Outline for an Action Plan for sustainable coast management in the Seychelles.

1. Introduction

The Seychelles archipelago, being composed entirely of islands, has a great percentage of her total land area classified as coastal. These areas are the habitat of much avian, mollusc, crustacean and fish species, and are of large benefit to the country's economy as they allow the existence of industries which bring in foreign exchange and provide employment. Seychellois culture is also centred on the sea and coast which have supported the population in the past and should continue to do so.

2. The importance of coastal areas for the Seychelles

Tourism: Tourism is essential to the country's economy, amounting to about a third of the gross domestic product (GDP). It directly employs 15% of the formal workforce and contributes to 70% of total foreign exchange earnings. This industry depends largely on beaches, marine flora and fauna and coastal features such as coral reefs which are major tourist attractions.

Fisheries: In addition to providing employment, this is also a food source for the population. This industry is dependant on the well-being of marine species.

Culture and recreation: Many locals use coastal areas for recreational activities such as swimming, as well as traditional activities such as dancing festivals. Being near the coast has influenced Seychellois cuisine and folklore as well.

Habitation: The majority of the population lives in the coastal zone and anything which affects the zone tends to affect the inhabitants.

3. What this action plan aims to do

This action plan is aimed towards using ICZM (integrated coastal zone management) to **sustain** Seychelles' coastal zone for the future by trying to reach a level of **human activities** and **natural processes** that does not threaten the areas in question. To do this, factors which may negatively

affect the condition of coastal areas are tackled in a series of steps. The goal is to reach **and maintain** a harmonised integration of all aspects of the coastal zone, **as opposed to the sectoral approach of today**.

4. Why this action plan is necessary

The coastal zone is the location of industry, habitation, recreation and other activities. Presently, conflicts of interest result in over-usage and/or destruction of resources which, along with the destructive forces of nature, affect the future health of the zone. This action plan is necessary to deal with these conflicts and threats so that the diverse coast related activities continue to be carried out.

5. The main elements of the plan

I. Sustainable management of coastal and marine resources
II. Preventing and/or controlling coastal wave erosion
III. Controlling upland erosion and river erosion at the coast
IV. Waste management
V. Managing varieties and numbers of aquatic species
VI. Eco-tourism
VII. Developing an efficient monitoring system to aid the implementation and evaluation of the above six subsections

6. Putting the elements into action

The administrative process of ICZM is to be organised and applied by an ICZM task force as part of the Ministry of Environment. Its role in the implementation of the following objectives would be to deploy, guide and set aside the necessary resources for each task.

6.1. Sustainable management of coastal and marine resources

As mentioned in section 4, various **uncoordinated** economic, social and environmental sectors make use of coastal and marine resources simultaneously. Not surprisingly, resources tend to be pressured. The solution is to share the resources according to the sector's priority in a way that all essential sectors continue to function optimally without compromising the availability of resources in the future.

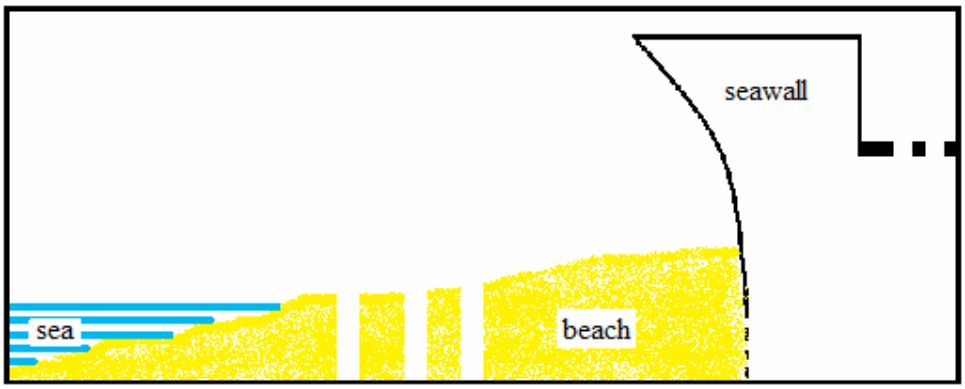
6.2. Preventing and/or controlling coastal wave erosion

Coastal erosion in the Seychelles occurs through direct wave action and, as discussed in section 6.3, also river action. Measures taken to manage coastal erosion depend on the aesthetic importance of the area, the type of erosion and the intensity of erosion occurring. This action plan suggests different methods for the different situations.

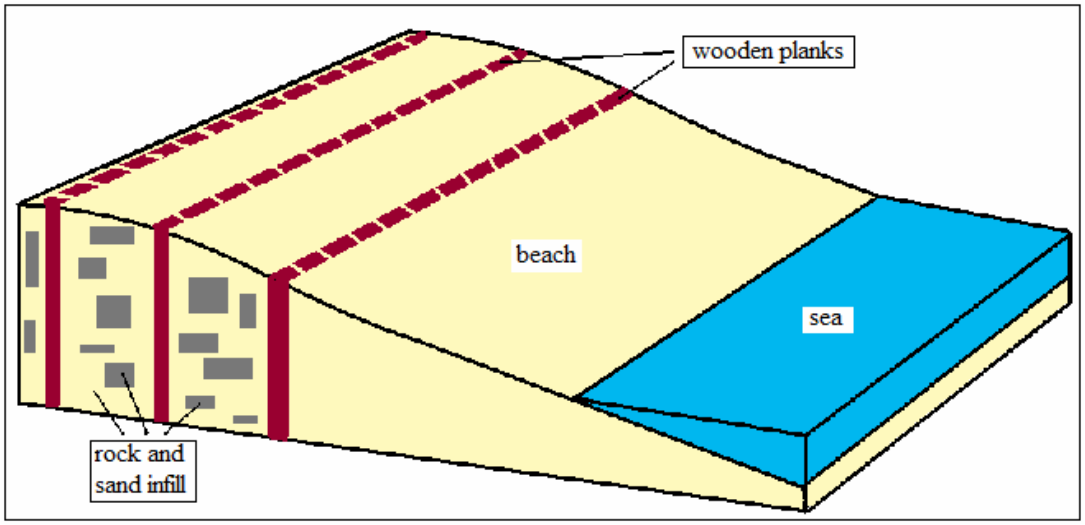
There are two ways to go about this issue:

-Hard engineering: uses **man-made** structures to protect the coastline. Being visually damaging and expensive, this option is best used with high intensity erosion beaches. Below is an explained list of hard engineering methods;

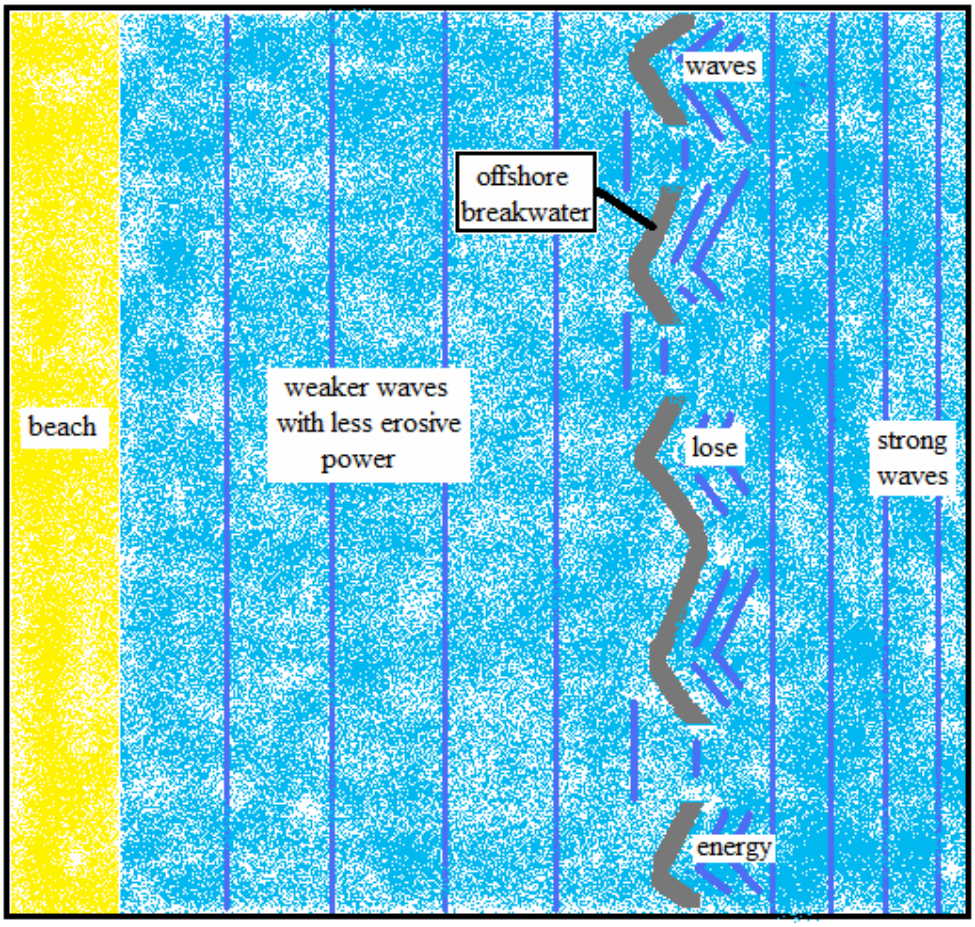
A. **Maintenance and/or redesigning sea walls -** Sea walls already exist in most coastal areas in inhabited islands. This measure has so far succeeded in considerable reduction of beach recession. Walls which have deteriorated should be repaired, and redesigned where necessary. Here is an example of a sea wall (cross-section).


seawall
sea
beach

B. Revetments: This is probably the best option for low to moderate wave strength tourist beaches. Consisting of wooden planks (recommended) with sand and/or rock infill, revetments are effective in reducing erosion and at the same time being bearable or even attractive in appearance.

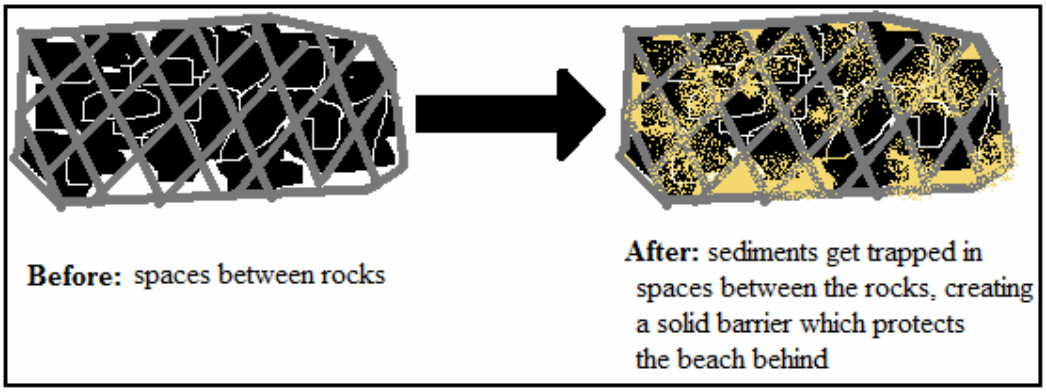


C. **Offshore breakwaters-** for high intensity beaches (very strong wave action), offshore breakwaters should be used as they considerably reduce the force of waves reaching the coast by absorbing and deflecting wave energy. In addition, costs could be saved by using granite boulders. The breakwater acts like an artificial coral reef and causes minimal visual damage, making this method suitable for tourist beaches.



D. Rock Armour: for beaches that are <u>not</u> specifically used for tourism, large rocks placed at the base of dunes absorb wave force and help slow down coastal erosion by holding back material.

E. Gabions: Granite boulders about 30-50 cm in length, obtained from a local source, are meshed together using metal wire netting. When placed on non-tourist beaches of medium to high intensity wave action, a solid barrier is created over time as water drains through the wire, leaving sediments behind.



-<u>Soft engineering</u>: creates **ecological** methods or improves existing features to produce sound coastal defences. Soft engineering is suitable for aesthetically important beaches because very little or no visual damage is done. Also, this option tends to be cheaper. Below is an explained list of soft engineering methods.

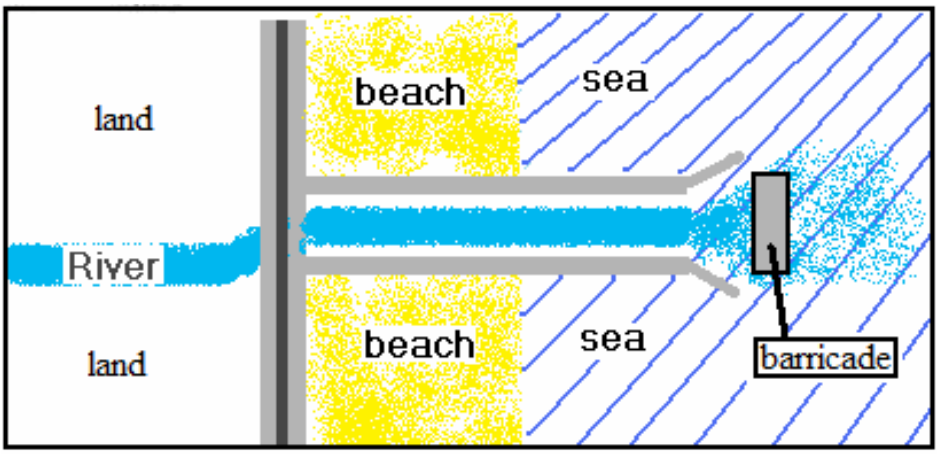
A. **Stabilising sand dunes:** sand dunes are piles of sand and other material in the most landward side of beaches. A cheap and aesthetically undamaging way of reducing erosion is to stabilise these dunes. This can be done by planting vegetation on the dunes as shown in the photograph. Afterwards, footpaths or boardwalks must be made for people to pass. A small drawback is that the vegetation may take long to establish within the dune.

B. **Beach Nourishment:** Alien sand is deposited upon existing sand. This is not a long lasting solution, as it needs maintenance every 1-10 years.

6.3. Controlling upland erosion and river erosion at the coast

i. Uncontrolled upland erosion has the negative impact of depositing soil and rocks into the sea at a rapid rate. This phenomenon can be controlled by several methods. Firstly, preserving vegetation on the river channel's sides will slow down erosion as roots hold the soil together. Secondly, pools or basins help to slow down the river in places and cause less material to get washed away (the river slowing down will mean periodical deposition along the river course).

ii. To tackle the effect of rivers on the coast, a concrete channel can be placed at the mouth of a river to stop sand being washed away.



Laying an underground pipe connecting a small river/stream to the sea causes less visual damage than the former, but it is not advised to do this with large rivers as complications may occur during high-discharge seasons.

6.4. Waste management

Solid Waste at the Victoria Domestic Jetty

Any form of waste, if released into the environment directly, can cause harm. For that reason, both liquid and solid waste forms have to be managed effectively.

Damaged sewage pipes result in the leakage of untreated liquid waste to the environment which can have effects on human health. Thus, leakage cases should be repaired as soon as possible. Additionally, if intentional dumping is occurring, legal action should be taken against those responsible.

Improperly discharged agrochemicals can cause over-nutrition of algae which in turn will kill fish from oxygen deficiency. Immediate action is to be taken to stop discharge, and a safe coordination of agriculture and other aspects is to be reached.

On the issue of ship generated waste, facilities to collect and treat sewage from ships should be developed on ports (instead of direct dumping). Solid waste from ships should be disposed in a safe way, perhaps at landfills.

Littering can make beaches look unappealing and consequently affect tourism. Harm can occur to marine creatures as well. So, bins should be placed in busy beaches and campaigns should be organised to clean up existing litter.

6.5. Managing varieties and numbers of aquatic species

There needs to be a healthy population of marine species for fisheries and aquaculture to occur. Protection of aquatic species must also be done for conservation purposes.

Current threats are invasive species, over-fishing etc. More detailed explanations are given below with solutions.

- **Invasive species**, in the coastal zone, are mainly introduced through ballast water discharge. If these aliens proliferate, local species can be threatened. As a preventive measure, policies on the issue of ballast water should be investigated and changed so that discharge is done offshore whenever possible. If invasion is already happening, the creatures' weak points should be examined and appropriate steps be taken to neutralise them.
- **Poaching:** Endangered species such as turtles are being poached in the Seychelles. To tackle this, night patrols and public involvement could be integrated to locate cases and legal action be taken against the perpetrators.
- **Over-fishing:** Marine creatures are sometimes over-exploited so that populations drastically decrease. In this case, as a preventive measure, fish stocks should be examined periodically. To handle existing population deficiencies, restocking could be carried out or fishing could be temporarily suspended.
- **Unusual phenomena:** These include temperature rises, tsunamis etc. A major related event that occurred in Seychelles was the 1998 coral bleaching. Steps taken should be to analyse the extent of damage, aid the recovery of the affected species and monitor improvement.

6.6. Ecotourism

This is essentially pro-environment tourism which promotes the conservation of heritage and ecology; hence it is an integration of heritage, conservation and tourism. This is not an issue in Seychelles as most or all tourism matches the above criteria. Therefore the firm idea of ecological and cultural importance need only be upheld. This can be done by balancing local

development with conservation efforts to have a sustainable environmentally-friendly economic activity.

6.7. Developing an efficient monitoring system to aid the implementation and evaluation of the above six subsections

To **locate problems** and **follow the progress of implemented plans**, there needs to be a good monitoring system.

For changes in beaches, a beach profile monitoring system can be set up. Students or school groups (with the aid of the community) could help with this, because in addition to helping monitoring, they are improving their scientific, mathematical, investigative and computing skills. Measurements are to be done at least every three months and the data collected is to be recorded in a database which could be processed to get a better image of seasonal trends in coastal erosion and accumulation. With this knowledge, necessary steps can be taken for regulation.

Sea levels can be monitored using a tide gauges located at different points around the island. One station is already located at Pointe-Larue, and cooperation with GLOSS (global sea level observing system) is ongoing. This should be continued.

The tide gauge at Pointe

Sea temperature is to be monitored through a system of sensors located at different point around the coastal zone. Information from the sensors could be logged in a computer database, and used for observation.

Finally, the general public could be used to monitor activities, with a hotline provided for reporting suspicious events (dumping, poaching etc.).