

MANAGEMENT OF SANDY COASTLINES - REPORT ON REVIEW AND WORKSHOP

A.E.F. HEYDORN (National Research Institute for Oceanology, Stellenbosch, South Africa)

1. SUMMARY OF REVIEW PAPER BY J R CLARK

Prof Clark made it clear that he would deal with management and conservation in the widest sense, including administrative and legal considerations. On this premise he emphasized that:

Beach management can only be effective when seen in the overall context of Coastal Zone Management. Management procedures have to be attuned to natural processes if they are to be effective. This means that they must be seen in relation to coastal environments from watersheds in catchments to water in the sea below the breaker influence.

The key to successful management is simplicity in spite of the complexity of governmental systems. There can be 10 to 20 authorities involved, belonging to Central, Provincial, District or Local levels of Government. This often leads to boundary disputes - where does the jurisdiction of each Authority end?

In spite of this, all interactive processes of an administrative and ecological nature must be considered. THUS ADMINISTRATIVE PROCESSES SHOULD BE STRUCTURED ACCORDING TO THE COMPONENTS AND PROCESSES WHICH ARE

IDENTIFIABLE IN THE ECOSYSTEMS TO BE MANAGED. It is therefore of great importance to get managerial systems to recognize themselves as being responsible for WHOLE ECOSYSTEMS and to guard against utilization or manipulation of COMPONENTS of ecosystems (i.e. dunes, beaches or floodplains) if the ecosystem as a whole can be harmed in the process.

For these reasons it is equally important that scientists should recognise that they are responsible for the transmission of information about the processes and functioning of ecosystems in understandable form to environmental management agencies. They must therefore ensure that their research, even if it is of fundamental nature, must eventually be relevant to the need for scientifically based environmental management.

In spite of the need for a HOLISTIC ECOSYSTEM APPROACH as advocated above, practical exigencies dictate the need for the utilization of ecosystem components. To achieve this without causing unnecessary damage, overall environmental management plans need to be drawn up in which the determination of boundaries is very important. However, administrators and ecologists

frequently attach different values to boundaries. While a river might be a useful boundary to an administrator, the ecologist might insist that watersheds should be used so that effective management of catchments can be achieved. Ecologists should therefore strive to separate coastal ecosystems into components which can be used by administrators. This has been successfully done in the U.S.A. but the alignments of boundaries must be coordinated with due regard for the relationship between natural and administrative processes.

Research should be global in concept. Thus, although there is great variation in coastal environments certain principles are universal in concept and should be applicable in coastal environments around the world.

On the basis of the above, the major components necessary for effective Coastal Zone Management were outline as:

1. Planning
2. Co-ordination
3. Control (permits)
4. Review (plans, progress reports, etc)
5. Environmental assessment (programs, projects, etc)
6. Consultation
7. Guideline criteria (buffers, mitigation, etc)
8. Designations (critical areas, reserves, etc)
9. Technical assistance (e.g. to local authorities).

2 DISCUSSION FRAMEWORK PRESENTED BY THE CHAIRMAN

Any process of management, including

that of the coastal zone (of which beaches form an important component), needs to be structured to be effective. In general processes of management must be based on:

- assessments of the resources involved;
- the setting of goals and objectives;
- the implementation of management decisions to meet these goals.

2.1 The assessment of resources as applied specifically to beaches

The beach and its characteristics:

In any assessment of the resources represented by or associated with a beach, it must first be decided whether the beach should be regarded as:

- a limited ecosystem, or
- a component of the greater coastal zone.

Thus it must be decided what the spatial limits are, e.g. the region between the watershed and as deep as sediments are capable of being moved onto beaches from the seabed; OR the beach between two headlands; OR the portion of beach affected by artificial structures or an estuary or river mouth; OR a transect of a beach in which physical, chemical and biological interactions with adjacent parts of the beach, with dunes or with the sea can be determined.

Similarly, temporal limits must be decided upon, e.g. tidal, diurnal, seasonal, episodic, etc.

Finally, the state of the beach must be assessed,, i.e. is it stable, is it eroding, is it ecologically viable, or is it polluted? Obviously the state of the beach will also be affected by its

present and predicted utilization.

Assessment of the state of knowledge of processes.

The scientific expertise available including its predictive capability.

Knowledge of the legal and administrative framework within which the beach must be managed.

Financial resources available for management.

Resources available for implementation of the management policy decided upon.

2.2 The setting of goals and objectives of management (including an evaluation of options).

An assessment must be made of all potential threats to the beach in question and this will determine the urgency with which action must be taken.

Priorities for preservation must be determined, e.g. should its present status quo be maintained in terms of:

- its intangible values such as scientific, educational or recreational ones or
- should it be regarded as a core or a buffer area, e.g. to protect dune environments (particularly where development has taken place on dunes), to contribute to the equilibrium of estuary mouths, in relation to harbour works, etc; or
- should the beach be maintained as a specific habitat, ecosystem or reference area.

Alternatively, should a beach be managed for a specific goal such as:

- recreation (swimming, angling, surfing, sunbathing, etc);
- economic exploitation (mining of heavy minerals, diamonds, sand reclamation, harvesting of organisms, kelp collection etc);
- a component of the coastal zone (to protect developments in dune areas, roads, railway lines, etc).

Finally, is it feasible to allow modification of beaches, e.g. through harbour development and the associated construction of groynes, revetments, etc.? If so, will accretion and erosional problems result which might require expensive maintenance or sediment replenishment procedures?

2.3 The implementation of management goals

Having assessed the beach resources and having set management goals and objectives, the next step is to decide on the requirements for implementation of the management goals. Relevant here are:

- engineering guidelines;
- the legal, administrative and enforcement infrastructure which is particularly important when the viability of beaches as natural systems is to be maintained;
- the creation of facilities for effective information transfer without which the all-important public awareness of the need for implementation of management procedures cannot be promoted.

From the considerations of 2.1, 2.2 and 2.3 above, four key questions arise:

Question 1:

What administrative structure is considered ideal for beach management? Inherent in this question is whether beaches can really be managed in isolation or only as components of coastal ecosystems?

Question 2:

Do we know enough about our beaches to be able to manage them effectively:

- for conservation,
- over predictable time horizons?

A closely related and basic question arises from this: do we really need deep-going biological knowledge for purposes of beach management, e.g. for the determination of the inshore angling potential?

Question 3:

If manipulation in the coastal environment is necessary, do we have the predictive ability on the basis of current research to assist planners and engineers with answers to questions such as:

- what will artificial sand replenishment requirements be?
- what ecological effects will temporary disruption have both in the long and the short term, e.g. of diamond mining in the sub-tidal?
- will, for example, revetment construction, have permanent detrimental ecological effects?

Question 4:

Is the type of research discussed at the symposium producing results which can be

readily used for management purposes in terms of:

- format;
- understandability;
- quantification, and the creation of adequate public awareness?

3. GENERAL DISCUSSION

While it had been hoped that the Workshop would provide answers to the four key questions posed by the Chairman under "Discussion Framework", it soon became clear that the topic of MANAGEMENT is so wide that it requires a symposium on its own.

Question 1: What administrative structure is considered ideal for beach management, and, can they be managed in isolation?

The real question should be: "How does scientific input get through to administrators?"

The need for cost-effective decisions and procedures in coastal zone management is largely ignored although much relevant information is available. This points to the need for land-use plans based on the recognition of ecological processes. This also emphasizes firstly the need for university education in this field and secondly the rôle which ecologically orientated engineers have to play.

There is a dire need for competent resource managers, but a glut of administrators and politicians exists. Transmission of available information on coastal zone management in understandable form to ALL authorities in coastal zone management is of vital

importance.

The problems of multiplicity of control in the coastal zone were reemphasised.

Question 2: Do we know enough about our beaches to be able to manage them effectively for conservation and over adequate time horizons?

Because these two questions entail the need for knowledge of physical, chemical and biological interactions within beaches and with the surrounding terrestrial, marine and estuarine environments, and because time horizons encompass natural changes, episodic events and short-term human manipulations, it was decided to combine discussion of these factors with that of Question 3, below.

Question 3: Is deep-going biological knowledge really necessary for purposes of beach management?

Deep-going biological knowledge is essential for all forms of beach management but not always available. Where knowledge is available its usefulness depends on the type of stress imposed on the environment by human action, e.g. the consequences of impacts due to interference with dunefields, or the effects of breakwaters on beaches are predictable, but the available information is often ignored. On the other hand, the effects of toxic waters, cooling waters, or multiple discharges into the sea or out of broken effluent pipelines, are usually unpredictable and more information is obviously required. Whether such information will be used when it does become available is another

matter.

In many cases there are conflicting interests which require equally conflicting managerial techniques. In these cases available knowledge is often ignored or even twisted to suit the desired form of utilization of the environment. Because of this very typical situation, effective management is only possible through strict recognition of the requirements of natural processes and the need for their maintenance in both ecological and economic terms.

Very often scientists are reluctant to give advice because they feel that more research needs to be done. Because of the rapid rate at which degradation is taking its toll of the environment and its resources, they should rather be prepared to use available information and on this basis advise NOW to the best of their ability of WHAT NEEDS TO BE MANAGED AND HOW THIS SHOULD BE DONE.

There are two types of management:

- (a) deferred management where decisions may have to be deferred because more data needs to be gathered;
- (b) adaptive management where existing knowledge is used but it is accepted that if mistakes are made, they will be corrected as more experience is gained.

Question 4: Is research producing usable results for management purposes?

At this stage time ran out for the workshop. In the final stages of the general discussion and also in post-workshop discussions, various participants emphasized the need for an

understandable format for the presentation of research results and warned against a tendency for many scientists to criticize managerial procedures. It is essential that the scientist does not adopt a lofty attitude but rather that he convinces those who carry responsibility for the implementation of coastal zone management procedures that he has an essential contribution to make. In this context the recognition of critical processes is of particular importance, e.g. the prediction of vulnerability of certain areas which in the U.S.A. has led to the protection of land behind barrier dunes through the withholding of Federal support for roads, sewage works or disaster assistance AND of insurance or tax relief in such areas. About 600 miles of the Atlantic coast of the U.S.A. is involved and the protection of critical areas here can be attributed directly to the fact that scientists, on the basis of the research results they produced, could convince the Government that it would cost more to develop such areas than not to develop them. Similarly the predictive ability of scientists has led to the acceptance of the concept of buffer zones in the U.S.A. For example on an eroding coastline it is necessary to know where the coast will be 50 years from now and no building is permitted in front of this line.

4. CONCLUSION

It can be accepted therefore that although a great deal needs to be done, research is producing usable results in many countries and subject to adequate communication between scientists, engineers, administrators and managers,

scientific results are and will increasingly find practical application. It is a pity that this state of affairs was not achieved 25 years ago because much damage to the coast could have been avoided. With the increasing pressure brought about by growth in the human population throughout the world, the need for a scientific basis to coastal zone management will become more and more vital in the years to come.