030 AD (Anon, 1988).

At present, Australia possesses some of the largest areas of relatively undisturbed mangroves in the world and because of its unique demographic and economic condition (Table 3), it has an unrivalled responsibility to manage its mangrove systems effectively and efficiently.

REFERENCES

Adam, P., Unwin, N., Weiner, P. and Sims, I., 1985. Coastal wetlands of New South Wales. Coastal Council of New South Wales: Sydney.

AMSA, 1977. Guidelines for the protection and management of estuaries and estuarine wetlands. Australian Marine Sciences Association: Sydney.

Anon, 1988. Climate change in Australia to the year 2030 AD. In: Pearman, G.I. (Ed.) Greenhouse - Planning for climate change. CSIRO: East Melbourne, pp. 737-740.

Burchett, M.D., 1987. Mangrove management policies. In: Field, C.D. and Dartnall, A.J. (Eds.) Mangrove ecosystems of Asia and the Pacific: status, exploitation and management, pp. 305-316.

Hegerl, E.J., 1982. Mangrove management in Australia. In: Clough, B.F. (Ed.) Mangrove ecosystems in Australia - structure, function and

management. Australian Institute of Marine Science: Townsville, pp. 275-288.

Hutchings, P. and Saenger, P., 1987. Ecology of mangroves. University of Queensland Press: St. Lucia.

Saenger, P., 1981. Who protects Queensland's mangroves? Bull. Aust. Litt. Soc. 4:5-9.

Saenger, P., 1985. Definition and perceptions of the mangrove resource: The biological view. In : Davie, J.D.S., Hanley, J.R. and Russell, B.C. (Eds.) Coastal Management in Northern Australia. NARU Mangrove Monographs 2 : 15-20.

Saenger, P., 1986. Coastal land resources - mangroves. In : Proceedings of National Conference on Coastal Management, Volume 2, pp.267-271.

Saenger 1987. Mangrove use and conservation. In: Field, C.D. and Dartnall, A.J. (Eds.) Mangrove ecosystems of Asia and the Pacific: status, exploitation and management, pp. 97-103.

Saenger, P., Hegerl, E.J. and Davie, J.D.S., 1983. Global status of mangrove ecosystems. Environmentalist 3 (Suppl. No. 3):1-88.

Vanderzee, M.P., 1988. Changes in saltmarsh vegetation as an early indication of sea-level rise. In: Pearman, G.I. (Ed.) Greenhouse - Planning for climate change. CSIRO: East Melbourne, pp. 147-160.

Table 1: Management objectives for the three major areas of mangrove interests.

Value Category Objectives	**Expected Benefits**	**Management**
Utility	Products Services	Sustainabl;e yield Permanent provision
Conservation	Diversity Habitat	Maintenance of level Adequate provision
Conversion	Land	Essential provision and Minimize irreversible loss of benefits

Table 2: Costs of planting mangroves at the Brisbane Airport Site in 1984

Material	**Cost per plant**	**Percent Survival**	**Total Planted**
Propagules	<$0.50	30-90	2,000
1 year-old seedlings	$0.74- 1.33	40-60	22,350
1m high transplants	$4.50	80	50,727

(Data provided by Department of Housing and Construction)

Table 3: Coastal, demographic and economic characteristics of Australia and some adjacent countries.

	Coastline length (km)	**N/km^2**	**N/100km**	**Mangrove area (km^2)**	**Per Capita GNP ($US)**
AUSTRALIA	30,266	2.0	5.1	11,617	11,080
BANGLADESH	580	675.3	1631.9	4,050	140
FIJI	1,129	37.0	6.0	197	1,850
MALAYSIA	4,675	45.6	32.2	6,522	1,840
INDIA	7,003	220.0	1042.4	3,565	260
INDONESIA	61,000	81.6	25.7	38,061	530
PNG	5,152	6.9	6.2	4,116	840
SOLOMON IS	5,313	8.7	0.5	642	640
SRI LANKA	1,650	235.0	93.5	63	300
THAILAND	2,615	96.4	189.1	1,633	770