

**PHYSICAL ALTERATIONS
AND
DESTRUCTION OF HABITATS
IN
MAURITIUS**

M.Bhikajee and S.Bhagwant

2003

TABLE OF CONTENTS

1.	Introduction.....	4
1.1.	Geographic Location	4
1.2.	Climate	5
1.3.	The Coastal Zone.....	5
2.	Relevant National legislation.....	9
3.	National Institutional Set-up.....	10
4.	Socio-economic importance of the three main priority areas.....	11
4.1.	Tourism	11
4.2.	Mangroves.....	12
4.3.	Mining/ Sediment movement, Ports and Land reclamation and damming of rivers.....	13
4.3.1.	Mining.....	13
4.3.2.	Port Construction and Land Reclamation	13
5.	Assessment of land-based activities responsible for habitat alteration and destruction.....	14
5.1.	Coastal tourism.....	14
5.2.	Mining/ Sediment movement	14
5.3.	Mangrove Destruction.....	15
5.4.	Coastal Wetland Reclamation	15
5.5.	Damming of rivers.....	16
6.	Identification of degraded sites.....	16
7.	Ecosystem restoration initiatives	18
7.1.	Tourism Development Plan for Mauritius.....	19
7.2.	Partnerships for the management of marine protected areas in Mauritius and Rodrigues.....	20
7.3.	Study on Coastal Erosion	20
7.4.	Preparation of a Strategic EIA for Identification of Potential Sites for Marinas, Ski Lanes and Bathing Areas for Mauritius	20
7.5.	Study of Environmental Risks in Grand Baie.....	20
7.6.	Development of an Integrated Coastal Zone Management Framework for Mauritius	20
7.7.	National Physical Development Plan Review	21
7.8.	Banning of Sand Extraction from the lagoon	21
8.	Conclusion and recommendations	21
9.	References.....	23

1. INTRODUCTION

1.1. Geographic Location

The Republic of Mauritius consists of a main island, Mauritius (20°17' S, 57°33' E), and a group of small islands in the South West Indian Ocean namely Rodrigues, the Cargados Carajos, Agaléga, Tromelin and the Chagos Archipelago. The total land area amounts to 2040 km² whilst the marine exclusive economic zone covers an area of about 1.9 M km² extending from 100 S to 200 S and from longitude 550 E to 750 E. The main island Mauritius is 1865 km² in area, volcanic in origin and consisting of a central plateau (mean elevation 300-400 m) surrounded by mountain ranges and plains.

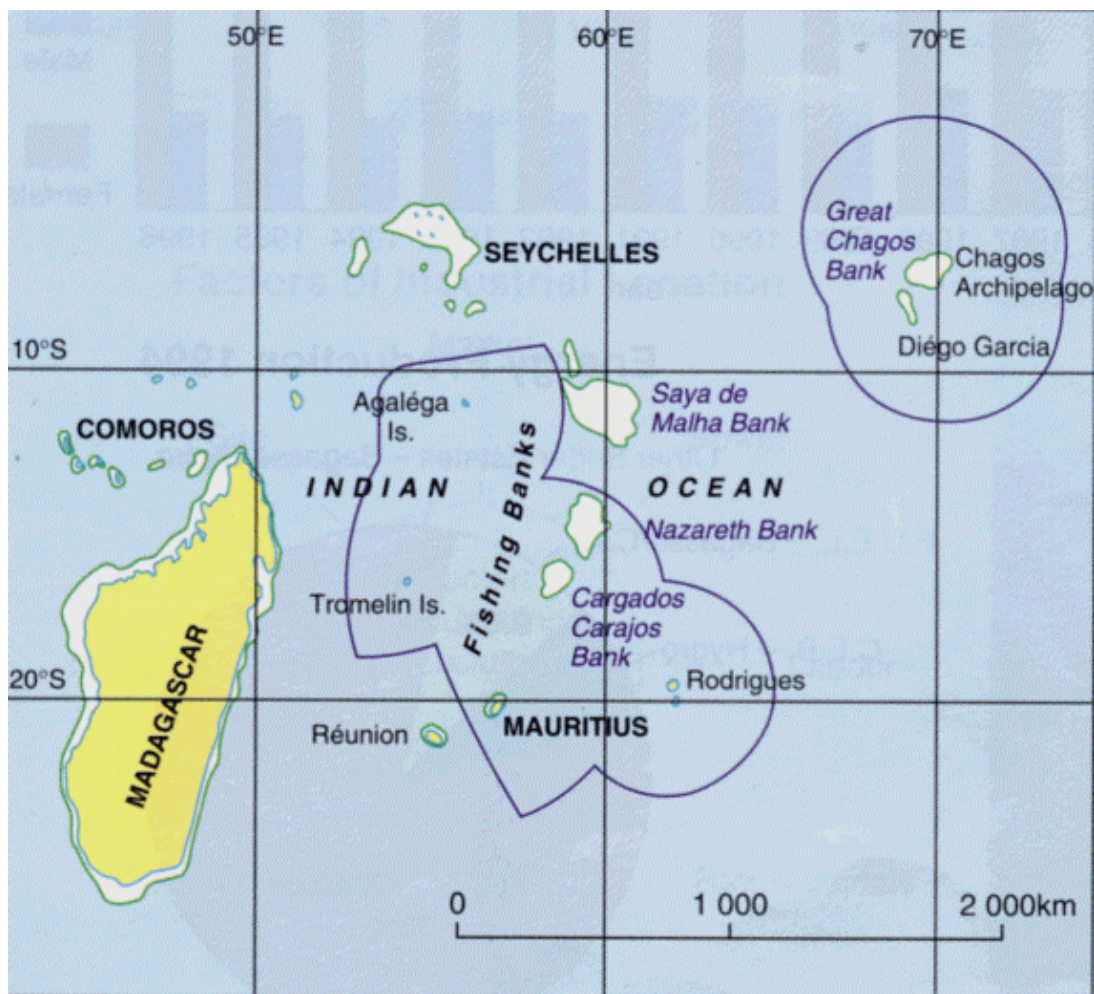


Figure 1: The Islands forming the republic of Mauritius and the EEZ of Mauritius

1.2. Climate

Mauritius enjoys a mild maritime climate with summer extending from October to April and winter from May to September. Trade winds are prevalent throughout the year but are stronger in the winter when strong anticyclones pass to the south of the island. In summer, the trade winds are weaker but the island is also under the threats of tropical depressions, which can build up in cyclones. On average one cyclone passes within 100 km of Mauritius each year. Mauritius receives an average of 2100 mm annual rain with 70% of it occurring in summer. Tropical depressions and cyclones bring abundant rainfall spread over a number of days. Mean maximum temperature reaches 31⁰ C in the coastal areas during the peak summer months of January and February whilst the mean minimum temperature on the central plateau reaches 14⁰ C in July and August.

1.3. The Coastal Zone

The coastline of the island of Mauritius is 322 km long and is almost completely surrounded by fringing coral reefs enclosing a lagoon area totaling 243 km². Reefs are absent near estuaries and also from two areas, one in the south and one in the northwest. The volcanic nature of the island's origin, the existence of coral reefs and the access to the lagoons of not less than 50 rivers and rivulets, determine the diversity of the coastal habitats, flora and fauna. The sandy beaches, protected bays and calm lagoons have allowed the development of a prosperous tourism industry.

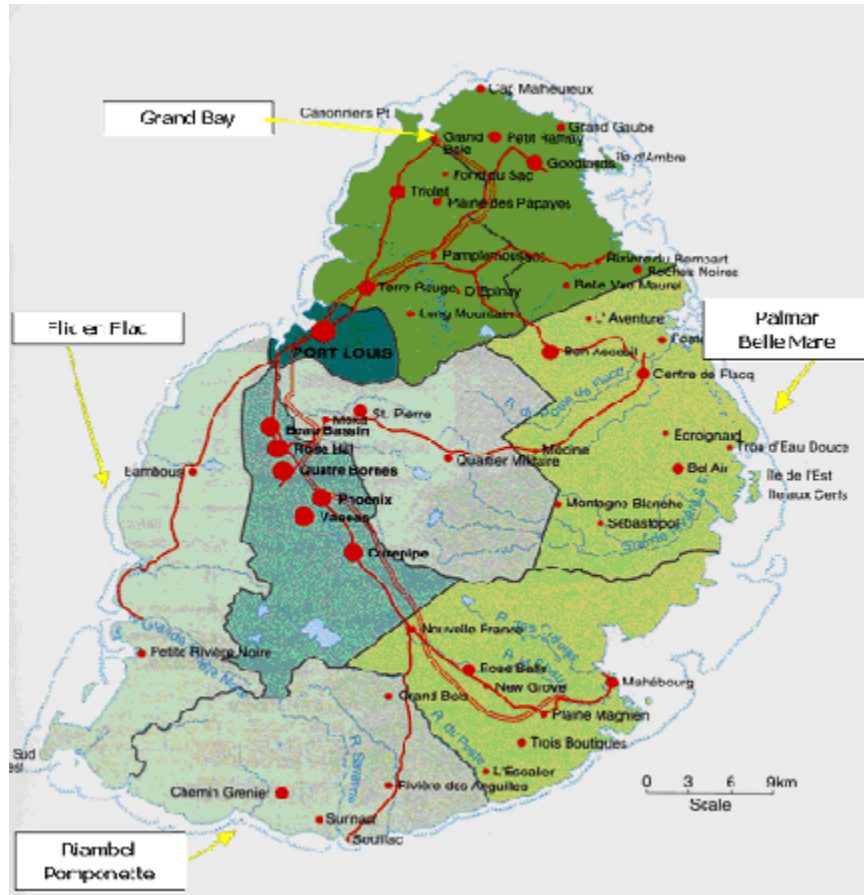


Figure 2: Map of Mauritius showing the reef complex and selected sites

The reef complex of Rodrigues almost surrounds the island except where there are passes. The lagoon covers an area of 200 km². The coral reef of St Brandon covers an area of 190 km², while that of Agalega is 100 km².

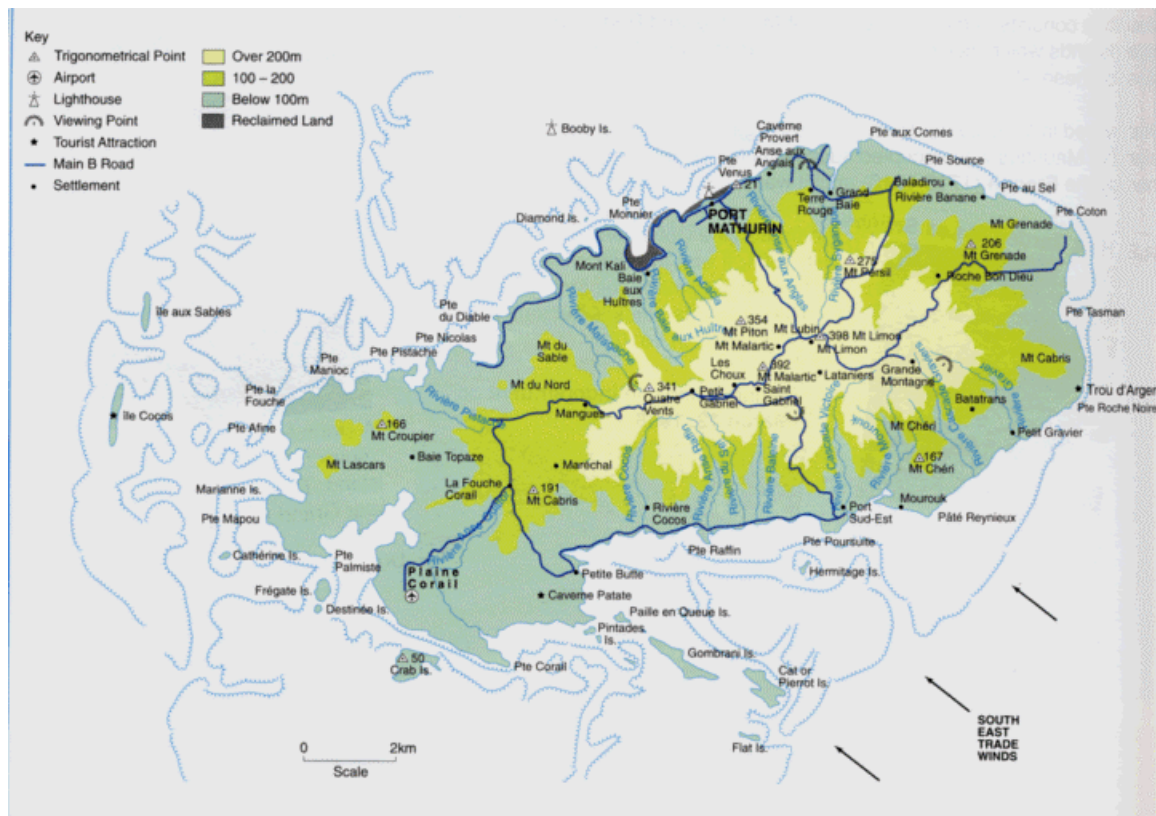


Figure 3: Map of Rodrigues

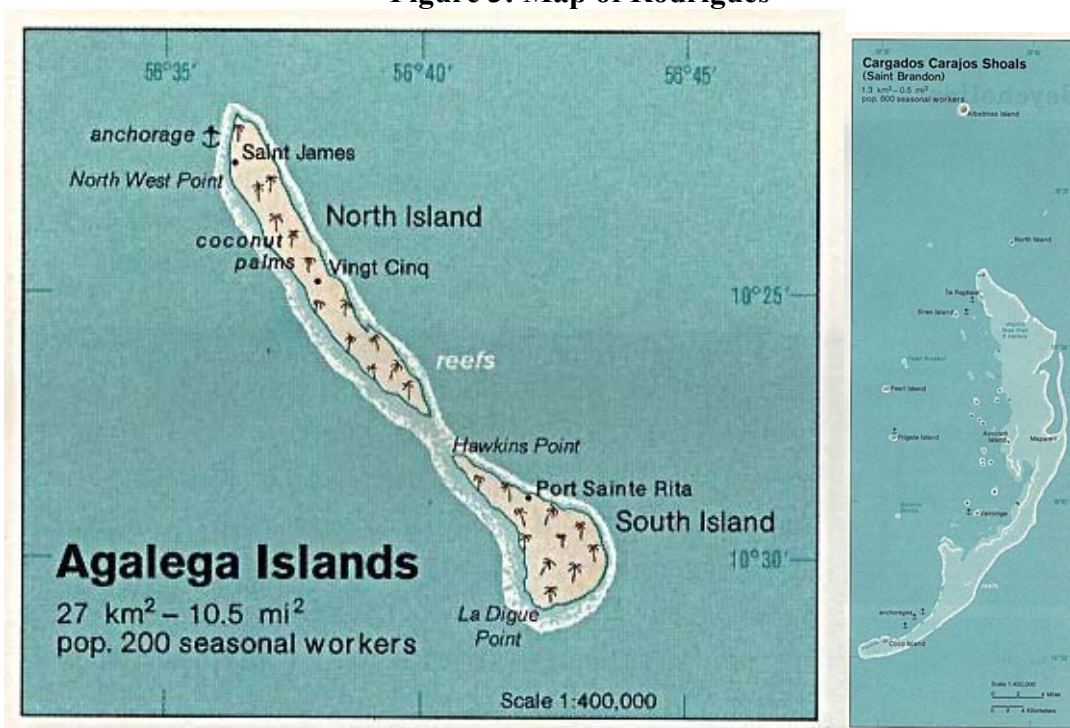


Figure 4: Maps of Agalega and St Brandon

Economically, the coastal zone is by far the most valuable segment of the Mauritian territory. Located here are the tourist facilities of a very high standard, secondary homes, ports, the fisheries infrastructure and the public beaches. Figure 5 gives the changes in coastal land distribution from 1990 to 2000. In this zone billions of rupees are being invested in the form of hotels, infrastructure, water sport facilities, biodiversity conservation, coastal protection and coastal developments in general. Environmental problems which affect the coastal zone are therefore of a very high priority. Even where the environmental impacts are reversible the adverse publicity which may result from, for example poor water quality in the lagoon, may have a severe and long lasting impact on tourism.

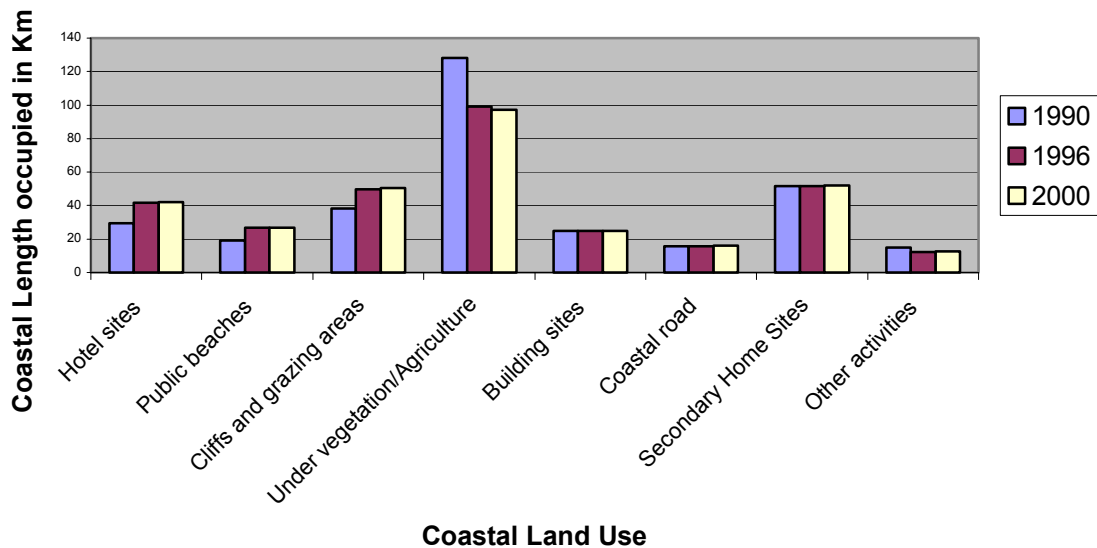


Figure 5: Changes in coastal land use from 1990 to 2000

Source: Ministry of Housing and Lands, 2001

In the 1992 report on the *State of the Environment in Mauritius*, major environmental problems in the marine environment were clearly identified namely:

- deterioration of the water quality (fouling of the seas with industrial and domestic effluents and agricultural run-off),
- disappearance of mangroves and sedimentation,
- destruction of coral reefs,
- erosion of shores,
- decrease in fish productivity and
- contamination of beaches and seafood.

Though much has been done to control and in some cases reverse the deterioration process, the coastal zone is still under intense pressure from both sea based activities and land based ones. The rapid increase in the number of hotels and the haphazard development against the shoreline has exacerbated erosion of the beachfront due to the construction of inappropriate protection structures and jetties.

The priority issues identified in the National Environment Strategies (NES 1999) can be summarised as:

- beach erosion and over-development resulting in a loss of quality of the coastal zone and a threat to existing commercial interests;
- poor lagoon water quality as a result of contamination from land, coastal and marine sources; and
- loss of biodiversity due to the destruction of wetlands, mangroves and corals.

2. RELEVANT NATIONAL LEGISLATION

National legislation pertaining to the three main priority areas, (namely Coastal Tourism, Mangrove destruction and Mining/Sediment Transport/Port & Land Area Reclamation) are currently contained in several sources, which are predominantly sectoral and often overlapping. Important national legislation includes:

- Beach Authority Act 2002;
- Continental Shelf Act 1970;
- Environment Protection Act 2002;
- Fisheries and Marine Resources Act 1998;
- Forests and Reserves Act 1983;
- Maritime Zones Act 1977;
- Merchant Shipping Act 1986;
- National Coastguard Act 1988;
- Pas Géométriques Act 1895;
- Pleasure Crafts Act 1993;
- Ports Act 1998;
- Removal of Sand Act 1975;
- Rivers and Canals Act 1863.
- State Lands Act 1874;
- Territorial Sea Act 1970;
- Town and Country Planning Act 1954;
- Wildlife and National Parks Act 1993;

Although Mauritian legislation affecting the coastal zone is fragmented, recent developments have begun to reflect a more integrated approach. Thus, the Environment Protection Act of 2002 establishes an Integrated Coastal Zone Management Committee, with cross-sectoral representation, to develop management plans, monitor coastal waters, and make recommendations to the Minister of Environment. Clause 14 of the EPA 2002 also provides for the setting up of an Environment Coordination Committee made up of members of the different enforcing agencies. In addition, the Beach Authority Act 2002, which was passed on 2 April 2002, creates a representative Beach Authority to manage and control public beaches. The environmental impact assessment of coastal projects under the Environment Protection Act 1991 also provides a mechanism for consultation and participation in environmental decision-making. However, these positive measures have been superimposed on the existing fragmented system of sectoral legislation, which remains largely unchanged, and they do not constitute a comprehensive statutory framework for integrated coastal zone management.

3. NATIONAL INSTITUTIONAL SET-UP

At present the policy and legislation framework for the management of the coastal zone in Mauritius is fragmented and, despite the recommendation made in the *1991 State of the Environment Report* that “control, custody and management of a coastal zone should be vested in an Authority”, there is no Government body with overall responsibility for the coastal zone. At present, various ministries and parastatal organisations share in the management of the coastal zone including:

- Ministry of Environment;
- Ministry of Fisheries;
- Ministry of Local Government, Rodrigues and Rural and Urban Development;
- Ministry of Tourism;
- Ministry of Agriculture, Food Technology and Natural Resources;
- Ministry of Public Utilities;
- Ministry of Housing and Lands;
- Ministry of Public Infrastructure, Land Transport and Shipping;
- Mauritius Ports Authority;
- National Coast Guard;
- Beach Authority (created by the Beach Authority Act 2002);
- Waste Water Authority;
- Police Force and the Police de l’Environnement
- Municipal and District Councils.

The Ministry of Environment has set up an Integrated Coastal Zone Management Division. This division was set up on the recommendation of the National Environment Strategy (2000-2010) and it is expected to have a regulating role in coastal zone management (Bhikajee, 2001).

However, the creation of the Integrated Coastal Zone Management Committee and the Environment Coordination Committee, as spelt out in the new Environment Protection Acts of 2002, is expected to provide a better coordination among the various enforcing agencies

In addition, the Environment Protection Acts of 1991 and 2002 provide for the setting up of the National Environment Commission under the Chairmanship of the Prime Minister and having all the Ministers as members. The aims of the commission are to:

- set national objectives and goals, and determine policies and priorities for the protection of the environment, having due regard to the recommendations of the Minister;
- review progress made by public departments on any aspect of environmental management projects and programmes;
- ensure coordination and cooperation between public departments, local authorities, and other government organisations engaged in environmental protection programmes;
- make such recommendations and issue such directions as it may determine to public departments; and
- monitor and review the activities of public departments concerned with the protection and management of the environment.
- It is expected that the above initiatives will largely help in decreasing overlap of responsibilities and provide for better coordination between the various organizations involved in coastal area management.

4. SOCIO-ECONOMIC IMPORTANCE OF THE THREE MAIN PRIORITY AREAS

4.1. Tourism

During the past decade, the tourism industry has emerged as the fastest growing sector and established itself as the third pillar of the Mauritian economy. It is also the second largest foreign exchange earner. The tourism sector recorded a growth of 11% in 2000, which is a marked up-turn in the declining trend registered since 1996. Gross receipts from tourism for 2000 amounted to around Rs 14,234 million, representing an increase of 4% compared to Rs 13,668 million in 1999. The total number of tourists visiting the country reached around 656,453.

Table 1: Tourism main indicators

		1998	1999	2000	2001
Real growth	%	4.0	11.0	7.0	0.6
Gross earnings	Rs m	11,890	13,668	14,234	18,166
Tourist arrivals	No.	558,195	578,085	656,453	660,320
Expenditure per tourist	Rs	21,301	23,644	21,683	27,511
Employment (March)	No.	16,490	16,235	17,811	19,944

Source: Central Statistical Office, 2003

Table 2:- Hotels, rooms and bedplaces, 1998 - 2001

Year	Number as at end of period		
	Hotels	Rooms	Bedplaces
1998	90	7,267	14,995
1999	92	8,255	16,947
2000	95	8,657	17,776
2001	95	9,024	18,350

Source: Central Statistical Office, 2003

4.2. Mangroves

Mangroves covered a large part of the coastline in the past, but its area has decreased markedly with the development over the last three decades. Nowadays they are to be found at mouth of rivers and estuaries such as Riviere Noire, Baie du Cap, Trou D'eau Douce, Poste Lafayette, Bras D'eau and Poudre D'or. The two species occurring in Mauritius- *Bruguiera gymnorhiza* and *Rhizophora mucronata* are not exploited. A replantation programme is now in progress in the areas where mangroves were thriving in the past.

Mangroves, in Mauritius, do not have a use-value. No part of the plant is traditionally or commercially used. Only very rarely is its bark used for medicinal purposes. However its non-market value (indirect benefit associated with the preservation of the ecosystem) is important when the importance of the coastal zone in foreign exchange generation is considered.

4.3. Mining/ Sediment movement, Ports and Land reclamation and damming of rivers

4.3.1. Mining

The Republic of Mauritius does not have any mineral resources that are presently being mined. The only mining activity that, until recently, impacted on the coastal zone was sand extraction from the lagoon area. Permits were given to a limited number of sand miners. This activity was later found to have an adverse impact on the marine environment by destroying habitats and causing suspension and movement of sediments. After a moratorium period, sand mining was declared illegal in October 2001.

4.3.2. Port Construction and Land Reclamation

The new container terminal at Port Louis harbour was constructed on reclaimed land. The area was already impacted by the presence of other port infrastructure. The 1995 report of the World Bank mentioned that: “The proposed container terminal facilities at Mer Rouge site is unlikely to have any major negative environmental impact on the landside as the land has recently been reclaimed with no established fauna and flora. On the marine side the dredging of the channel and turning basin has already been completed since 1990” – before the requirement of a formal EIA became mandatory. Port Louis handles about 4.8 million tonnes of cargo annually. Over the past years an average annual growth of 8% has been registered in total cargo traffic. Some 1900 vessels call at Port Louis annually and over the recent years a vessel traffic growth of 4% has been recorded.

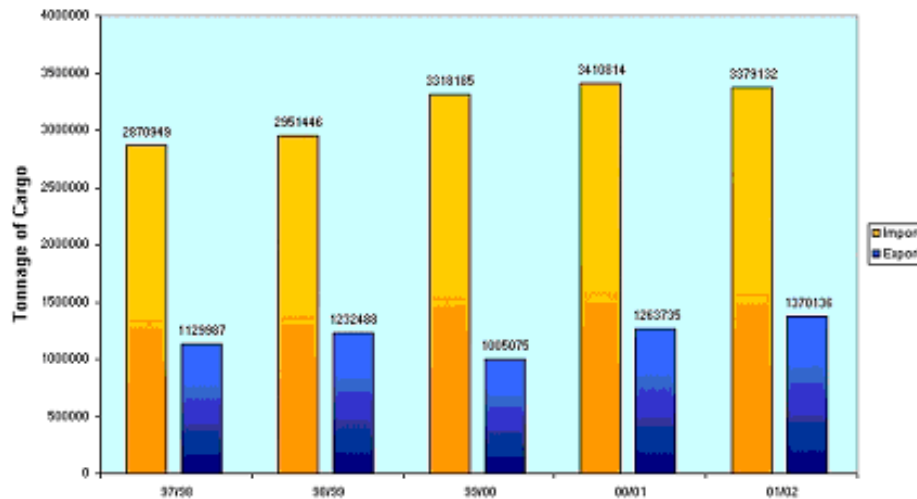


Figure 6: Total Import and Export Cargo Traffic for Port Louis, Mauritius

Source: Mauritius Ports Authority, 2003

5. ASSESSMENT OF LAND-BASED ACTIVITIES RESPONSIBLE FOR HABITAT ALTERATION AND DESTRUCTION

5.1. Coastal tourism

The rapid development of tourism in Mauritius has led to several unplanned facilities and infrastructure. The town of Grand bay in the north-west of the island (Fig 2) developed in a haphazard manner. The construction of tourist hotels in the area triggered the setting up of restaurants, shopping facilities, discotheques and private apartments for rent. Land being limited in that zone, marginal low-lying swamps increased in value. Between 1975 and 2002, 66 % of the wetlands were filled to accommodate private bungalows, tourist facilities and a government conference center.

The result is that Grand Bay lagoon, now, is largely turbid with a low diversity of organisms. The sea bottom is covered by a slimy ooze and nearly all marine habitats within the bay have been destroyed.

Beaches provide protection to the backshore and dunal complexes where most of the hotels are implanted. Changes in the beach profile will have serious impacts on the tourist industry. The linear shape of the dunal ridge running parallel to the coastline and the steeper downlift and gentler uplift with the vegetation cover impart coastal stability. Once this morphology is altered, disruption of the coastal equilibrium will ensue and beach erosion will prevail (Prayag *et al*,1995). Beaches have then to be reprofiled, protection to beaches more effective, slipways jetties and groynes be redesigned.

The wide shoreline provides a recreational zone for tourist and local residents. With an average beach retreat of about 1m per year (Jootun *et al*, 1994) there has been significant loss of valuable recreational area. In some areas the problem is more acute owing to ill-designed infrastructure such as sea walls, slipways and jetties. In Flic en Flac the vertical sea wall in front of Pearl Beach Hotel is causing wave reflection and the sand at the foot of this wall has been washed away northwards (Prayag *et al*, 1995).

5.2. Mining/ Sediment movement

The west coast tourist zone at Flic en Flac is closely following the trend of Grand Bay in terms of haphazard development. Inland sand deposits in the coastal strip have been mined and the resulting crevices backfilled to a level which is lower than the water table during periods of heavy rain. A series of hotels have been built to accommodate the ever-increasing number of tourists. Coastal urbanization has been further exacerbated by the increasing trend of having a second residence near the coast.

For various reasons, the coast is being eroded. The position of the high water line has moved and coastline has receded by 2m near Flic en Flac public beach (Jootun *et al*, 1994). This is clearly seen by the uprooting of the filao trees from the ridge complex and the retreat of the coastline to the foot of the seawall. The scouring of the ridge has given rise to a rectilinear coastline. Eroded materials are carried by long shore currents and deposited elsewhere on the beach thereby altering the beach slope. Erosional scarps are particularly visible in the regions of Flic en Flac, Le Morne, Pomponette-Riambel, Belle Mare and Grand Baie. In some regions the beach line has retreated by at least 10m over the past ten years. The southern regions are mostly exposed to the constant attacks of high amplitude waves reinforced by south-east trade winds. The impacts of these are further aggravated by the opening of reef gaps on the fringing reef. The worse eroded sites are Pomponette and Riambel where a beach retreat of 4m has been recorded during a period of 3 years. This has produced pronounced beach scarps reaching 2m and many of the coastal vegetation particularly the filao trees have their root systems exposed. At Belle Mare the coastline receded to about 5m forming scarps of 1.8-2.0m in 1988 under the influence of tropical cyclones (Prayag *et al*, 1995).

5.3. Mangrove Destruction

Mangrove destruction is not presently a major issue in Mauritius. The mangrove strips are relatively narrow and appear to have been impacted since long by the construction of coastal roads. There is no widespread traditional use for mangrove. Also Clause 6 of The Fisheries And Marine Resources Act of 1998 mentions that “No person shall cut, remove, damage or exploit a mangrove plant or part of a mangrove plant...”

Salt pans are restricted to the dry south west coast and were built inland in areas where mangroves are not present

Traditional mariculture, in Mauritius started in the 1800's in bays (Bhikajee, 1997) which were closed by basalt walls and metal grids. Most of these infrastructure are still present to-day. Several of these barachois are lined by mangroves, but being isolated from the open sea by walls, they are not accessible to fish juveniles. The mangroves are therefore unable to fully carry out their function as nursery grounds.

5.4. Coastal Wetland Reclamation

Several wetlands are present in the northern tourist zone. According to a recent study, the extent of wetlands decreased between 1975 and 2002 from 390 000m² to 130 000m² i.e. by about 66% because of backfilling resulting from land speculation. Based on data between 1998 and 2002, the rate of backfilling is presently continuing at a rate of 1 000 m² per year. Some of the construction in this zone cater for tourists whereas those in, for example, Camp Carole provide low cost housing to vulnerable groups.

5.5. Damming of rivers

Occasional droughts present a serious challenge for the provision of water to agriculture, industries and for domestic uses. Inadequate and insufficient water storage facilities may become a serious constraints for national development. In this context, the Midlands Dam, the first of the five proposed dams, has recently been completed across Grand River South East. It has a storage capacity of 25.5 Mm³ and will meet 100% municipal water requirement of the north. It would also satisfy the total requirement of the Northern Plains Irrigation Project covering about 1900 ha and allow the irrigation of an additional area of 2850 ha. The socio-economic value assigned to such water is huge considering that all the sectors of the economy rely heavily on this commodity.

6. IDENTIFICATION OF DEGRADED SITES

In Flic en Flac, construction of hotels and bungalows has transformed the natural setting of the shoreline. The dunal complexes have been mostly affected, these have had to be levelled off and the surrounding of hotel complexes modified considerably with numerous exotic species of plants introduced. This transformation has modified the existing habitats/ecosystem and consequently affected the existing biota. Dunal complexes offer a variety of habitats for land animals and plants. These native species have been displaced by more aggressive exotic ones. The landscaping works also affect the backshore and foreshores. In many cases beach profiling works have been carried out.

The increasing activities in the lagoons coupled with the use of destructive fishing methods have affected the lagoon ecosystem. Coral cover has diminished (through coral trampling, damages by boats, clearance for ski lanes etc) and sea grass beds have been cleared for bathing spaces. All these activities have resulted in changes in the biota; fish catch is on decline while other marine species are proliferating. The reduction of coral cover has been associated with the proliferation of the sea urchins. The problem was so acute in some areas of Flic en Flac that hotels had to resort to manual removal of these sea urchins in front of their premises (Prayag *et al*,1995).

In Flic en Flac, Grand Baie and Belle Mare/Palmar regions, hotels have cleared the sea grasses in the lagoon to create bathing areas and ski lanes impacting on the sea floor causing loss of habitats and floor stability (Ramessur, 1991). Recent studies carried out at Pointe aux Piments towards the southern end of the Grand Baie site indicate that dredged areas have significantly lower biomass values, higher turbidity, lower biodiversity with only a few rare crabs, and can take four to five years to recover (Choony, 2001).

In Riambel and Flic en Flac, the beach is very eroded and has produced beach scarps of 1-2m. Soft remedial steps have been taken to mitigate the impacts. The use of gabions (large rectangular metal wire baskets holding broken basalt rocks) to curtail the negative effects of waves is becoming increasingly popular but the effectiveness of these structures needs to be monitored. Furthermore gabions decrease the aesthetic value of the area, reduce the recreational beach area, prevent easy access to the sea, add to the cost of maintaining the beaches.

In regions such as Wolmar where remedial measures have not been taken the eroded shoreline looks defenseless with the root system of filao trees partially exposed and the ill-designed seawalls cracked.

With an average beach retreat of about 1m per year (Jootun *et al*, 1994) there has been significant loss of valuable recreational area. In some areas the problem is more acute owing to ill-designed infrastructure such as sea walls, slipways and jetties. In Flic en Flac the vertical sea wall in front of Pearl Beach Hotel is causing wave reflection and the sand at the foot of this wall has been washed away northwards (Prayag *et al*, 1995).

In Rodrigues many of the lagoons are affected by siltation modifying completely the sea floor and impacting on the resident biota. The corals and sea grasses are heavily affected. Whole areas are covered with deposited silt and turned unproductive. The extent of the damage varies; some bays are completely silted and channels have to be made to facilitate passage of fishing boats. In other areas corals are being suffocated by deposits of silt and thus become unproductive and even the reefs are threatened. The lagoons of Rodrigues are exploited by the coastal community for fish and octopus. Recent studies suggest a decline in octopus and fish catch (Resource Analysis- EDC 1999; Genave, 1997).

Sea grass meadows, corals, reefs, and shoreline offer a wide range of habitats supporting an equally wide range of associated biota. These include various species of fishes, crabs, shrimps, crustaceans, echinoderms, holothurians, algae, seaweeds, and marine angiosperms. Any change to these habitats will bear consequent losses to the associated biota. The destruction of corals through coral trampling, fishing malpractices, damages by boats, and natural causes such as bleaching affect the quality and availability of these habitats for the residing biota. These effects are visible at Grand Baie, Flic en Flac and Belle Mare. In Flic en Flac, the distribution of corals has altered significantly since it was first mapped (Montaggionni and Faure, 1981). Quantitative studies carried out in 1994 revealed that the cover was below 40% both at Flic en Flac and Wolmar. In Grand Baie, the lagoon floor is littered with coral rubbles mostly caused by boat anchors. With regard to bleaching, recent studies (Goorah *et al*, 2000) suggest that 31-39% of live corals in the marine parks of Blue Bay and Balaclava were affected by bleaching. This figure could be higher in regions such as Flic en Flac and Belle Mare.

The clearing of sea grass meadows, also caused by dredging activities, in particular in front of hotels for bathing areas or for ski lanes further impact on the sea floor causing loss of habitats and floor stability (Ramessur, 1991). Sea grass is known to hold together sediment particles and thus prevent them from being carried by strong currents. Recent studies carried out at Pointe aux Piments towards the southern end of the Grand Baie site indicate that disturbed areas have significantly lower biomass values, higher turbidity, lower biodiversity with only a few rare crabs, and can take four to five years to recover (Choony, 2001).

Likewise sand mining activities affect the physical status of the habitat. Over 800,000 tonnes of sand used to be removed from the lagoons annually (NEAP,1999) and the resulting damages of this practice as evidenced at Pomponette-Riambel are two-fold; ecosystems are completely destroyed causing migration and death of associated biota in particular sand dwellers, water currents are changed and sea floor topography modified.

7. ECOSYSTEM RESTORATION INITIATIVES

In its quest to foster sustainable development, the Government commissioned the 'National Environment Strategies for the Republic of Mauritius' in 1998. The outputs of the study is the following three reports, all approved by the Government in January 2000:

- Second National Environmental Action Plan (NEAP2);
- Second Environmental Investment Programme (EIP2); and,
- Review of the Legal and Institutional Framework for Environmental Management in Mauritius.

The NEAP2 prioritised the coastal zone as an area for urgent management action. It recommended the establishment of a fully operational and fully equipped Integrated Coastal Zone Management (ICZM) Division in the Department of Environment (DOE), which should be capable of managing the coastal zone. This Division should become the centre of expertise on coastal zone and should work in close collaboration with other national agencies, supporting and, where necessary, reorienting their actions and activities that affect the coastal zone with a view to achieving a unified and focused approach.

Since the Government approved the NEAP2, the environmental sector has undergone substantial activity and the various Ministries have projects that are either ongoing or upcoming in order to address the coastal issues. These projects all converge towards providing a detailed picture of the ecological, physical, socio-economic, planning and environmental aspects of Mauritius. The important studies and projects which are in progress or planned are:

- Tourism Development Plan for Mauritius;
- Partnerships for the management of marine protected areas in Mauritius and Rodrigues
- Study on Coastal Erosion;
- Preparation of a Strategic EIA for Identification of Potential Sites for Marinas, Ski Lanes and Bathing Areas for Mauritius;
- Study of Environmental Risks in Grand Baie;
- National Physical Development Plan Review
- Banning of sand extraction from the lagoon

7.1. Tourism Development Plan for Mauritius

The Tourism Development Plan for Mauritius, published in February 2002 is the masterplan for sustainable tourism development. It identifies the main coastal problems as:

- Inadequate physical planning, by which individuals and corporate and municipal entities construct buildings too close to the high water mark and destroy vital inter-linked components of the coastal zone
- Construction of jetties, docks, groynes, walls, underwater recreation activities etc. that change the geomorphology of the coastal zone
- Dredging of the lagoon
- Reef destruction for a variety of intentional and unintentional reasons by tourist-related and non-tourist related activities
- Overuse of beaches, coastal waters and reefs, in relation to their capacity, that destroys the delicate biological and geomorphologic interrelationship between them

The Tourism Development Plan for Mauritius provides an integrated approach to the tourism development and its impact on the environment. The plan includes chapters on:

- Coastal Zone Management for Tourism
- Lagoonal Water Quality
- Protection of Coastal Wetlands
- Tourism and Conservation Areas
- The Importance of Physical Planning
- Grand Bay Waterfront Development Brief
- Flic en Flac Public Beach Development Brief

7.2. Partnerships for the management of marine protected areas in Mauritius and Rodrigues

This UNDP-GEF project will identify the best management practice for Marine Protected Areas and apply these on a pilot scale at different localities in Mauritius and Rodrigues. The project is expected to start in mid 2003.

7.3. Study on Coastal Erosion

A study on coastal erosion was commissioned in early 2003 by the Ministry of Environment and is expected to be ready by mid 2003. Coastal erosion being a major problem in Mauritius, the results of this study will provide proper insight in the causes of erosion and their potential solutions.

7.4. Preparation of a Strategic EIA for Identification of Potential Sites for Marinas, Ski Lanes and Bathing Areas for Mauritius

So far, requests for development of marinas, ski lanes and bathing areas in Mauritius were looked into on a case-by-case basis. This gave rise to unplanned allocation of coastal resources. Taking this into consideration, the Government of Mauritius has commissioned the preparation of a strategic EIA for identification of potential sites for these activities. The result of the study is expected to be ready by May 2003. This strategic EIA will go a long way in providing propose guidelines for these activities which can impact heavily on the coastal zone if not properly planned.

7.5. Study of Environmental Risks in Grand Baie

In order to determine the impact of unplanned development in the Grand Bay area, the Ministry of Environment has requested a study of the environment risks in Grand Bay. The report which has recently been submitted identifies the major causes of coastal degradation, including wetland backfilling and proposes solutions to minimise impacts on the zone.

7.6. Development of an Integrated Coastal Zone Management Framework for Mauritius

The Government of Mauritius is aware of the crucial importance of the coastal zone in the development of Mauritius and its role in the national economy. This two years' project has as rationale the integration of the results of all previous and on-going studies on the coastal zone with a view of developing an Integrated Coastal Zone Management Framework for Mauritius. The project is expected to start in 2003.

7.7. National Physical Development Plan Review

The National Physical Development Plan (NPDP), prepared in 1993 and approved in 1994 was meant to provide a special framework for the physical development of Mauritius up to 2010. The NPDP has now been reviewed with the following objectives:

- To provide strategic guidance and context to Government in the improvement and provision of new infrastructure to enable the planned development to be achieved,
- To promote sustainable development which allows for the protection of the best quality of agricultural land and of environmentally sensitive areas,
- To provide a basis for the revision of all local and use plans, that is Outline Schemes,
- To provide guidance on the need for strengthening the institutional/legal framework for physical planning,
- To provide suitable development opportunities for both local and international investors to achieve significant economic development that will secure high standard of living for Mauritius.

7.8. Banning of Sand Extraction from the lagoon

Coral sand used to be extracted from the lagoon at the rate of 800,000 tonnes annually. Studies commissioned by the Government showed that this activity was having adverse, irreversible effects on the marine environment such as destruction of the marine habitat and coastal erosion. In 1997 Government of Mauritius decided to ban lagoonal sand mining. Sand miners were given a moratorium up to 2001 to stop their activities and look for alternative livelihoods. This decision was enforced in October 2001. Compensation was paid to those engaged in the sand mining business. Adequate substitute materials are now available, particularly through use of advanced technologies for crushing rock and utilising it for construction.

8. CONCLUSION AND RECOMMENDATIONS

Considering the importance of the coastal zone in the national economy, the Government of Mauritius has taken the lead in tackling problems associated with the coastal zone in an integrated manner. Recommendations of studies and projects are systematically implemented in a timely manner and important recommendations are given legal status.

Apart from the projects mentioned in section 1.9, necessary changes have also been brought to the Environment Protection Act (EPA) in order to better protect the coastal zone and to consider it as an integral system. The new EPA caters for the creation of an Integrated Coastal Zone Management (ICZM) Committee consisting of all stakeholders as members.

The mandate of the ICZM Committee is to:

- develop an integrated management plan;
- coordinate regional and international projects;
- monitor coastal water quality and coastal resources, including wetlands;
- conduct and recommend studies on beach erosion and propose measures for its control;
- make recommendations for the upgrading of recreational facilities;
- coordinate the management of islets and outer islands;
- make recommendations on guidelines for coastal constructions;
- propose oil spill contingency planning and sensitivity mapping; and
- generally, make recommendations to the Minister on the management and protection of the coastal zone.

The need for an integrated plan is also spelt out in the new law: “The Minister shall cause to be prepared an integrated coastal zone management plan which shall be used for coastal zone planning, management and development.”

According to the new EPA 2002, the following works require a full EIA:

- Construction of breakwaters, groins, jetties, revetments and seawalls
- Construction of dam and dyke
- Construction of marinas
- Harbour dredging operation, construction and development
- Hotel (coastal), including extension
- Lagoon dredging and re-profiling of sea beds including creation of bathing areas
- Landfill
- Lime manufacture
- Modification of existing coastline such as beach re-profiling, coastal protection works and removal of basaltic and beach rock
- Offshore sand mining
- Sewage treatment plant
- Sea outfall
- Shipyard and dry dock
- Undersea walk
- Wetland development

Conscious of its fragility and vulnerability as a Small Island Developing State, Mauritius is planning ahead for the sustainable development of its coastal zone. The very strong political will coupled with the need to meet the challenges of globalisation have brought about considerable changes in environmental management in Mauritius. Making the most of international agreements and cooperation, Mauritius is forging ahead to become a model for the region.

9. REFERENCES

- Bhikajee, M. (1997). Mariculture of the red tilapia in enclosed bays and in cages- the Mauritian experience. Proceedings of the Fourth International symposium on Tilapia in Aquaculture, Orlando, Florida, U.S. November 9-12, 1997. 595-602.
- Bhikajee (2001) Coastal Zone Management in Mauritius in SEACAM, 2001. The Voyage from Seychelles to Maputo - Success and Failures of Integrated Coastal Zone Management in Eastern Africa and Island States, 1996-2001. (Vol. II - Eastern African Island States and Regional Reports)
- Choony, N. (2001) Monitoring of a disturbed seagrass bed at Pointe aux Cannoniers. B.Sc Thesis (Unpublished) University of Mauritius.
- Genave J T. (1997). Growth, reproductive biology and stock assessment of Octopus cyanea off the coast of Rodrigues Island 1997. B.Sc Thesis (unpublished) University of Mauritius.
- Ghoorah, D., Ratacharen, B. D. & Rulputeea, D. (2000) Occurrence of coral bleaching in the marine parks of Mauritius. (Unpublished Report) Albion Fisheries Research Centre, Mauritius.
- Jootun, L., Gungaparsad, D., Ragoonaden, S., Dunpath, K., & Ujodha (1994). National report on the state of coastal erosion in Mauritius.
- Montagioni I& Faure G (1981) Les récifs corallines des Mascareignes (O.Indien) Coll.Travaux Centre Universitaire. Réunion. 100 pages
- NEAP-Government of Mauritius (1999b). National Environmental Strategies for the Republic of Mauritius: National Environment Action Plan for the next decade. Environment Resources Management.
- NES-Government of Mauritius (1999b). National Environmental Strategies for the Republic of Mauritius: National Environment Action Plan for the next decade. Environment Resources Management.
- Prayag R, Jootun L and Bheeroo R.A. (1995) Integrated Coastal Zone Management. Protection and Management of Marine and Coastal Areas of the Eastern African Region. Report prepared for UNEP/FAO/IOC/IUCN EAF5 project. Ministry of Environment and Quality of Life, Mauritius. 92 pages
- Ramessur, T. (1991). Coral Zonation in Flic en Flac, Mauritius. University of Mauritius Journal 32. pp.3-11.
- Resource Analysis- EDC (1999). Feasibility of desiltation of lagoons in Rodrigues.