MPA buildings

F1

An MPA requires a range of buildings to meet its objectives and the style and layout of these will have an impact on how the MPA is perceived, particularly by visitors. This sheet aims to give the MPA manager some guidance on key issues to consider when planning buildings.

An MPA needs some or all of the following building and facilities:

- Offices, library, documentation centre, meeting rooms and laboratory;
- Staff and visitor accommodation;
- Restaurant, kitchen, snack bar, picnic area;
- Visitor centre, exhibition and conference areas;
- Storerooms, maintenance and repair workshops, generator house, air compressor, room for dive bottles and other dive gear;
- Garages, boat sheds, vehicle and boat parking.

When planning buildings, compromises will have to be made between cost, availability of materials, aesthetic, environmental considerations, and functionality. Lighting, power and energy needs (see sheet F2) need careful thought. Other factors to consider include the following, many of which are interrelated and all of which will have cost implications:

LOCATION AND SIZE

Minimising the environmental impact of buildings is essential and for new buildings, or other major construction work, an Environmental Impact Assessment may be required and is strongly recommended even if there is no legal obligation (see sheet A6).

Buildings need to be accessible to roads, harbours, and boat landing facilities as appropriate. However, they should not be too close to the sea, where beach erosion may cause problems, nor to sites of ecological importance where there is a risk of disturbance to wildlife (e.g. turtle nesting by lighting, or bird roosts by noise). Buildings sited close together will permit easier management, better security, and cheaper connection of water, power and communication services. Privacy, risk of fire spreading and adequate ventilation favour separating them however and so a balance must be sought.

Buildings should be located where there will be a low risk of storm damage, falling trees, and flooding, but oriented to catch seasonal prevailing breezes. Adequate capacity with some flexibility for change of use is important. Shipping containers can make cost effective 'instant' and secure storerooms and longer term 'buildings' if shaded, camouflaged, ventilated and properly mounted.

SECURITY

The appropriate levels of security will need to be judged locally. Try and establish the 'weakest link' in security, and if it is judged to be a real issue, seek professional advice. Cost effective, passive security, to incorporate into buildings, preferably during construction, include: unobtrusive metal bars across windows; outer metal grills on doors; concrete ceilings over rooms that may contain valuable items such as offices and storerooms (if the roof is thatching); built-in concrete safes; good quality locks; and low power security lighting.

DESIGN AND CONSTRUCTION MATERIALS

It is important to determine the local architectural styles and those that will have minimum environmental impact, and then to assess whether these are suitable for the MPA's needs. Consideration of locally available building materials is also important. Traditional construction techniques will usually be cheaper due to locally available materials and skills, but can deplete resources like mangroves and other timber. However, maintenance may be greater and building life shorter than with more modern materials. Consider making cement blocks on site, but not with beach sand. When using timber, find out the source and whether it is sustainable. Ensure timber is treated against termites and other wood borers. In some situations, buildings can be constructed from recycled materials.

Galvanised sheet metal roofs are ideal for catching rainwater but eventually rust, are noisy during heavy rain, and need insulation. Thatched roofs offer insulation, but quality, maintenance and fire risk may be an issue. Tile roofs can provide insulation and catch water but are often more expensive.

Advice should be sought on external and interior surface finishes. Many paints and wood treatments are highly toxic and do not last long in the salt laden air and strong ultraviolet light experienced in the WIO region. Natural finishes or eco-friendly labeled products should be considered where possible.

S. Wells

View from the Chumbe Island lighthouse showing the eco-bungalows within the forest reserve.

VENTILATION AND CLIMATE CONTROL

It is important to decide at an early stage whether natural ventilation will be adequate or if climate control is needed. Effective natural ventilation in the tropics requires open plan spaces with high ceilings, and windows and doors located to maximize air movement, with usually at least two windows per room, on different walls. Climate controlled spaces by contrast are sealed and of minimum volume compatible with their function. Sometimes local climatic factors or equipment that is sensitive to dust or salt laden air will dictate the decision. Dehumidifiers or air conditioning can however require alot of supply.

WATER AND SANITATION

Freshwater is often a scarce resource in MPAs. It is important to establish if seasonal or permanent streams or springs, wells or boreholes exist in the vicinity. If water is available locally, an assessment should be made of extraction impacts on ecosystems or users downstream. Ground-water aquifers can be accessed relatively inexpensively, if not deep, but must not be over-used, as in coastal situations this often leads to salt water intrusion. Check quality of locally-available water, particularly salinity.

If mean annual rainfall is more than 700mm and spread over three months or more, rainwater harvesting may be feasible. This requires a catchment area (roofs), capturing system (gutters and drains) and storage (ground or surface tanks). A roof of 50 sq. m, with an annual rainfall of 1,000 mm should provide 50 tonnes of freshwater a year, or about 140 litres per day.

Minimise water consumption and wastage. Recycle water by separating drains carrying 'grey water' (from washing and kitchen facilities) from toilet drains, and using the grey water on gardens or vegetables. Ensure none remains stagnant to attract mosquitoes. Consider water saving devices for flush toilets and showers (see sheet K2).

KEY POINTS FOR THE MPA

- ❑ **Buildings are a major investment, hence careful planning is required; construction often damages the environment and mitigation may be needed.**
- ❑ **Respect set-back and other building regulations and favour eco-friendly options wherever possible.**
- ❑ **MPA buildings can illustrate valuable environmental approaches to construction (see case study).**

Sources of Information

Corfield, T. 1993. *The Wilderness Guardian: A Practical Handbook*. African Wildlife Foundation/The David Sheldrick Wildlife Trust. Longman, Kenya. 701pp.

Eagles, P.F.J., McCool, S.F. & Haynes, C.D. 2002. *Sustainable Tourism in Protected Areas: Guidelines for Planning and Management*. IUCN, Gland, Switzerland and Cambridge. 183pp.

Grange, N. & Odendaal, F. 1999. *Guidelines for the Environmental Assessment of Coastal Tourism*. SEACAM, Maputo, Mozambique.197pp.

National Park Service. 1993. *Guiding Principles for Sustainable Design*. National Park Service, Denver, Colorado, USA.

Tourism Council Australia & CRC Tourism. 1998. *Being Green Keeps You Out of the Red*. Tourism Council, Woolloomooloo, NSW, Australia.

http://energy.sourcesguide.com - worldwide souces on energy and related building design.

www.greenbuilder.com - advice on environmentally appropriate and sustainable building technologies.

www.cat.org.uk - consultants on appropriate technology buildings, energy and water and sanitation.

www.fscoax.org and www.fsc-uk.demon.co.uk - Forest Stewardship Council, for information on sustainable timber.

CASE STUDY

Environmentally sound buildings at Chumbe Reef Sanctuary, Zanzibar

Chumbe Island has a variety of buildings: seven tourist eco-bungalows, visitor and education centre, library, dining areas, kitchen, office, beach shelters, staff accommodation, maintenance shed, snorkel hut, boat maintenance stores, compost recycling area and historic buildings (lighthouse and mosque). There is a separate head office on the mainland of Zanzibar.

The eco-bungalows are built 50m from the high-water mark, have an open front to maximise air circulation (no fans or air-conditioning) and the roofs have maximum surface area for rainwater collection. Construction uses local materials (mangrove and termite treated *Casuarina* poles with palm-thatched roofs). Each building is a self-sufficient unit generating its own water and energy, with rainwater catchment and filtration, solar water heating and photovoltaic electricity. The decentralised energy and water generation helped lower building costs and minimized environmental impact.

There is no natural source of freshwater so rainwater is collected in tanks under each eco-bungalows, visitor centre and staff quarters and filtered through natural gravel and sand. Seasonal rains are usually sufficient to maintain the supply all year round. The eco-bungalows and staff quarters have composting toilets (see sheet K2), so there are no flush toilets or septic tanks. Wind-powered extraction fans on the composting toilets create an outward draught that helps aerobic decomposition and extracts odours. Shower and kitchen grey water is channeled into clay-encased plant beds that absorb nutrients before the cleaned water drains naturally through the coral rag. Organic kitchen waste is composted and used in the toilets and grey water filtration plant beds. Any other waste is removed from the island.

Photovoltaic and solar thermal energy provides for lighting, water heating and VHF radio communication. The visitor centre and eco-bungalows are powered independently by 12V units consisting of 48W and 52W solar panels, regulators, solar batteries and energy-saving halogen bulbs. Solar-powered torches are provided for guests to find their way along the path to the visitor centre (approximately 100m) to prevent disturbance of nocturnal species.

www.chumbeisland.com