

REPUBLIC OF MAURITIUS

Ministry of Agriculture, Food Technology & Natural Resources

*Development of a Management Plan for the Conservation and Management
of Offshore Islets for the Republic of Mauritius*

Management Plan for Ile d'Ambre

Abbreviations

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| EIP | Environmental Investment Programme |
| IZM | Integrated Zonal Management |
| MoA | Ministry of Agriculture, Food Technology and Natural Resources |
| MoE | Ministry of Environment |
| MPA | Marine Protected Area |
| MWF | Mauritian Wildlife Foundation |
| NPCS | National Parks Conservation Service |

Foreword

This report represents a management plan for the Isle d'Ambre and Bernache. Ile d'Ambre is designated as a Plantation under the Forestry Service (MoA). It has been proposed by the Islets Task Force that Ile d'Ambre be included in the Islets National Park. Ile d'Ambre has been considered in conjunction with the neighbouring islet of Ilot Bernache (vested to the MoE). The Islets National Park Strategic Plan proposes that Ile d'Ambre has a Open status.

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The present document is the result of extensive consultations and visits to the various islets by a consultant team from the Belgium firm AGRER, which visited Mauritius from November 2003 through February 2004 and conducted a series of workshops, which considered the various aspects of the Strategic Plan for the 16 Islets that comprise the Islets National Park.

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| AGRER consultant team | |
|-----------------------|---|
| Dr Michael A K Smith | Team leader / conservation planning and management specialist |
| Dr Jeremy Hills | Biodiversity survey specialist |
| Vincent Florens | Biodiversity survey specialist |
| Ian Sotheran | GIS analyst |
| Dr Deolall Daby | Environmental assessment specialist |

**For the National Parks And Conservation Service,
Ministry of Agriculture,
Government of Mauritius**

Executive Summary

1. Ile d'Ambre is located on the northeast of Mauritius, and is approximately 5km from Goodlands. The 137 ha islet is positioned within the barrier lagoon, the closet part of the islet being approximately 400m from the mainland.
2. The islet is formed of low-lying basaltic rock, similar to the mainland area.
3. Most of the islet is covered with degraded forest; there are considerable fringing mangroves around the islet. There are small numbers of native palms which at present are not regenerating.
4. The islet has populations of the tenrec hedgehog and invasive mammals species, such as rats, shrews and cats.
5. The terrestrial ecosystem has relatively high biodiversity; however, most species are exotic. The system functions effectively and is not fragile.
6. The marine area can be divided into relatively pristine biotopes on the seaward side, with relatively degraded biotopes on the landward side. This degradation is probably caused by high sediment load from land sources.
7. A **Marine Protected Area (MPA) is proposed** on the seaward side to encompass most of the coastal biotopes in the area. It is proposed that access by boat travel and educational and recreational use is allowed within the MPA, but degrading activities such as reef fishing, fishing with fine nets and anchoring are banned. The southern perimeter of the proposed MPA borders on the northern edge of an existing Riviere du Rempart - Poudre d'Or Fisheries Reserve. A dialogue with local users is proposed.
8. In the development of the plan the neighbouring islet of Ilot Bernache is included, as there are existing plans for development. It is proposed to link Ile d'Ambre to Bernache, to allow infrastructure developments planned on Bernache to be constructed on Ile d'Ambre. This raises the carry-capacity of Ilot Bernache as well as reducing risk to infrastructure during cyclonic periods.
9. An Integrated Zonal Management (IZM) plan is proposed, in which zones are dedicated to education and public awareness, recreation and conservation.
10. It is proposed that a **local assembly** is set up, made of local stakeholder groups, including fishermen and boat-operators, as well as groups with conservation and education interests. The assembly will be facilitated by a local government officer to deliver participatory co-management
11. A Logical Framework is proposed to deliver activities under the following areas :
 - Conservation.
 - Construction of walkways and educational signage.
 - Infrastructure developments for camping and day visitors.
 - Reduction of fire hazard.
 - Local awareness and negotiation on role of MPA.
 - Setting up and managing of the Local Assembly.

1. General Description

1.1. Introduction and General Information

1.1.1. Location

Ile d'Ambre is located on the northeast of Mauritius, and is approximately 5km from Goodlands. The islet is positioned within the barrier lagoon, the closest part of the islet being approximately 400m from the mainland (S 20° 02.111', E 57° 41.833'). Between the islet and the mainland there are a number of other small islets, up to 200m wide, including Ilot Calmi. Ilot Bernache, a commonly visited islet, is situated approximately 200m north-east from the northern tip of Ile d'Ambre. Ile d'Ambre covers an area of 137 hectares.

1.1.2. Map Coverage

Ile d'Ambre is covered by Sheet 2 (Rivière du Rempart) of the 1:25,000 Edition 2 (1990) maps published by the Government of the United Kingdom for the Government of Mauritius. The aerial photography was carried out by Hunting Survey Limited 1975. Additional information was supplied by the Ministry of Housing, Lands and Town & Country Planning.

The Ministry of Housing, Lands and Town & Country Planning has produced a 1:5,000 map of the islet, which shows the major biotopes.

1.1.3. Photographic coverage

The Ministry of Housing holds aerial photographs taken in 1997, which cover Ile d'Ambre. NPCS now has digital copies of these.

1.1.4. Land Tenure

The land is presently tenured by the Forestry Commission.

1.1.5. Access

The gently sloping terrain of the islet makes for easy landing in a small boat in many places. There are more than 20 open boats which anchor close to the mainland in the lee of the island (in an area known as Bassin Trou Polite). Two concrete quays are present, probably constructed for past coral mining activities. These boats are used for fishing as well as for taking visitors to Ilot Bernache, but can be hired for access to Ile d'Ambre.

The main access point is a promontory about 400m from the mainland anchorage (S 20° 02.11', E 57° 41.833'), where the natural sloping rocks permit boats to get close into shore. Small piers made out of rocks have also been constructed on the islet to allow access from boats, these can be found on the north side (S 20° 02.158', E 57° 41.833') and the south side (S 20° 02.537', E 57° 41.689').

A new tarmac road has been constructed (completed December 2003), leaving the Goodlands to Poste de Flacq main road (B15) 2 km southeast of Goodlands and leading to the quays. This road construction has led to areas of devegetation. At present there is no construction at the end of the road by the quay area.

1.2. Environmental Information

1.2.1. Physical

Ile d'Ambre and Ilot Bernache are situated in a large **lagoon system**, enclosed by a barrier reef. The lagoon extends approximately 6km north to Pointe Aux Roches and about 9km south to Pointe Aux Roches Noires. In certain places there are small natural breaks in the lagoon allowing boat access to the sea. The lagoon system is approximately 40km². The lagoon is primarily sandy-bottomed with areas of exposed basaltic rock, and a seaward barrier reef. In areas where flow is constrained by land masses, then flow rates are significant, e.g. through the channels on the west and east of the islet and between the northerly point of Ile d'Ambre and Ilot Bernache.

The 137 hectares of the islet are generally low-lying. The topography is gently undulating, the highest point on the islet being less than 20m. The islet is volcanic in origin, with underlying basaltic rock; large and small basalt boulders are common. The geological nature of the islet is similar to the mainland area; the soil is a sandy red-soil with little organic matter. On some of the headland areas the soil is quite shallow.

The islet has a highly convoluted coastline, with many promontories and protected shallow bays. There are no extensive areas of sandy beaches, though there are a few small sandy bays. There are a number of brackish ponds and extensive areas of occasionally flooded mudflat and swampy areas. In addition, there are a number of small islets and outcrops on the western side of Ile d'Ambre. The islet is protected by a barrier reef, situated about 1.5km from the northeast coastline of Ile d'Ambre.

The islet has a number of pathways, which allow easy access to most areas of the islet. These pathways are presently kept clear of invading plants by the Forestry Service. Many of the scattered basaltic rocks have been used to make edges to the major pathways. The only area not served by major pathways is the northern peninsula, where a small path peters out in thorny scrubland. However, access into much of the forest is difficult once you stray from the main paths, due to heavy and thorny undergrowth.

(Flora see species list available on spreadsheet at NPCS).

1.2.2. Biological

1.2.2.1. Terrestrial

General Biotopes

Most of the vegetation can be described as **exotic degraded forestry**; the islet had been managed as a plantation of *Tecoma*, *Filao* and *Arucaria*, and these are still the dominant the vegetation. There is composite plant undergrowth habitat, especially on the slopes of the forest near the coastal margin. A few individuals of native *Latania* palm still survive, which although not regenerating has the potential for regeneration.

The island has some interesting features including an expanse of seasonally freshwater marsh, and a brackish water sinkhole). There are fresh water springs close to Poudre d'Or, which possibly indicates that the water table is either very close to sea level in this area, or that the fresh water is running through lava tunnels to the sea. It is possible that the sinkhole is linked to part of this system There is also a salt pan on Ile d'Ambre which is only flooded at extreme high water, representing an inland hypersaline salt marsh and associated species, unusual in this area. These sites may be unique and important to local biodiversity therefore require investigation with a view to their restoration.

The **proximity of the fresh water table** in this area possibly makes it more vulnerable to point source and general pollution, which may be discharged, from the nearby textile factories and the municipal dump. This requires further investigation.

The shoreline is complex of the coastal area there are considerable lengths of **inter- and supra-tidal habitat**. In the islet bays and some of the more protected areas of the islet there are mangroves.

There are areas, which have been cut back, and the cut branches are laid in piles on the ground, this creates a significant fire risk. This practise should be ceased, and existing piles should be cleared

During a visit in December 2003, small mammal trapping was carried out (details in Appendix A). The trapping was carried out using commercially available "kill-traps" supplied by NPCS. A total of 21 small mammals were caught, of which 19 were identified as Black or Ship rats (*Rattus rattus*). The extensive trapping survey identified that there is presently a population of rats on Ile d'Ambre.

The capture rate of rats was moderate (~7.5%) and captures were made in all areas of the islet, suggesting a **modest infestation of rats** across the whole of the islet. Only two shrews

were caught in the trapping programme. As they are smaller and lighter, trapping inefficiency is likely to be greater for catching shrews using this type of trap.

Observations were made of other animals. Two, presumably feral, cats were observed on separate parts of the island. In addition, two tenrec hedgehogs (*Tenrec ecuadatus*) were observed during night surveys by torchlight.

In addition, a number of reptile species were observed:

Hemidactylus renatus

Callitrus verisocolor

Fellisima (green gecko)

Phelsuma ormos

Other reptile species might be present but were not observed during the fieldwork.

Summary Terrestrial Biotopes

1. Mangrove influenced: - This biotope encircles most of the islet. The dominant species is the mangrove *Rhizophora mucronata*, with the occurrence of few individuals of another mangrove species *Bruguiera gymnorrhiza*. Behind the mangrove belt, other native species occur such as *Thespesia populnea*, *Pemphis acidula*, *Zoysia* and *Hibiscus*; some *Casuarina* can occur in these areas.
2. *Araucaria*: - This is a plantation having a triangular shape and usually well delineated. The alien *Leucaena* is the dominant species in the undercover, where *Flacourtia*, *Ehretia*, and *Cissus rotundifolius* can also be common.
3. *Casuarina* dominated: - *Casuarina* dominated biotope are restricted to areas next to the coast where they were originally planted. Some natural regeneration is apparent. *Flacourtia* occurs in the under storey, but in rocky areas, grasses and Cyperaceae usually takes over such as *Zoysia* and *Fimbristylis cymosa*.
4. *Tabebuia* dominated: - This is the **main biotope of the islet**. It is a plantation of tecoma which can take different aspects depending on whether it is invaded in the under storey mainly by acacia (*Leucaena*), aloes (*Fucraea*) or prune malgache (*Flacourtia*). A large variety of other species, herbaceous as woody, occurs in this biotope. In areas next to the coast, filao (*Casuarina*) can be found also. The endemic Bois pipe (*Ehretia petiolaris*) is sometimes to be found in this biotope.
5. *Tectona* dominated: - with some *Dalbergia* and occasional *Santalum*.
6. *Dalbergia* dominated: - Dense plantation invaded by *Leucaena*, with occasional *Santalum*
7. *Leucaena* dominated: - Almost pure *Leucaena* patches. In one of the patches there is what appears to be a plantation of the endemic palm, *Latania loddigesii*.
8. *Santalum* dominated: - Inland, this biotope includes the endemic *Ehretia*, but closer to the coast, it tends to be invaded mainly by *Fucraea* and *Casuarina*.
9. Mango orchard: - Mango trees are far apart, mixed with *Leucaena* and occasional *Santalum*, *Tabebuia* and *Ehretia* and other woody species. Closer to the coast *Casuarina*, *Schinus* and *Flacourtia* tend to become more important.
10. Ponds: - The composition varies in relation to the size. The species always present is *Acrostichum* with the following trees growing nearby: *Tabebuia*, *Casuarina*, *Flacourtia* and *Pongamia*. Also the only place where the *Adiantum* fern was found.
11. Wetland: - Mainly herbaceous vegetation like *Sesuvium*, *Ludwigia* (herbe des mares), *Solanum*, *Ageratum*, *Vernonia*. *Thespesia* seems the only large tree truly associated with this biotope.

12. Swamp: - It has a good population of some native species like *Rhizophora*, *Thespesia*, *Cassytha*, *Zoysia* and *Ehretia*. The main alien species are *Tabebuia*, *Santalum*, *Pongamia*, *Cordia*, *Flacourtia* and *Fucraea*.
13. Salt pan: - Most of the area has no vegetation.
14. Flooded areas: - The inner composition is mainly the halophytic *Zoysia* and *Sesuvium*, with some occasional *Fimbristylis cymosa*. Around the ponds *Thespesia*, *Ehretia*, *Casuarina*, *Tabebuia*. *Pongamia* is occasional.

1.2.2.2 Coastal and Marine

General

Ile d'Ambre and its associated islets effectively form a basaltic ridge straddling the lagoon, separating the mainland of Mauritius from the **fringing coral reef**. The lagoon to the north and south is predominantly sandy bottomed and has an average depth of 4m, except where basaltic outcrops provide harder substrate with 1.5 to 3 m water depth. Benthic flora and fauna is mainly associated with these rocky areas in shallower water.

The coral reef protects the shallow lagoon and has a well developed outer spur and groove zone and an algal ridge. During the survey of the lagoon carried out by the consultants, the algal ridge had a high cover of macroalgae. In contrast to many areas within the lagoonal system of Mauritius that have extensive beds of branching and tabular corals (e.g. *Acropora ormosa*, *A. cytherea*, *A. hyacinthus*) and patches of *Pavona*, *Porites*, *Platygyra*, *Galaxea*, *Montipora*, Ile d'Ambre lagoon is a relatively impoverished hard coral community, consisting predominantly of beds of *Galaxea* spp. Seagrass (namely *Syringodium* sp and *Halophila* sp) occurs in small patches in the lagoon. Much of the Ile d'Ambre shoreline is fringed by a well-developed stand of mangroves.

The reef around Ile d'Ambre should be considered in light of two general types of impacts, which are common to the Mascarene reefs:

- **Bleaching events:** Coral bleaching, which is characterised by the expulsion of symbiotic algae (zooxanthellae), is an increasing problem worldwide. Evidence suggests that Mauritius was affected by increasing sea surface temperatures during the first quarter of 1998. However, corals at Mauritius did not suffer mass bleaching. Although up to 40% of coral colonies did bleach on some reefs and in lagoons, these colonies recovered quickly resulting in low coral death. The high survival rates were due partly to the overcast and windy conditions prevailing during much of February and March 1998, when the cyclone Anacelle was in the region and which mitigated the warming impacts observed elsewhere further north of Mauritius.
- **Socio-economic effects.** There has also been direct damage to the reefs – blast fishing was a problem in the past and anchor damage by fisherman boats continues. Large areas are also affected by crown-of-thorns starfish, which have undergone population explosions since the early 1980s. Coastal development to cater for tourism has added significant impacts, notably through pollution and removal of seagrass for swimming areas, but also through coral and shell collection for sale to tourists as well as direct diver impacts. Many lagoons and reefs are already over fished and heavily degraded due to light industry, fertiliser, pesticide run-off and sewage. While bleaching has not caused major additional degradation, it is considered that the **reef system** has been weakened and is **extremely vulnerable to future events**, threatening fishing and tourism industries.

Ile d'Ambre Marine Biotopes

Montaggioni and Faure (1980) described the profile of the lagoon-reef complex at Ile d'Ambre from a survey carried out by snorkel-diving and analysis of aerial photography of the site. Moving from the mainland shore towards the coral reef, they identified the following main habitats/biotopes: mangrove and muddy sand, seagrass bed of *Syringodium* sp and *Halophila* sp, mixed colonies of hard coral amongst reticulating channels, *Thalassodendron* sp, sand

accumulation, field of coral debris extending up to the back reef, reef flat and reef front with sloping spur and groove zone.

A broad scale survey of the lagoon and reef surrounding Ile d'Ambre conducted in December 2003 by the consultants revealed seven biotope types, which can be considered to characterize the benthic flora and fauna present. Biotopes on the landward side of the lagoon are probably constrained by their tolerance to more turbid waters, probably caused by riverine outflow (possibly the Citronniers River) from the south. This turbid water is probably held close to shore by the water overflowing the reef from the open ocean. In contrast biotopes on the seaward margin of the lagoon would be determined by the flushing of oceanic water across the fringing reef.

Seven general biotopes were identified from a lagoon survey in December 2003. This survey was a rapid boat / snorkelling based survey in combination with aerial photographs. The results identify the main biotope groups and their spatial mosaic and should be used as baseline information for monitoring and for basing further and more detailed work.

The following 7 biotopes were identified:

1. **Galaxea stands** – Basaltic outcrops on the landward side of the lagoon were colonised by large stands of *Galaxea* spp. separated by sandy channels. The presence of fragmented pieces of coral on the seafloor was evidence of substantial physical disturbance to the *Galaxea* stands. *Galaxea* is often found on reef flats and relatively turbid environments in other reef locations and its presence on the landward rock outcrops in the vicinity of Ile d'Ambre is probably a consequence of substrate availability and turbid waters from the river outflow.
2. **Mixed Galaxea & Phaeophyta stands** – Basaltic outcrops to the seaward side of the lagoon with small *Galaxea* spp. Colonies and Phaeophyta (brown algae) – probably *Padina* spp. Other coral species (e.g. *Porites* sp) present in this area are characteristic of reef flat/back reef areas. . The presence of other coral species and fleshy algae in these areas reflects the flushing affect of clear oceanic water.
3. **Shallow seagrass** – Shallow (<2m) zones particularly in sheltered areas adjacent to land were characterised by seagrass beds of *Syringodium* sp and *Halophila* sp. Such shallow and sheltered areas were characterized by sedimentation and supported some algae (including bubble algae). Small coral colonies (e.g. *Porites* sp) also colonized basaltic rock, which was exposed from the surrounding sandy bottom.
4. **Reef Flat** – The reef flat (a high energy zone) was characterised by a mixed community of filamentous green algae and fleshy brown algae (probably, *Padina* sp.) No live coral colonies were present on the exposed and bare rock, although small coral colonies (probably *Porites* sp.) could be found around holes and spaces in the substrate where they would be protected from the strong water movement
5. **Back reef** – Immediately behind the reef flat the water was slightly deeper and clear. This zone supported a mixed community associated with the exposed rock, which consisted of filamentous and encrusting algae attracting the sea urchin *Diadema* sp., encrusting coral (probably *Porites* sp.) and sponges. Sandy bottomed channels occurred between the exposed rocks. The lack of any colonisation on the sandy substrate is probably a consequence of the flushing effect of water crossing the reef into the lagoon.
6. **Thalassodendron beds** – Areas adjacent to land as well as those exposed to strong water currents were associated with beds of the seagrass *Thalassodendron* sp.
7. **Lagoon channels** – The lagoon channels are predominantly sandy-bottomed with some fleshy algae and sponges, particularly in areas with exposed rock.

Designation of a Marine Protected Area

The Task Force Report suggests designation of a 1km marine buffer zone around each of the islets. This marine buffer zone has two roles; to support the enforcement activities and to protect the coastal and marine biodiversity. However, 1km *per se* may not be a suitable envelope to encompass the important coastal and marine biotopes associated with the islets.

Part of the present day valuable resources for conservation at Ile d'Ambre is associated with the coastal fringe (mangroves and mud flats) and the shallow marine areas. Consequently, it is important that protection and management be conferred to this area as well as the terrestrial zone. In addition, the proposed status of the Ile d'Ambre, as stated in the Islets National Park Strategic Plan, is as an Open Reserve. Therefore enforcement to limit access to the islet is not an issue, and the marine zone should be considered as primarily having a protection and conservation function for Ile d'Ambre and Ilot Bernache. Thus the area will be termed a Marine Protected Area (MPA), rather than a Marine Buffer Zone, as used for islets where enforcement is the main role of the marine designation.

Designation of the area of the MPA needs to be considered in an ecological sense. However, it is apparent from the coastal survey work that the main factor that impacts on the coastal communities is highly turbid water and sedimentation, derived from sources external to the MPA area. This means that any management restricted to the 1km MPA area could well be overshadowed by sedimentation processes. Consequently, it is proposed to **designate an area around Ile d'Ambre** which:

1. Encompasses most of the biotopes, and their inherent biodiversity.
2. Encompasses all of the high biodiversity biotopes.
3. Through spatial designation, minimises the impact of the major uncontrollable factors degrading the coastal communities.

The proposal is to include the biotopes, which are found in the relatively clear water of the seaward area of Ile d'Ambre, but leave out the landward degraded communities. This means that the MPA area would cover from the southern most point of Ile d'Ambre due eastwards to the 20m contour beyond the barrier reef, and from the rock outcrop 500m north of Ilot Bernache, eastwards to the seaward 20m contour of the barrier reef. Designation of this boundary means that boat access to Ile d'Ambre, and the proposed landing on Ile d'Ambre for access to Ilot Bernache can largely take place outside the MPA.

These proposed boundaries leave out the *Galaxea* biotope. These stands are highly degraded, probably due to a combination of cyclone impacts and sedimentation, and their existence is highly threatened. However, because it is unlikely that the main impact factors on this area can be managed, it would appear pointless to designate this area as a protected zone.

The MPA should allow boats to motor through it, for access to Bernache etc. However, anchoring of boats, the "quanting" of boats using poles should be banned. Fishing activities should be limited in this area, following negotiation with local fishermen and the Ministry of Fisheries. Poaching activities, such as catching octopus should also be ceased, through increased awareness and enforcement by the resident warden and supported by the Coastguard.

The area should be used for swimming and other non-destructive recreational activities, as well as an educational resource. For example, for school groups and University courses can use it to learn about the dynamics of the benthic coral communities and the important role of mangroves in maintaining fish resources. Public awareness tours can also use this area to learn about the mosaic of biotopes and their importance in fisheries and ecological functioning of the whole lagoon system. The processes for developing wide ownership of the MPA are presented in the Logical Framework.

1.2.3 History

At present little has been obtained about the history of the island. It is presently forested. From present day evidence it is certain that much work has been carried out on the islet. The numerous pathways, many bounded by low walls, constructed from the basalt boulders, suggest that the area was at one time developed as a park or plantation garden. It has also been suggested that the islet was once a deer park.

There are some small ruins on the islet, this coupled to the remnant mango orchards, suggest that the islet was inhabited in the past, or used as a base for forestry on the islet. The lack of drinking water may have made permanent habitation difficult. There are also signs of what are probably saltpans on the northern peninsula, though these presently do not appear to be used, as well an abandoned aquaculture development in a bay on the southern side of the islet.

2. Evaluations and Environmental Impact Assessment

2.1. Evaluation of Features

2.1.1. Terrestrial

| Character | Comments |
|---------------------|---|
| Size | <p>Isle d'Ambre is 137 hectares, with a considerable length of coastline due to the convoluted shape of the island. Compared to other islets in the northern region it is smaller than Flat (253ha), Round (169ha), but larger than Gunners Quoin and the other islets off the north coast of Mauritius.</p> <p><i>The size of the islet suggests that it has significant potential for long-term viable populations of reptiles, birds and plants.</i></p> |
| Biodiversity | <p>The islet is quite diverse in terms of species, compared to the islets off the northern coast of Mauritius. However, most of the islet vegetation consists of exotic species, including most of the planted tree species and the invasive rat and shrew. Thus the biodiversity is relatively high; however, the conservation value of the islet remains low, due to the few rare or endemic species.</p> <p><i>The islet has relatively high biodiversity, but it largely consists of exotics.</i></p> |
| Naturalness | <p>Most of the islet is forested and thus not natural. Little of the natural forest that might be expected on such an islet remains, and regeneration appears to be poor in the <i>lantania</i> palms. However, much of the mangrove coastal fringe is natural as it has not been forested and some of the vegetation on the exposed headlands although it has been impacted by exotic species such as <i>Flacourtia</i>.</p> <p><i>Almost all of the forest on the islet is not natural, however much of the coastal fringe is relatively natural and some of the vegetation on the exposed headlands.</i></p> |
| Rarity | <p><i>The islet presently harbours few rare species.</i></p> |
| Fragility | <p>As a whole the Ile d'Ambre ecosystem is not fragile. Its reasonably fertile soil, coupled to extensive forest cover, means that the ecosystem is in a relatively stable but unnatural state. Certain areas, with large trees are relatively fragile to cyclones. The remaining <i>Lantania</i> population is fragile, due to poor regeneration, probably due to rats.</p> <p><i>The ecosystem is not fragile, however, the <i>Latania</i> palms population is fragile in the long term as it presently seems to be unable to regenerate.</i></p> |

| | |
|-------------------------------|--|
| <p>Potential Value</p> | <p>The islet has considerable potential in terms of conservation, as it is large, varied and has a stable soil base. However, the present ecosystem is of little value thus the potential value can only be increased through active conservation management; this is likely to involve extensive resources for relatively small gains, especially in the initial stages of a conservation management programme. In addition, its many access points and closeness to the mainland and Ilot Bernache mean that securing the island to visitors or rodent invaders is difficult. Compared to the inherent conservation value, and relative spatial security, of the northern islets (e.g. Round and Gunners Quoin), the <u>relative</u> potential value for conservation is low.</p> <p>The islet also has potential value as an educational resource and a recreational amenity.</p> <p><i>The potential conservation value of the island is high, however, to achieve this would require significant resources and large-scale ecosystem modifications. The potential conservation value is relatively low compared to the northern islets. The islet has potential value as an educational and recreational amenity.</i></p> |
| <p>Public use</p> | <p>Although visiting the islet is relatively easy by boat, there are few visitors. Most visitors in the area tend to go towards the sandy beaches of Ilot Bernache. A few tourists have been encountered on the islet, dropped at one end and picked up at the other by boat. The islet is used by some local rod and line fishermen and also for illegal collection of octopus.</p> <p><i>The islet is presently little used by tourists or local people.</i></p> |

2.1.2. Coastal and Marine

The evaluation of features concerns the area designated as MPA

| Character | Comments |
|------------------------|---|
| Size | <p>The proposed MPA area is relatively small compared to the whole of the lagoon however, it contains a wide range of habitats in relatively pristine conditions. It is probably large enough to maintain these communities, if the levels of impacts remain the same as at present.</p> <p><i>The size of the proposed MPA encompasses most of the communities of the lagoon.</i></p> |
| Biodiversity | <p>The MPA is relatively diverse compared to the area closer to land from Ile d'Ambre and comparable areas in the lagoon. Part of this is due to coastal fringes of the islets of Ile d'Ambre and Ilot Bernache and associated basaltic outcrops, which form a complex mosaic of habitats. Although the coral biodiversity is relatively high for the lagoon, it is relatively low compared to alternative and less impacted areas in other lagoon settings.</p> <p><i>The islet has relatively high biodiversity compared to the remainder of the lagoon, however, the lagoon is partially degraded.</i></p> |
| Naturalness | <p>Much of the designated MPA appears to have a high degree of naturalness, although it is probable that the fish component and some target poached invertebrate species are relatively depauperate (though these were not surveyed). Compared to the island area, which appears to have been impacted by increased sedimentation from anthropogenic activity on the mainland, the MPA area is considerably more natural.</p> <p><i>The designated MPA is relatively natural, although some faunal species are likely to be relatively rare due to hunting and fishing activities.</i></p> |
| Rarity | <p>No data was available to assess rarity; no rare species were identified during the general biotope survey.</p> <p><i>Unknown.</i></p> |
| Fragility | <p>The MPA is relatively fragile in relation to a number of factors. Cyclones can potentially have a significant impact upon a relatively exposed MPA. In addition, human-induced impacts can significantly affect the MPA, in particular, eutrophication through pollution and sedimentation from land-runoff. However, the designated MPA boundaries, due to hydrodynamics, would be expected to be at low risk from eutrophication and sedimentation from the mainland, although cyclone impacts could be potentially high.</p> <p><i>The ecosystem is potentially fragile, although its position protects it from the main anthropogenic impacts.</i></p> |
| Potential Value | <p>The MPA has potential value as a conservation area, due to the highly mosaic benthic biotope distribution. Although the coral species identified are relatively common in the MPA, they are in good condition and thus deserve a degree of protection.</p> <p><i>The mosaic of healthy benthic habitats has conservation value.</i></p> |
| Public use | <p>The MPA area has potential value for recreation by the public and visitors. Minor impacts through this activity are likely to affect the benthic communities, however, they will be relatively insignificant and localised. In addition, recreation / commercial fishing and poaching for invertebrates (e.g. octopus) is likely to impact upon target species in the MPA.</p> <p><i>The MPA area has use for recreation activities as well as fishing / poaching.</i></p> |

Ile d'Ambre has one other significant feature, which is relevant to conservation: *connectivity* with the lagoon system. Many of the islets in the proposed National Park are of high conservation value because they have remnant populations which escaped from some of the mainland pressures, such as urbanisation and sugar cane plantations, due explicitly to their islet isolation. However, many of the endangered species are not specifically coastal (e.g. Pink Pigeon, Kestrel, Ornate day gecko, Lesser night gecko, Bottle palm), but exist on the islets because they are isolated from major forces of development on the mainland. Ile d'Ambre is different in that much of the conservation value, biodiversity and aesthetic value is associated with the coastal fringe, particularly the mangroves and the shallow corals. Consequently, Ile d'Ambre is closely associated and connected with the larger scale lagoon functioning: tidal hydrodynamics, sediment flux and water quality. Thus **consideration of the conservation value of Ile d'Ambre needs to be always considered in the wider lagoonal context.**

2.2. Impact Assessment

The islet has been heavily impacted. Most of the natural vegetation has been removed and planted with forestry trees. Compounded to this is the ongoing impact and spread of exotic shrub species (e.g. *Flacourtia*). In addition, rodents have invaded the islet and have had a negative impact upon tree regeneration and predation of bird eggs.

The degenerating *Lantania* palm population, coastal fringe vegetation (including mangroves) and some exposed headlands represent the remains of original native habitats. These areas are still sensitive to future impacts and protection / management should be carried out to ensure that they are maintained.

The lagoon on the landward side is somewhat degraded and the water is turbid; this possibly arises from four activities that are nearby:

- Textile industry at Poudre D'Or, which apparently has a wastewater bio-filter in the lagoon, which requires monitoring and assessment in order to ascertain the viability of this type of pollution control in lagoon systems.
- A sugar plantation on the mainland shore adjacent to Ile d'Ambre may be causing increased sedimentation in the lagoon as well as being a source of increased nutrients in the lagoon.
- A substantial landfill site, which is the receptacle for all rubbish from Goodlands, and other communities in the area including Grand Baie, is situated on the coast near Poudre D'Or. This possibly results in leaching of substantial quantities of serious pollutants into the lagoon with unknown impacts for the future.
- Increased land run off; a consequence of the building of the new road and accompanying removal of vegetation from adjacent plots.

Due to the hydrodynamics around the islet, the impact area is restricted to the inshore, the areas between Ile d'Ambre and the barrier reef remain relatively unimpacted at present, though they are susceptible to cyclonic storms.

2.3. Management Objectives

A number of future management scenarios are proposed and critically evaluated.

Fig 2.1. Possible future management objectives for Ile d’Ambre.

| Management approach | Management objective | Possible actions required | Final conservation value | Resources required | Strengths | Weaknesses | Net cost |
|--|---|---|---------------------------------|---------------------------|--|--|-----------------|
| <i>Maintain present management</i> | Maintenance of existing pathways | <ul style="list-style-type: none"> Existing path cutting by labourers | Low | Low | None | <ol style="list-style-type: none"> A maintenance option, not providing added value. No income generated. | - |
| <i>Conservation management</i> | Restore Ile d’Ambre to a palm – tree woodland, and introduce relevant endangered endemics | <ul style="list-style-type: none"> Rodent eradication. Extensive felling and planting. Ongoing removal of exotic plant species and possibly rodents. Introductions / reintroductions need to be monitored and managed. | High | Very high | <ol style="list-style-type: none"> Provide an extensive area of natural vegetation and associated rare endemic species. Use as a safe haven for certain endangered species | <ol style="list-style-type: none"> Huge resources required, probably better placed onto other northern islets. Probable further invasions of exotics (plants and rodents) which need to be continuously managed. No income generated. | --- |
| <i>Educational and recreational management</i> | Develop Ile d’Ambre to provide an educational experience for visitors | <ul style="list-style-type: none"> Develop appropriate signage / visitor activities and guided routeways. Develop licensed user group among the boatmen to support islet management. Implement a marketing strategy to schools, Mauritians and through International hotels. | Low/ medium | Low | <ol style="list-style-type: none"> Provide income from islet to local community. Increase awareness of conservation issues to visitors. | <ol style="list-style-type: none"> Conservation value of islet not enhanced. Possibility of visitor impact if poorly managed (e.g. Ile Foquet). Activities fringe to core conservation activity of NPCCS. | - |

| | | | | | | | |
|------------------------------------|--|---|--------|---------------|---|---|--|
| <i>Integrated zonal management</i> | Develop both conservation and educational value together in a mutually compatible way. | <ul style="list-style-type: none"> • Selective zoned felling and planting and management of invasive exotics. • Selective species introductions / re-introductions. • Develop appropriate signage / visitor activities in selected areas. • Develop licensed user group / lease arrangement. • Implement a marketing strategy to schools, Mauritians and through International hotels. | Medium | Medium / high | <ol style="list-style-type: none"> 1. Provide income from activities to local people and also to support NPCS activities. 2. Increase awareness of conservation issues to visitors. 3. Provide an extending area of natural vegetation and associated rare endemic species. 4. Use as a safe haven for certain endangered species | <ol style="list-style-type: none"> 1. Possibility of visitor impact if poorly managed 2. Requires management of licenses/leases | |
|------------------------------------|--|---|--------|---------------|---|---|--|

Four management options have been proposed: maintain present management, enhance conservation value, develop educational and recreational value and an integrated zonal approach which is a hybrid between the educational / recreational approach and conservation. It is possible to assess these options in a number of ways, however, it appears that two criteria are paramount: enhance conservation value and resourcing issues.

Taking a pure conservation enhancement approach suggest that the conservation management option should be followed. It is probable that NPCS have the resources to achieve this outcome, however, this would require the cessation of most activities on the other northern islets (in particular Gunners Quoin and Flat). It has been stated (Section 2.1) that the potential conservation value of Ile d'Ambre is lower, relative to the other northern islets. Consequently, following a conservation management route, would have a significant negative impact on other conservation activities and also overall. Thus, with proposed level of staffing at NPCS, following a pure conservation approach for Ile d'Ambre is untenable.

Two further options, maintain existing management and development of educational / recreation without conservation enhancement, do not achieve the overall goal of NPCS or the proposed Islets National Park.

The final option is the **Integrated Zonal Management (IZM)**, a hybrid **between an educational / recreational approach and a conservation approach**. It is suggested that, due to the size of Ile d'Ambre, these activities can be managed in a mutually compatible way through zoning. It is proposed that the islet be zoned for visitor areas and for conservation enhancement. In the long-term, a tourist / visitor entrance fee could be used to partly cover the costs of maintenance of the islets; ensuring inherent sustainability. If the demand was sufficient this could be achieved through a leasing/licensing approach coupled to contractual maintenance of environmental standards and environmental covenance.

In addition, **Ile d'Ambre should not be considered functionally separate from Ilot Bernache, in terms of ecological functioning, and with respect to planning**. The Ministry of Environment (MoE) in collaboration with the Department of Police are planning to develop Bernache as a public recreational facility. The recent "Inception Report and Preliminary Design for Ilot Bernache, Ministry of Environment November 2003" proposes the development of infrastructure (cabins, ablutions, tracks), further tree planting and construction of a bridge with erosion control between the two Bernache islets. The Inception report identifies that wilderness; seclusion and adventure are some of the main attributes of Bernache, but notes constraints on development of Bernache due to its small size, exposure and sensitivity to environmental degradation; the islet is exposed to cyclones and is so low lying that much of the area becomes inundated during storms, which poses a substantial risk to any infrastructure.

Bernache, has both day and overnight visitors but as a small island has limited carrying capacity. Ile d'Ambre is about 30 times larger than Bernache and is less susceptible to storm damage. Consequently, it would be possible to use some of the land area of Ile d'Ambre to support infrastructure, which would then help maintain the "wilderness" resource of Bernache.

It is proposed that most of the overnight infrastructure for camping and coastguard huts detailed in the "Inception Report and Preliminary Design for Ilot Bernache" could be developed on the northern end of Ile d'Ambre. This area has relatively deep water and sheltered access for boats, a hard rock base and coastal area resistant to erosion and higher lying land, which will be less sensitive to cyclones.

Taking developments on Bernache into account thus modifies the proposed Integrated Zonal Management by the addition of recreational facilities, which help to maintain activities on Bernache. IZM proposed by this plan combines conservation, educational and recreation.

2.3.1. Stage I Development

This focuses on the development of recreational infrastructure. This plan is a modification of that proposed in "Inception Report and Preliminary Design for Ilot Bernache, Ministry of Environment November 2003". The main modification is the recommendation that the infrastructure of cabins, campsite, etc. be moved to the northern end of Ile d'Ambre, thus limiting the construction on Bernache. This will allow an enlargement of the over-night

facilities and will leave Bernache in a more natural state, enhancing its recreational value. Also the infrastructure will be less susceptible to cyclone damage as Bernache is reportedly flooded during cyclonic tidal swells.

The plan is to develop eco-friendly camping and cabin provisioned with water, basic amenities and barbecue. There will be two levels of camping, passive luxury and active youth. Composting toilets are recommended. Landing jetties will reduce the damage caused by beaching boats, barbecue and picnic areas will be rationalized to prevent accidental fires and reduce litter. The island will be planted with additional shade trees. The expansion of the scheme to Ile d'Ambre will require an additional bridge to Ilot Bernache and an additional jetty. The gate will now separate the proposed Nature Park of Ile d'Ambre (Phase II) from the recreational facilities. There will be an additional watchman hut on Bernache and near the entrance jetty to Ile d'Ambre, as well as the Coastguard Office.

Ile d'Ambre can be joined to Bernache via a footbridge across the narrow (10-15m) channel. This should be arched to permit fishing boats to use the channel as access to the outer lagoon. Both spans of the bridge would be on hard basaltic rock and thus not prone to erosion. If the northern part of Ile d'Ambre can be used for the overnight infrastructure, development on the sensitive environment of Bernache can be limited to toilets, BBQ's and associated woodstore, sunshades, and a warden's hut.

The original plan proposes a bridge across the existing two parts of Bernache. This walkway should traverse onto the higher areas of sand rather than the low sloping area to limit erosion by trampling, and allow the intertidal and supra-tidal grass cover to be maintained. In addition, the proposed plans for Bernache suggest anti-erosion construction across the channel by this bridge. The value of this should be questioned, both in terms of the requirement for anti-erosion measures if the footbridge allowed water to pass beneath, as well in terms of secondary impacts, namely increased erosion, upon the southern beaches on Bernache, where beach recharge schemes are also proposed.

Care must be taken during construction to avoid unnecessary damage to the fragile environment, especially along the beach edge. Heavy equipment must be limited.

A major challenge for this project will be the long-term monitoring and management of the facilities and environment to ensure a balance between user groups, tourism and island ecology.

2.3.2. Stage II Development

The development of Bernache and the northern part of Ile d'Ambre as primarily a recreational area can be considered as Phase 1 of the management plan. The second phase is dependent on the demand for the remainder of Ile d'Ambre as a **Nature Park and Educational Field Centre**. This part would arise from the development of environmental studies in the primary and secondary school curriculum and from an increase in environmental studies and conservation work at the University of Mauritius, outlined in the Islets National Park Strategic Plan. The level of investment required to develop such a centre, is relatively high and **should not be considered without a strong justification and certainty of demand for such a centre**.

Ile d'Ambre and its adjacent lagoon is particularly useful as an area for introducing education and training initiatives as it lies adjacent to a heavily populated area, and yet is easily accessible for field visits. The islets and lagoon contains a wide variety of terrestrial and marine habitats that will provide students, researchers and visitors a good, practical introduction to the environment, together with some unique habitats that can be developed as special features. This can be facilitated by guided walks and information boards on the terrestrial and coastal environments of Ile d'Ambre.

The long-term objectives would include management of the marine and terrestrial habitats, with a strong involvement of the local community, local authorities and Non Governmental Organisations (NGOs). Ensuring an appropriate and sustainable management approach through research and education, utilising this bio-region and its unique mix of habitats and anthropogenic activities as a teaching tool for school students, university students and youth and community groups. At the same time increasing community awareness and

understanding leading to the implementation of co-management strategies and local stewardship of the marine and terrestrial resources and biodiversity conservation. If appropriate, this model may then be applied to other areas in the region. These activities will be carried out through inter-agency cooperation between the Ministry of Environment and the National Parks and Conservation Service and the Albion Fisheries Research Centre.

The plan includes the construction and development of a Biodiversity Conservation and Interpretation Centre as a focal point for research, training and education activities; including a cafeteria and dormitory and camping facilities for visiting students. This centre should utilise sustainable local natural materials as much as possible in the construction.

Training

- Training for youth leaders and teachers in the use of the terrestrial and marine environment as an educational tool and to implement environmental monitoring and guided tours for youth and community groups, schools groups and tourists
- Environmental monitoring and management training for volunteer island wardens selected from local youth groups

Education

- Education for local youth groups and school children on the terrestrial and marine environment provided by the youth leaders and teachers
- Raising awareness of the local community, stakeholders and tourists to environmental issues through appropriate educational activities and the resource and interpretation centre

Management strategies

- Development and implementation of co-operative management strategies based on sound scientific imperatives
- Dissemination of information and community education initiatives leading to local stewardship and conservation of natural resources and biodiversity in the area, through stakeholders having a better understanding of the processes and the environmental issues at stake
- Production of guidelines for co-management and local community stewardship of natural resources and biodiversity in the area, relevant to all stakeholders, including tourist operators

Students and local groups could participate in restoration and conservation activities. For example, different plots could be given to different groups to survey and manage. A possible area for enhancement and protection is the area where the *Lantania* palms are found. It may be possible to develop a fenced off area, similar to the Conservation Management Areas on the mainland, which could be weeded and planted with other native vegetation. The fenced area could be regularly baited to rid it of rats. MWF is currently testing a superfence, which is alleged to keep out rats.

It would be relatively easy to manage, as long as it was regularly inspected and maintained. When the vegetation is established it could be open for visiting groups. If successful this plot would be a showcase; providing an example of what the vegetation on the islands should be like – educating and raising public awareness and also education – linking with the CMA projects on the mainland. In the long-term it may be possible to introduce tortoises as the natural grazer.

2.3.3. Proposed Zonation of Ile d'Ambre

The participatory workshops that developed the Islets National Park Strategic Plan recommended that Ile d'Ambre and Bernache **be designated as an Open Reserve**. That is a multipurpose island group that is open, under controlled access, to the public. Spatial zoning will facilitate management; the different zones signify different sanctioned activities, thereby ensuring adequate protection of ecosystem integrity, and conservation of fragile habitats and

areas of scientific interest. Zonation of the islets is primarily a management tool that allows clear understanding by all users and stakeholders in the Islets National Park, of what specific activities are allowed in which particular locations. The suggested zonation terminology has been developed with this in mind.

Zonation Scheme for Islets of Islets National Park

| | Management Zones | |
|----------|-------------------------|--|
| a | Protection Only | - Monitoring, protection and enforcement only |
| b | Restoration Only | - Conservation management only |
| c | Limited Public Access 1 | - Eco-tourism and scientific research, conservation management |
| d | Limited Public Access 2 | - Education and public awareness, conservation management |
| e | Recreation. | - Mainly recreation |

The zones¹ recommended for Ile d'Ambre / Bernache are as follows:

Limited Public Access 1 signifies a focus on development of the area for scientific experimentation in restoration techniques and eco-tourism; the zone characteristics indicate a relatively robust ecosystem, where such activities pose little risk to endemic species, either because of the low level of native species biodiversity or because they are well established and resilient. The relative robustness of the ecosystem would also allow low-risk experiments in conservation management techniques with respect to environmental habitat manipulation, habitat restoration and reintroduction of native species. Specific vulnerable areas may still require protection, other areas habitat restoration and conservation management. Given the high levels of capital investment needed to enhance the relatively degraded islet ecosystems, Public-Private-Partnerships should be encouraged. Eco-tourist visits should be encouraged but would be restricted in number and supervised through the provision of guided tours, the cost of which would be included in an entrance fee.

Limited Public Access 2 signifies a focus on education and public awareness. The zone would be developed to inform and encourage a public interest in conservation issues. The zone would have a network of signed pathways leading visitors through the various habitats and ecosystems present. It would also provide a venue for information dissemination to the general public of the progress in environmental conservation, rehabilitation and restoration activities pursued by the government. Community participation and involvement would be actively encouraged; local government and other interested community group representatives would be progressively given "ownership" of islet developments. Opportunities may exist to establish a field centre and infrastructure to enable high school and undergraduate students to carry out environmental management and ecological field experiments. Education and public awareness facilities such as a small museum, displays of native species, aquarium and the like may be considered.

Recreation signifies public access for the prime purpose of recreation. Unlike the other zone classifications, overnight camping will be allowed. However, other conservation management activities will be necessary and desirable to support the prime objective of the strategy and to ensure the sustainable development and management of a particular islet resource.

The recommended carrying capacity based on the planned infrastructure of Phase 1 and 2 are given below.

| Islet Name | Biodiversity Value | Ecological Integrity | Cultural Value | Carrying Capacity |
|-----------------|--------------------|----------------------|----------------|-------------------|
| D'Ambre | Low | High | Low | 1,000 |
| Bernache | Low | Medium | Low | 200 |

¹ This description is taken from the Islets National Park Strategic Plan

2.4. Factors Influencing Management and Rationale

2.4.1. Natural Trends and Constraints

There are a number of natural trends, which would be expected to impact future management:

1. **Exotic plant species.** Much of the area of the islet has been planted with forestry trees, many of which are exotic. This does not create a long-term hurdle for conservation regeneration as native species can be gradually inserted into the plantations to create a more “natural” stand. However, forests in the areas of relatively impoverished soil, or exposed to the SE trade winds, have a low and patchy canopy and suffer considerably from invasive exotics (e.g. *Flacourtia*, *Leucaena*). In addition, other open areas such as pathways require routine maintenance to clear the invasive exotics and allow passage.
2. **Rodent populations.** The islet presently has populations of rat and shrew. Eradication of the rat could potentially be done on the islet. However, its closeness to the mainland, the presence of a number of small islets between Ile d’Ambre and the mainland, as well as the possible introduction by visitors, means that maintaining the island rat free could be an ongoing problem. At present, no reliable method exists for eradication of the shrew, though Mauritian Wildlife Foundation (MWF) are searching for a technique for Ile aux Aigrettes.
3. **Global warming.** Although data is limited and extrapolation is prone to error, evidence for global warming seems to be widely accepted in the scientific community. Best estimates from Meteorological Services in Mauritius estimate that the global mean sea level is expected to rise by 0.09 to 0.88 m between 1990 and 2100. Global sea levels rose between 0.1 and 0.2m during the 20th Century. In addition, high-resolution modelling studies suggest that peak winds intensity of cyclones is likely (66-90% chance) to increase by 5-10%. Data from Mauritius is short term, however the number of intense cyclones has increased from a mean of 1 per season (1973-4 to 1992-3) to 2.8 per season (1993-4 to 2001-2). In addition it is likely that the cyclone season is extending; from 1974 to 1987 there were no recorded cyclones in May, however since then May cyclones have been observed in 1988, 1990, 1993, 2002 and 2003. The impact on Ile d’Ambre of global warming is difficult to ascertain due to the uncertainty of the predictions. However, in the longer term (50-100 yrs) it would be expected that there will be a greater impact of cyclonic winds on the forest stand, and that the area of mangrove might be reduced through coastal squeeze as the sea level rises. It is also possible that the exposed headland communities would extend further inland as wave energy increases due to the lessening effect of the barrier reef.

2.4.2. Human Induced Trends and Constraints

The main human induced trend is the potential impact of **subsequent development following construction of the feeder road from Goodlands**. It is expected that new road construction will lead to an increase in visitor numbers in the area, mainly heading to Ilot Bernache. In addition it is also expected that dwellings will be built in the area, as well as associated visitor facilities (e.g. shops, restaurants). Although this is of little direct impact upon the areas above the supra-tidal zone of Ile d’Ambre, due to the connectivity of some of the islet conservation features to the lagoon, there are a number of potential negative impacts:

1. **Sediment load.** It is likely that the sediment load into the lagoon through land run-off will increase due to devegetation as a consequence of road construction, and other future allied constructions. Complementary to that, unless a comprehensive drainage system is installed, it is likely that increasing urbanisation will lead to higher peak flow rates through gullies, which will lead to erosion as well as to increased sediment levels once drainage into the lagoon has occurred.

Topographic information suggests that the main watershed drainage from Goodlands and St Antoine is in a southerly direction, through the Baudot Estate, entering the lagoon at Poudre d'Or, approximately 2.5km south of Ile d'Ambre. North of Poudre d'Or there are a number of small gully catchments draining into Bassin Goemons and Bassin Humbert. However, none of the catchments include drainage of the gentle hillside (up to 20m, 1 km from the coast) inland from the quay, thus it appears that drainage into the lagoon in this area is directly into the quay vicinity though over-rock seepage, and overland gullies in periods of high rainfall. Although the detailed currents in the lagoon are not known, it is likely that the road construction and future associated developments will have a negative impact upon the water quality in the quay area and Bassin Trou Polite. Such changes in water quality could impact upon the shallow lagoon community and also lead to increased sedimentation in mangrove bays and inlets on the western reaches of Ile d'Ambre. Wider spatial scale impacts (e.g. increasing muddiness of the beaches of Ilot Bernache, blanketing of sandy-coral communities) might be possible, but without hydrodynamic flow data, they cannot be ascertained.

2. **Nutrient status.** It is unlikely that a comprehensive sewage treatment plant will be constructed for the developments on the road close to the quay, thus it is likely that seepage from storage facilities will lead to an increase in the nutrient loading of the lagoon. Again, the spatial scale of such an impact is difficult to ascertain without hydrographic information. Literature suggests that increasing nutrient status can lead to the sandy-coral community being modified to an algal turf, and this may subsequently happen in the Ile d'Ambre – quay area.

A worst-case scenario for the quay – Ile d'Ambre area is that water sediment load will increase and limit the growth or blanket the coral outcrops, algae will take over shallow areas where suitable light penetrates through the water column and that the sandy substrate will be covered by fine sediment. Mangrove and shoreline communities on Ile d'Ambre will be affected, though certain areas of mangrove might increase if sediment accretion takes place. In addition, wider potential effects include a declining beach quality on Ilot Bernache and impacts upon lagoon fish productivity.

2.4.3. Legal and Non-legal Obligations

The Forests & Reserves Act 1983 and the Wildlife and National Parks Act 1993 provides the legal instrument for the restoration of Ile d'Ambre and to protect it from human damage.

Mauritius has also signed up to a number of International Conventions, which are relevant to management of Ile d'Ambre.

| International Convention | Relevant issues to Islets |
|---|---|
| Convention on Biological Diversity (CBD; 1992) | This Convention, signed by the Ministry of Environment but implemented through the NPCCS, requires signatories to protect biodiversity and to implement sustainable development policies. |
| Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES; 1973) | This convention regulates international trade in endangered flora and fauna, and this compliments the State Law of the Wildlife and National Parks Act (1993). |
| United Nations Convention on the Law of the Sea (UNCLOS; 1982) | Requires that coastal states ensure through conservation and management the maintenance of living resources in the Exclusive Economic Zone. |

| National policy | Relevant issues to Islets |
|---|--|
| National Biodiversity Strategy and Action Plan (BSAP; 2001) | <p>The National Vision set out in BSAP is:</p> <p><i>“By the end of year 2010, the safety of biotic wealth for the Republic of Mauritius will be ensured, its values appreciated by society at large. The biodiversity resources will be sustainably used and managed through improved comprehensive policies, legal frameworks, and appropriate conservation techniques so as to enhance their environment, social and economic contributions.....”</i></p> <p>It specifically identifies the islets and proposes:</p> <p><i>“a coherent long-term plan for the remaining islets be drawn up, which will cater for the different demands in a co-ordinated way”</i></p> |
| National Environmental Strategy (NES; 1999) | <p>Recommends protection of the islets be improved by:</p> <ul style="list-style-type: none"> • Creation of a Management Plan • Restoring Biodiversity of Islets |
| National Physical Development Plan (NPDP; 1994) | <p>Aimed to balance development and protection of the environment. The Plan proposes:</p> <ul style="list-style-type: none"> • Development of a conservation plan for the Islets • Prior to adoption of this management plan, no development will be allowed which could destroy or adversely affect the islets • Prior to adoption of the management plan, no intensification of visitor or tourist activities would be permitted. |
| Outline Schemes | <p>These schemes for the North, South and Moka/Flaq suggest that the Northern Islets be retained in their natural states</p> |

In addition, Mauritius has a number of State and Regional policies and Plans, which provide a national policy framework for Ile d’Ambre.

Consequently it seems that restoration of Ile d’Ambre has suitable legal support, is in sympathy with International Conventions signed by the State of Mauritius and the national policy framework.

2.4.4. Management Constraints and Limitations

If indeed an Integrated Zonal Management (IZM) approach is taken, then some form of partnership with organisations involved in **managing visitors** to Ile d’Ambre is required. At the local level, visitors (to both Ile d’Ambre and Ilot Bernache) are primarily managed by the boat owners. If local will is forthcoming, it is suggested that the present boat owners form a co-operative, which has exclusive rights to take visitors to Ile d’Ambre and Ilot Bernache. This approach would be easier than piecemeal licensing of individual boats. Further, it is proposed that NPCS and the Boat Co-operative agree terms for the protection and sustainable management of Ile d’Ambre, as part of this a small levy is paid to NPCS (per visitor) for use of educational and wildlife features of Ile d’Ambre. Within the terms of this agreement, tripartite

(International Hotel – Boat Cooperative – NPCS) agreements with International hotels can be brokered. This has benefit for all parties concerned:

- Boat Co-operative – they maintain exclusive rights to visitor transport to Ile d’Ambre and Ilot Bernache, and thus have increased “ownership” of the islet resources.
- International Hotels – they can sell more competitive, semi-exclusive and value-added tourists packages, coupling educational and adventure trekking on Ile d’Ambre with sandy beach relaxation on Ilot Bernache.
- NPCS – they can gain income from the agreement, which can then be used to support conservation activities in conservation zones on the islet.

Negotiation, contracting and monitoring such an agreement would set a precedent for NPCS. Existing leasing arrangements (e.g. with MWF for Ile aux Aigrettes) have been contractually loose, and extensive management skill within NPCS would be required to implement such an agreement.

2.5 Legislation and Enforcement

These aspects are covered in general in the Islets National Park Strategic Plan. Specific to Ile d’Ambre is the issue of enforcement, as there is presently poaching and possibly fishing activities. The Ministry of Environment development plan for Ilot Bernache includes construction of facilities for a permanent warden to manage the camping / visitor infrastructure. It is proposed that one of the roles of the warden is the enforcement of existing legislation, against poaching and illegal fishing.

3. Management Strategies

3.1. Management Strategies and Goals

| Aspect | Goal | Strategy |
|-----------------------------------|--|--|
| Habitat Management /zoning | <i>To increase the conservation value of Ile d'Ambre through selective conservation restoration in zoned conservation areas.</i> | <ul style="list-style-type: none"> • To manage and eradicate invasive exotic plant species within the identified conservation zone. • To gradually introduce native tree species into existing forestry stands in conservation zones. |
| Species Recovery | <i>To manage targeted populations to increase population size and long-term sustainability.</i> | <ul style="list-style-type: none"> • To support regeneration of <i>Lantania</i> palms, through seed collection, propagation and replanting. • To consider eradication program for rats. |
| Species reintroduction | <i>To reintroduce appropriate plant species, and in the longer term reptile and avifauna.</i> | <ul style="list-style-type: none"> • To use conservation zones on Ile d'Ambre as a safe haven for endangered or rare plant species and bird species appropriate to the islet habitat. • To monitor reptile populations on the island, and in light of reintroductions on other northern islets, review a reptile reintroduction program. |
| Study & research | <i>Not considered at present¹</i> | |
| Training and education | <i>To provide guidance infrastructure to allow maximum interpretation of natural features by visitors in visitor zones.</i> | <ul style="list-style-type: none"> • To provide a network of well maintained pathways in the visitor zone. • To provide extensive interpretational signage of natural features within the visitor zone. |
| Socio-economic | <i>To increase visitor numbers and educational value of the islet and Bernache for visitors and tour groups, supported by a local co-operative of boat owners.</i> | <ul style="list-style-type: none"> • To develop part of Ile d'Ambre as an area for development of facilities for visitors to Bernache. • To increase the ownership of islet resources through a licensing agreement to the Boat owners Co-operative. • To increase local ownership and management through a local assembly of interested groups. • To market the islets visitor value to increase visitor numbers to local visitors and international tourists, through identified agents • To provide boat operators with interpretative and guiding skills. |

¹ It is considered that study and research should be concentrated on the other northern islets, such as Flat, Round and Gunners Quoin.

3.2. Institutional Issues, Monitoring and Reporting

3.2.1. Institutional Issues

To achieve this plan requires considerable institutional development at the local/regional level. One of the key aspects of this plan is that it provides **increased ownership and livelihood support for people in the region**. No example of this participatory management is apparent to date from Mauritius. The proposal is that this is initially developed in two sectors:

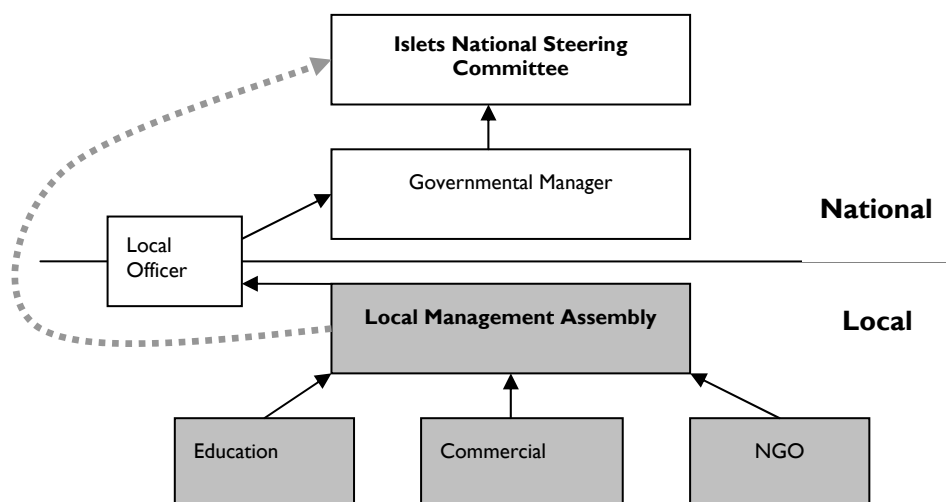
1. **Local boat operators.** The proposed licensing system for the boat operators is an important control on development. To avoid the “tragedy of the commons” it is proposed that exclusive rights are supplied to a local boat co-operative (which includes all present operators) to take visitors to the islets. However, along with the exclusivity comes an increased degree of ownership for the resources as they have a higher degree of responsibility for maintaining the islet as a visitor resource. This will increase the degree of self-management. In addition, the information provided from the licensing system to NPCCS on visitor numbers can be used to inform future planning. If no form of management and control is developed alongside the proposed infrastructure developments on Ilot Bernache, then the valuable “wilderness resource” is likely to be degraded, which has negative effects on both conservation and the sustainability of this visitor income stream to local people.

2. **Local stakeholder groups.** The proposal for Integrated Zonal Management is a strategic move to maximise use of the islet by a number of interest groups in an integrated way, which minimises potential conflict. However, Ile d’Ambre (but not Ilot Bernache) is of suitable scale for further **activities**, as long as they are **compatible with the sustainable management of the islet**. Consequently, within this zonal framework it is proposed that other interest groups can utilise the resources, these could include:

- School groups: the islet could be used for the education of local school groups. This could be through tours of the educational zone, with added worksheets (e.g. reptile identification keys to carryout a survey), etc for the pupils to fill out and discuss with the teachers. In addition, school groups can be provided with plots within the conservation zone in which they can plant appropriate trees (e.g. *Lantania* plants supplied by NPCCS) and then follow their growth over the years.
- Commercial operators: eco-tours can be arranged through regional hotels for international tourists. One possible tour would be an educational tour across Ile d’Ambre followed by a BBQ on Ilot Bernache.
- NGO's: there might be a number of NGO which would like to base activities on Ile d’Ambre. For example, MWF may perceive benefit of using a part of the conservation zone for the establishment and maintenance of endangered populations from Ile aux Aigrettes. The Mauritius Marine Conservation Trust may be interested in setting up a monitoring program of the corals within the MPA zone.

It is proposed that a governmental officer has the role of development of local activity on Ile d’Ambre / Bernache. This would initially involve meetings with the local boat operators, and also contacting a wide range of other stakeholders to determine their interest in activities in the islet.

It is proposed that a **local management assembly** is set up consisting of the boat operators, interested groups (education, NGO and commercial), as well as existing users (e.g. fishermen) to determine and organise activities on the islets within the management plan framework. The role of the government officer would be to organise and facilitate such meetings, and to determine that decisions are within the strategy of the Management Plan and are based on sound judgements. This local assembly would be the prime organisation, which would determine activity and usage of Ile d’Ambre, and potentially Ilot Bernache. It is recommended that the assembly has a local and annual revolving Chairperson, who has access to the governmental manager and can also take a seat on the Islets National Park Committee if required.



3.2.2. Monitoring and Reporting

Project monitoring is an integral part of day-to-day management. It provides information by which management can identify and solve implementation problems, and assess progress. The Logical Framework provides the basic structure against which monitoring, evaluation and reporting are made.

The following basic issues need to be regularly monitored:

- Which Activities are underway and what progress has been made?
- At what rate are means being used and cost incurred in relation to progress in implementation?
- Are the desired Outputs being achieved?
- To what extent are these Outputs furthering the Purpose?
- What changes in the plan environment occur? Do the Assumptions hold true?

During the inception period of a plan, **mechanisms for communication** have to be established to ensure that the necessary information is generated and utilized in a timely and effective manner. In this context:

- *Progress review* meetings are useful to review progress against the plan. This may also be an opportunity for written reports to be presented and discussed, or simply for a rapid oral assessment of current issues and problems.
- *Project progress reports* provide periodic summaries of project progress incorporating key information from the physical and financial indicators included in the logframe.

In terms of monitoring and reporting, it is proposed that the **reporting channels** follow the communication channels identified above. The local development officer takes the minutes of the local assembly, and once confirmed by the chairperson of the local assembly passes them to the governmental manager. The manager then reports a summary of the local assembly (with Minutes in full as appendix) and adds in other ongoing activities and plans from the Management Plan Logical Framework (see chapter 4) and reports this annually to the Islets National park Steering Committee.

The optional reporting route for the local assembly is not perceived to be used routinely. However, if disputes arise, or the local assembly feel that their views are not being voiced appropriately, then the local assembly can report directly to the Islet National Park Steering Committee and the Chair of the local assembly can take a seat on the Steering Committee.

Full details of reporting are presented in the following Chapter, following the logical framework.

3.3. Response Plan Against Introduction of Alien Species and Pests

Ile d'Ambre has probably a sizeable rat population and other pests (e.g., shrews, cockroaches), due to the availability of food and water. There will in the long-term be a need to rid the island of rats, through an intensive poisoning campaign. Until the campaign is underway there is little necessity to implement any plan against introduction of pest species. Again the current established level of invasive plant species is such that there is little to be gained at the present time in instigating any quarantine procedures. Probably the most realistic response will be to construct large "enclosures" with rat proof fences² and to conduct eradication within the boundary of the enclosure.

In the event of successful islet-wide eradication, the proximity of the islet to the mainland and the envisioned number of visitors is not conducive to intense quarantine procedures; sensitisation of the visitors and boat operators to the need to check their belongings before going to the islet is probably the most realistic approach.

² MWF Mauritius is currently conducting tests on such fencing.

4. Action Plan, Implementation Schedules, Logframe and Cost Estimates

4.1. Logical Framework for Ile d’Ambre, Stage 1

| Intervention logic | Objectively verifiable indicators of achievement | Sources and means of verification | Assumptions |
|--|---|--|---|
| <p>Goal: overall objectives. <i>What is the overall broader objective to which the project will contribute?</i></p> | <p>What are the key indicators related to the overall objective?</p> | <p>What are the sources of information for these indicators?</p> | |
| <p>The development and implementation of a management strategy for protection and enhancement of the existing natural resources of the Mauritius Islets (Islet National Park – goal).</p> | <p>Decrease in islet environmental degradation and improvement in conservation value.</p> <p>Increase in awareness of conservation value of islets.</p> <p>Reduction in illegal degrading activities on islets.</p> | <ul style="list-style-type: none"> • Government statistics. • Environmental monitoring reports. • Social and educational impact monitoring. • National Park committee minutes. | |
| PURPOSE | | | |
| <p>To develop and implement a zoned integrated management plan for Ile d’Ambre, which enhances conservation and develops recreational and educational activities.</p> | <p>Integrated management plan is incorporated into the National Park Strategy and government’s long-term policy and plans.</p> <p>Conservation value of selected areas of vegetation is enhanced.</p> <p>Structure and functioning of Marine Protected Area is maintained.</p> <p>Increasing visitor numbers to Ile d’Ambre and Ilot Bernache.</p> <p>Educational value of islet to visitors is improved.</p> | <p>Monitoring reports from NPCS, Ministry of Environment etc.</p> <p>National Park committee minutes.</p> | <p>Changes in national policy and legal framework do not negatively affect plan implementation.</p> <p>Resourcing adequate for implementation agencies, especially NPCS and Ministry of Environment.</p> <p>Adequate capacity available in NPCS, and other government bodies to implement plan.</p> |

| | OUTPUTS | | | |
|---|---|--|--|---|
| 1 | Increased conservation value of selected parts of Ile d'Ambre. | Increasing <i>Lantania</i> palm population. Increased passerine bird populations in selected areas. | Monitoring and annual report. | Resources available within NPCS for interventions. |
| 2 | Development of marked visitor trails with educational interpretation. | Trails and signage in place. | Contracts achieved. | Resources for construction not available. |
| 3 | Development of infrastructure on Ile d'Ambre, which supports development on Ilot Bernache. | Construction of bridge between Ile d'Ambre and Ilot Bernache. Development of supportive infrastructure for visitors to Ilot Bernache. | Reporting and contracting of construction. | Construction resources available. |
| 4 | Decreased fire risk. | Removal of cut wood and scrub piles | No wood piles remaining, reported to management authority. | Management practices maintained. So no wood build up. |
| 5 | Enabling framework for sustainably co-managed MPA. | Local agreement on MPA guidelines achieved. | Reports from warden, Coastguard and local assembly. | Guidelines not followed. Enforcement lacking. |
| 6 | Increased awareness in local boat owners of Ile d'Ambre, as well as other local stakeholders, as a conservation and amenity resource. | Development and maintenance of a boat owners co-operative and licensing arrangement. | Evidence of boat owner meetings and discussions. Licensing arrangement operational. | Boat owners supportive of co-operative and have the capacity to make it function effectively. |
| | Activities | | | |
| 1 | Regeneration of <i>Lantania</i> palm population. | Palm population increasing | Publication of draft report | |
| 2 | Planting of native trees to enhance carrying capacity of passerine birds | Planting and growth of native tree species. | Dissemination and feedback documentation. | |
| 3 | Review possibilities for rat/shrew eradication. | Review of value of eradication programme. | Publication of final plan and dissemination complete. | |
| 4 | Develop and maintain signed walkways in educational zone. | Signed walkways constructed and maintained. | Activity and annual report. | |
| 5 | Design, place and maintain educational signs on walkways. | Signage developed and constructed. | Activity and annual report. | |
| 6 | Review of Ilot Bernache development plan in light of Ile d'Ambre | Report on Ilot Bernache development | Financial & contracting detail | |
| 7 | Construction of warden and visitor facilities on Ile d'Ambre (and Bernache). | Facilities constructed and maintained. | Contract payment. Annual review. | |

| | | | | |
|----|---|---|---|--|
| 8 | Management of visitor numbers and impact. | Rubbish and other visitor impact monitoring. Comments from warden | Annual review | |
| 9 | Woodpiles, which represent a fire risk, identified and removed. | Woodpiles removed by labouring staff, so none remaining. | Report from site manager/warden. | |
| 10 | Change in management practise to removal of cut wood. | Training of labouring staff achieved. | Training executed, and no new woodpiles identified by manager / warden. | |
| 11 | Management authority to engage local groups about the role of the MPA | Meeting organised and carried out. | Annual review | |
| 12 | Negotiation leads to wide local agreement on role and rules of MPA. | Agreed MPA document constructed and signed. | Annual review. | |
| 13 | MPA rules passed to Coastguard and warden | Letters sent and response received. | Management authority documentation. | |
| 14 | Local groups uphold rules of MPA | Coastguard / warden reports. | Annual review. | |
| 15 | Instigate forum with boat owners and develop licensing protocol. | Licensing agreement negotiated and agreed by boat owners. | Report on boat owner's forum. | |
| 16 | Implement licensing protocol for visitors using commercial craft. | Licensing agreement implemented | Data collected from licensing procedure and collated in annual report | |
| 17 | Instigate local forum for other stakeholder groups to identify further commercial development and educational interest. | Invitations sent out to wide array of stakeholder groups and meetings arranged | Minutes from stakeholder meetings | |
| 18 | Decision-making on proposed Phase II development | Interest in further developments identified and plan proposed to National Steering Committee. | National Steering Committee. | |

4.2. Activity Implementation Schedule and Resourcing.

| Activity | 5 year implementation | | | | | | | | | | | | | | | | | | | |
|---|-----------------------|---|---|---|-----|---|---|---|-----|---|---|---|-----|---|---|---|-----|---|---|---|
| | Yr1 | | | | Yr2 | | | | Yr3 | | | | Yr4 | | | | Yr5 | | | |
| | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 | 1 | 2 | 3 | 4 |
| 1.Conservation | | | | | | | | | | | | | | | | | | | | |
| 1.1 Regeneration of <i>Lantania</i> palm population. | | | | | | | | | | | | | | | | | | | | |
| 1.2 Planting of native trees to enhance carrying capacity of passerine birds. | | | | | | | | | | | | | | | | | | | | |
| 1.3 Review possibilities for rat/shrew eradication. | | | | | | | | | | | | | | | | | | | | |
| 2.Walkways | | | | | | | | | | | | | | | | | | | | |
| 2.1 Develop signed walkways in educational zone. | | | | | | | | | | | | | | | | | | | | |
| 2.2 Design, place and maintain educational signs on walkways. | | | | | | | | | | | | | | | | | | | | |
| 3.Infrastructure | | | | | | | | | | | | | | | | | | | | |
| 3.1 Review of Ilot Bernache development plan in light of Ile d'Ambre. | | | | | | | | | | | | | | | | | | | | |
| 3.2 Construction of warden and visitor facilities on Ile d'Ambre (and Bernache). | | | | | | | | | | | | | | | | | | | | |
| 3.3 Management of visitor numbers and impact. | | | | | | | | | | | | | | | | | | | | |
| 4.Fire Hazard | | | | | | | | | | | | | | | | | | | | |
| 4.1 Woodpiles which represent a fire risk identified and removed. | | | | | | | | | | | | | | | | | | | | |
| 4.2 Change in management practise to removal of cut wood. | | | | | | | | | | | | | | | | | | | | |
| 5.Role of MPA | | | | | | | | | | | | | | | | | | | | |
| 5.1 Management authority to engage local groups about the role of the MPA | | | | | | | | | | | | | | | | | | | | |
| 5.2 Negotiation leads to wide local agreement on role and rules of MPA. | | | | | | | | | | | | | | | | | | | | |
| 5.3 MPA rules passed to Coastguard and warden. | | | | | | | | | | | | | | | | | | | | |
| 5.4 Local groups uphold rules of MPA | | | | | | | | | | | | | | | | | | | | |
| 6.Local forum | | | | | | | | | | | | | | | | | | | | |
| 6.1 Instigate forum with boat owners and develop licensing protocol. | | | | | | | | | | | | | | | | | | | | |
| 6.2 Implement licensing protocol for visitors using commercial craft. | | | | | | | | | | | | | | | | | | | | |
| 6.3 Instigate local forum for other stakeholder groups to identify further commercial development and educational interest. | | | | | | | | | | | | | | | | | | | | |

4.3. Reporting

Background

It is proposed that a **rigorous reporting procedure** is required to document activities and future plans in a way that is available to the widest possible readership. This will develop increased ownership of Ile d'Ambre / Ilot Bernache. With the development of the Islets National Park, and its associated committee, and the local assembly, reporting must be effective to ensure full ownership of the planned and ongoing activities. It is proposed that reporting operates in two stages:

1. Local assembly: these reports produced by the local development officer will provide a summary and full Minutes of local assembly meetings (as agreed by the Chair). In addition, the report will identify potential conflicts between interests groups, and possible future activities, which might be out of the scope of the strategy of the management plan. This report is presented to the co-managers following each local assembly meeting.
2. Management plan delivery: this annual report will be from the co-managers (NPCS / MoE) to the Islets National Park Steering Committee. It will contain details of the local assembly deliberations and decisions and also summary and future plans of NPCS / MoE to develop Ile d'Ambre / Bernache for conservation, educational and recreational use in relation to the logistical framework

Report from Local Assembly

This report should be produced following each local assembly meeting.

| Item | Comments |
|-----------------------|---|
| Exec. summary | No more than 1 page |
| Full Minutes | Minutes of the local assembly meeting, as agreed by the Chair. |
| Strategic assessment | This section needs to confirm that the decisions and planned activities from the local assembly are compatible with the management plan. |
| Potential conflicts | This section should identify potential conflicts between user groups. |
| Possible future plans | This is a "horizon scanning" section in which the development officer can identify possible future conflict and issues in the management of Ile d'Ambre / Bernache. |

Report to Islets National Park Committee

This report should be delivered by the co-managers at the end of the 4th Quarter. The proposed structure of the report is as follows:

| Item | Comments |
|---|---|
| Exec. summary | No more than 1 page |
| External factors impact | Review impact of changes in NPCCS resourcing, environmental changes, law and policy changes, Islet National Park modifications etc. on achievement of logical framework. |
| Local assembly | A short review of local assembly activities and decisions, constructed from local assembly reports. |
| Activity summary | Full description of all activities in the logical framework, issues and resources written in non-scientific terminology. Interpretation required assessing degree to which activities are being successfully implemented, alternative approaches considered. |
| Achievement of Objectives: | Objective interpretation of the extent to which activities are achieving the Objectives. Consider if alternative activities would be resource efficient and will be more effective in achieving Objectives. |
| Review of external changes and Objectives | Confirm that Objectives are still appropriate for Ile d'Ambre and Bernache and meet the strategy of Islets National Park in light of external factors. |
| Review and extension of logframe | Review the proposed log frame, which lays out the proposed activities for forthcoming year and summarises them in an activity implementation table. Maintain a rolling 3-year logical framework and implementation table. |
| Appendices | Each of the local assembly reports in full. |

4.4. Resources

| Activity | Resources | Costs |
|---|---|-------|
| 1.Conservation | | |
| 1.1 Regeneration of <i>Lantania</i> palm population. | <ul style="list-style-type: none"> • Staff time • Propagation facilities | |
| 1.2 Planting of native trees to enhance carrying capacity of passerine birds. | <ul style="list-style-type: none"> • Staff time • Propagation facilities | |
| 1.3 Review possibilities for rat/shrew eradication. | <ul style="list-style-type: none"> • Staff time | |
| 2.Walkways | | |
| 2.1 Develop signed walkways in educational zone. | <ul style="list-style-type: none"> • Staff time – positioning and writing signage. | |
| 2.2 Design, place and maintain educational signs on walkways. | <ul style="list-style-type: none"> • Staff time –writing signage. • Contracting out construction • Contract management | |
| 3.Infrastructure | | |
| 3.1 Review of llot Bernache development plan in light of Ile d'Ambre. | <ul style="list-style-type: none"> • Staff time | |
| 3.2 Construction of warden and visitor facilities on Ile d'Ambre (and Bernache). | <ul style="list-style-type: none"> • Building plans • Contracting out construction • Contract management | |
| 3.3 Management of visitor numbers and impact. | <ul style="list-style-type: none"> • Staff time | |
| 4.Fire Hazard | | |
| 4.1 Woodpiles which represent a fire risk identified and removed. | <ul style="list-style-type: none"> • Labourer staff time | |
| 4.2 Change in management practise to removal of cut wood. | <ul style="list-style-type: none"> • Staff and labourer time | |
| 5.Role of MPA | | |
| 5.1 Management authority to engage local groups about the role of the MPA. | <ul style="list-style-type: none"> • Staff time • Hiring of meetings venues | |
| 5.2 Negotiation leads to wide local agreement on role and rules of MPA. | <ul style="list-style-type: none"> • Staff time | |
| 5.3 MPA rules passed to Coastguard and warden. | <ul style="list-style-type: none"> • Staff, coastguard and warden time | |
| 5.4 Local groups uphold rules of MPA | <ul style="list-style-type: none"> • Monitoring staff time form Coastguard & warden | |
| 6.Local Forum | | |
| 6.1 Instigate forum with boat owners and develop licensing protocol. | <ul style="list-style-type: none"> • Staff time • Hiring of meetings venues | |
| 6.2 Implement licensing protocol for visitors using commercial craft. | <ul style="list-style-type: none"> • Staff time for licensing method | |
| 6.3 Instigate local forum for other stakeholder groups to identify further commercial development and educational interest. | <ul style="list-style-type: none"> • Staff time • Hiring of meetings venues | |

4.5. Proximate Costing of Ile d'Ambre / Bernache Development

| Item No. | Description | Unit | Quantity | Rate | Amount | P&G - 25% | Contingency - 15% | Total Amount | Total Amount inclusive of VAT @ 15% |
|--|---|--------|----------|-----------|------------|-----------|-------------------|--------------|-------------------------------------|
| <u>Stage 1: Bernache and Northern Ile d'Ambre development</u> | | | | | | | | | |
| 1 | Site clearing including removal of stumps, loose rocks etc. | sum | 1 | 400,000 | 400,000 | 100,000 | 60,000 | 560,000 | 644,000 |
| 2 | Construction of jetty; 20m long and 2.5m wide | sum | 2 | 500,000 | 1,000,000 | 125,000 | 150,000 | 1,275,000 | 1,466,250 |
| 3 | Entrance gateway and signage | sum | 1 | 80,000 | 80,000 | 20,000 | 12,000 | 112,000 | 128,800 |
| 4 | Footbridge from campsite on Ile d'Ambre to Bernache | m2 | 20 | 25,000 | 500,000 | 6,250 | 75,000 | 581,250 | 668,438 |
| 5 | Footbridge over tidal channel on Bernache | m2 | 10 | 8,000 | 80,000 | 2,000 | 12,000 | 94,000 | 108,100 |
| 6 | Extended walkway from Bernache footbridge to solid grassed ground | m2 | 10 | 5,000 | 50,000 | 1,250 | 7,500 | 58,750 | 67,563 |
| 7 | Construction of active campsite - 12 x 30m2 each inclusive of solar power lighting and water point, barbeque features | m2 | 360 | 3,000 | 1,080,000 | 750 | 162,000 | 1,242,750 | 1,429,163 |
| 8 | Construction for passive campsite - 5 x 30m2 | m2 | 150 | 2,000 | 300,000 | 500 | 45,000 | 345,500 | 397,325 |
| 9 | Construction of coastguard shelter and storage facilities | m3 | 46 | 10,000 | 460,000 | 2,500 | 69,000 | 531,500 | 611,225 |
| 10 | Construction of watchmans huts 2 Nos | m3 | 46 | 10,000 | 460,000 | 2,500 | 69,000 | 531,500 | 611,225 |
| 11 | Construction of cabins - 6 x 20m2 | m3 | 120 | 10,000 | 1,200,000 | 2,500 | 180,000 | 1,382,500 | 1,589,875 |
| 12 | Beach shade structure 6 Nos | No | 6 | 15,000 | 90,000 | 3,750 | 13,500 | 107,250 | 123,338 |
| 13 | Toilets and showers 3 Nos | No | 3 | 200,000 | 600,000 | 50,000 | 90,000 | 740,000 | 851,000 |
| 14 | Water storage and water supply network facilities, inclusive of groundwater tank, pump and overhead tank | Sum | 1 | 150,000 | 150,000 | 37,500 | 22,500 | 210,000 | 241,500 |
| 15 | Tree planting on Bernache | No | 100 | 500 | 50,000 | 125 | 7,500 | 57,625 | 66,269 |
| 16 | Loam sand for planting | tonne | 500 | 300 | 150,000 | 75 | 22,500 | 172,575 | 198,461 |
| 17 | Beach nourishment | m3 | 500 | 300 | 150,000 | 75 | 22,500 | 172,575 | 198,461 |
| 18 | Construction of pedestrian track gravel (<i>not crushed coral</i>) | m | 1,500 | 750 | 1,125,000 | 188 | 168,750 | 1,293,938 | 1,488,028 |
| 19 | Solar panel lighting | No | 35 | 10,000 | 350,000 | 2,500 | 52,500 | 405,000 | 465,750 |
| 20 | Garbage bins | No | 15 | 1,000 | 15,000 | 250 | 2,250 | 17,500 | 20,125 |
| 21 | Picnic areas with table and benches, barbeque | No | 5 | 5,000 | 25,000 | 1,250 | 3,750 | 30,000 | 34,500 |
| 22 | Tents and fixtures | Sum | 1 | 250,000 | 250,000 | 62,500 | 37,500 | 350,000 | 402,500 |
| 23 | Maintenance and management (annual) | months | 12 | 40,000 | 480,000 | 10,000 | 72,000 | 562,000 | 646,300 |
| Sub-total | | | | | | | | | 12,458,194 |
| <u>Stage 2: Ile d'Ambre Development</u> | | | | | | | | | |
| 24 | Upgrading of pathways | m | 2,000 | 300 | 600,000 | 75 | 90,000 | 690,075 | 793,586 |
| 25 | Construction of jetty; 20m long and 2.5m wide | sum | 1 | 500,000 | 500,000 | 125,000 | 75,000 | 700,000 | 805,000 |
| 26 | Signage | sum | 1 | 250,000 | 250,000 | 62,500 | 37,500 | 350,000 | 402,500 |
| 27 | Protective fencing | sum | 1 | 375,000 | 375,000 | 93,750 | 56,250 | 525,000 | 603,750 |
| 28 | Undergrowth clearing | sum | 1 | 187,500 | 187,500 | 46,875 | 28,125 | 262,500 | 301,875 |
| 29 | Information Centre | sum | 1 | 3,000,000 | 3,000,000 | 750,000 | 450,000 | 4,200,000 | 4,830,000 |
| 30 | Cafeteria | sum | 1 | 4,000,000 | 4,000,000 | 1,000,000 | 600,000 | 5,600,000 | 6,440,000 |
| 31 | Field Center and classroom, laboratory, equipment, etc | sum | 1 | 8,000,000 | 8,000,000 | 2,000,000 | 1,200,000 | 11,200,000 | 12,880,000 |
| 32 | Campsite 10 x 30m2 | m2 | 300 | 2,000 | 600,000 | 500 | 90,000 | 690,500 | 794,075 |
| 33 | Dormitory 2 in Nos at 100m2 | m2 | 200 | 10,000 | 2,000,000 | 2,500 | 300,000 | 2,302,500 | 2,647,875 |
| 34 | Construction of special conservation areas | m2 | 100,000 | 100 | 10,000,000 | 25 | 1,500,000 | 11,500,025 | 13,225,029 |
| Sub-total | | | | | | | | | 43,723,690 |
| Total | | | | | | | | | 56,181,884 |

4.6. Non Construction Costs

| PROJECT ACTIVITY | ESTIMATED COST |
|--|------------------|
| Liase with and develop links with stakeholders | 25,000 |
| Baseline investigations | 40,000 |
| Training of youth group leaders and school teachers | 200,000 |
| Education initiatives | 500,000 |
| Detailed biodiversity surveys and mapping | 150,000 |
| Coastal monitoring programme | 250,000 |
| Key biotope monitoring and restoration programme | 250,000 |
| Fishermen and boat owners stakeholder investigations and consultations | 75,000 |
| Development and implementation of management strategies for the area, in conjunction with local stakeholders and relevant Govt. Ministries | 75,000 |
| Tourism studies and development of eco-tourism strategies | 50,000 |
| Total | 1,615,000 |

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List of organisations consulted

1st, 2nd and 3rd Workshop delegates.

WORKSHOP ON DEVELOPMENT OF A STRATEGY & MANAGEMENT PLAN FOR THE CONSERVATION & MANAGEMENT OF OFFSHORE ISLETS FOR THE REPUBLIC OF MAURITIUS

Hilton Mauritius Resort, Flic en Flac, Thursday 19th February 2004

PARTICIPANTS ATTENDED WORKSHOP

| Name | Position | Institution | Tel | Fax |
|------------------------------|---|---------------------------------------|-----------------|-----------------|
| SMITH A. Michael (Dr) | International Consultant (Team Leader) | AGRER | - | - |
| ALLET Mario | Forester | National Parks & Conservation Service | 464 4016 | 465 1184 |
| ABDOOLA B.I.Mahboob | Technical Officer | Ministry of Fisheries | 238 4100 | 238 4184 |
| ATKINSON Rachel (Dr) | Plant Project Coordinator | Mauritian Wildlife Foundation | 697 6097 | 483 5038 |
| BACHRAZ Vishnuduth | Research & Development Officer (Wildlife) | National Parks & Conservation Service | 464 4016 | 464 1184 |
| BAIDER Claudia (Dr) | Technical Officer | Mauritius Herbarium, MSIRI | 454 1061 | 454 1971 |
| BAGHA Soondur | Secretary/Manager | Young Farmers Club | 415 1805 | 415 1805 |
| BARNES Robert | Project Manager | Kerrysma Limited, Green Valley Resort | 634 5097 | 634 5261 |
| CALLYCHURN Y. I | Chief Inspector | National Coast Guard | 212 2747 | 212 2770 |
| COLE Nick | PhD Student | Mauritian Wildlife Foundation | 697 6097 | 483 5038 |
| DABY Deolall | Lecturer | AGRER/University of Mauritius | 454 1041 | 465 6928 |

| Name | Position | Institution | Tel | Fax |
|----------------------------|---|---|-----------------|-----------------|
| DINDOYAL Jawaharlal | Agricultural Superintendent | Agricultural Information Division (MoA) | 464 4907 | 464 4898 |
| FLORENS Vincent | Lecturer | AGRER/University of Mauritius | 454 1041 | 465 6928 |
| GOBIN Mahandra | Forest Guard | National Parks & Conservation Service | 464 4016 | 465 1184 |
| GOPAL Vinehswar | Technical Officer | National Parks & Conservation Service | 464 4016 | 465 1184 |
| GRIFFITHS Owen | Managing Director | Bioculture Mauritius Limited | 626 2503 | 626 3642 |
| JUGNARAIN Dhanand | Assistant Secretary | Min/Agriculture, FT & NR | 211 7621 | 211 6448 |
| JUWAHEER khemraj | Representative | Gold Award Holders' Association | 266 1788 | - |
| KHADUN Ashok | (Ile aux Aigrettes) Restoration Coordinator | Mauritian Wildlife Foundation | 697 6097 | 697 6512 |
| LUXIMON Rajaram | Environment Officer | Ministry of Environment | 212 6975 | 211 9903 |
| MANNA Gaitree (Mrs) | Principal State Council | Attorney General's Office | 212 0544 | 212 6742 |
| MEUNIER Hugot | Forest Ranger | Rodrigues Regional Assembly | 831 4560 | 831 4835 |
| MICHAEL Marie | Enforcement Officer | Min/Local Government & Rodrigues | 213 0988 | 208 8804 |
| MOOLOO Santaram | Divisional Environment Officer | Ministry of Environment | 212 4385 | 211 9086 |
| MUNGROO Yousoof | Director | National Parks & Conservation Service | 464 4016 | 465 1184 |
| NARASIAH Paramnanda | Deputy Forest Ranger | National Parks & Conservation Service | 464 4016 | 465 1184 |
| NUNDLAUL Vimul | Technical Officer | National Parks & Conservation Service | 464 4016 | 464 4016 |
| NUNKOO Parmanand | Senior Regional Development Officer | Min/Local Govt. & Rodrigues (NDU) | 210 3478 | 210 5246 |
| PAYENDEE Richard | Rodrigues Conservation Manager | Mauritian Wildlife Foundation | 8314558 | 8314559 |
| PERRINE Jean Alain | Technical Officer | Forestry Services, Rodrigues | 831 4510 | 831 4835 |

| Name | Position | Institution | Tel | Fax |
|---------------------------------------|---|---|------------|------------|
| POONYTH Asha (Dr) | Project Officer | Mauritius Oceanography Institute | 427 4434 | 427 4433 |
| PUTTOO Manikchand | Research & Development Officer (Wildlife) | National Parks & Conservation Service | 464 4016 | 464 1184 |
| PURBHOO BISSOONAUTH R B (Dr) | Lecturer | Mauritius Institute of Education | 466 0228 | 454 1037 |
| RAJCOOMAR Soomantee (Dr) | Senior Lecturer | Mauritius Institute of Education | 466 1940 | 467 5159 |
| ROJOA Hassambhye (Dr) | Principal Research & Development officer | Horticulture Section, Min/Agr., FT & NR | 464 4857 | 464 4857 |
| RUHOMAUN Kevin | Research & Development Officer (Wildlife) | National Parks & Conservation Service | 464 4016 | 465 1184 |
| RUTTEE Rajmohunsingh | Forest Ranger | Forestry Service | 675 4966 | 674 3449 |
| SEEBUN Padmini (Mrs) | Research and Development Officer | Plant Pathology & Quarantine, MoA | 464 4872 | 465 9591 |
| SEETARAM Ashwin Kumar | Tourism Planner | Min. of Tourism & Leisure | 208 3256 | 208 6776 |
| SOOKHAREEA Rajendraprasad (Dr) | Research & Development Officer (Wildlife) | National Parks & Conservation Service | 464 4016 | 465 1184 |
| TATAYAH Vikash | Fauna Manager | Mauritian Wildlife Foundation | 697 6097 | 697 6512 |
| VENCATASAMY Mooniamah (Mrs) | Technical Officer | National Parks & Conservation Service | 464 4016 | 465 1184 |
| WONG SIN WAI J.M. | Project Coordinator | Ministry of Environment | 729 4051 | 211 3198 |
| ZUEL Nicolas | Round Island Warden | Mauritian Wildlife Foundation | 697 6097 | 483 5038 |

APPENDICES

Appendix A – details of small mammal trapping.

During a visit in December 2003, small mammal trapping was carried out on Ile d'Ambre. The trapping was carried out using commercially available "kill-traps" supplied by NPCS. Two baits were used: a mixture of oats, Peanut Butter and vegetable oil (1 jar Peanut Butter, 200g oats and a small amount of vegetable oil to make the bait sticky) and dried fish mixed with sardines (1-2cm pieces of dried fish mixed with tins of sardines in vegetable oil). Two separate baits were used as previous trapping has showed that rats prefer Peanut Butter, whereas shrews prefer fish bait.

Trapping was carried out over 3 nights along the main paths across the island and in the edges of the associated biotope. Traps were placed approximately every 15m along the path or the nearby associated biotope; bait was alternated along the trapping transect. Traps were placed out between 4-7pm and collected between 7-9am the next morning. Over 3 nights, a total of 251 traps were baited (i.e. 251 trap nights), covering about 3,800km of track and associated biotope.

A total of 21 small mammals were caught, of which 19 were Black or Ship rats (*Rattus rattus*). Although these individuals looked like *Rattus norvegicus*, the most robust discriminatory feature which is used to distinguish these species is tail length; *R. rattus* having tails 120% their body length, whereas *R. norvegicus* having tails 80% their body length. It was this characteristic which was used to identify the captures as *Rattus rattus*, in spite of their brown colour more associated with *R. norvegicus*. The remaining two captures were Indian house shrews (*Suncus murinus*). This makes a capture rate of about 8% of traps set. Further details are in The following table:

Summary of captures from trapping using 251 trap nights

| Bait | Rat | | | Shrew | | |
|--|------------------|--------|----------------|-----------------|----------------|---------|
| | Male | Female | Unknown | Male | Female | Unknown |
| Fish | 4 | 3 | 1 ¹ | 1 | 1 ² | |
| Peanut Butter mix | 8 | 2 | 1 ³ | | | |
| Total | <u>19</u> | | | <u>2</u> | | |
| ¹ This animal was eaten, possibly by other rats or cats, only a small remnant of flesh and fur were found in the trap. ² This shrew was an usual "saddle back" colouring. ³ This animal was caught by the tail and escaped when the trap was checked. | | | | | | |

The extensive trapping survey identified that there is presently a population of brown rats on Ile d'Ambre. The capture rate of rats was moderate (~7.5%) and captures were made in all areas of the islet, suggesting a **modest infestation of rats across the whole of the islet**. Although the figures are small, the trapped population was dominated by males (70% of those captured and sexed), this could be because the population is male dominated, or that the male rats were more easily caught in the traps due to sex differences in foraging style and/or foraging range.

It might be that rat densities are higher than the results suggest. Quite a large number of baits had disappeared but the trap had not sprung. This was probably due to within-trap variation in the required force to spring the trap; some traps required a gentle push whereas as other sprung at the slightest pressure. In addition, some hermit crabs were caught in the traps. Both these factors probably contributed to trapping inefficiency. However, this does not invalidate the conclusions that the islet has a moderate and well distributed rat population, but the capture rates must be considered as a conservative estimate.

Only two shrews were caught in the trapping programme. As they are smaller and lighter, trapping inefficiency is likely to be greater for catching shrews using this type of trap. However, the results suggest that there is definitely a population of shrews on the island. One of the shrews caught had an unusual fur colouring; grey with a white “saddle back”. It is probable that this is caused by natural genetic variation (as it is in mice) and is unlikely to be a different species. In general morphology, the “saddle back” shrew was similar to the other natural coloured shrew which was trapped.