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Seychelles

Contents

National vision Biophysical profile Socio-economic profile Legal profile Institutional profile EIA practice Key successes and challenges Conclusion

Appendix 1: Case studies Banyan Tree Beach Resort St Anne Resort Development Appendix 2: Useful contacts

References and other key publications Acknowledgements





Strict conservation measures have saved the giant tortoise from extinction.



'Seychelles – as pure as it gets'

P Wagner (Photo Access)

National vision

The value and uniqueness of the ecology of the Seychelles archipelago has long been recognised both locally and globally. Almost 50% of the land surface of the Seychelles is designated as national park, reserve or protected area under national legislation. In addition, two areas — the Aldabra Atoll and the Vallée de Mai on Praslin — are World Heritage Sites, protected by international law.

In July 1997, the environment of the Seychelles was afforded a higher status locally when the Ministry of Environment was separated from the Ministry of Environment and Transport. This reflected the Government's recognition of the importance of the environment to the health of the Seychelles economy. Vice-President James Michel, who simultaneously serves as the first Minister of Environment, stated that —

[W]ben visitors come bere they spend money. And tourism, a pillar of our economy, thrives on the beauty of our environment. We want to ensure that this pillar of our economy remains. In a way our environment is our bread and butter.

(Seychelles Unlimited, December 1997)

The Seychelles Tourism Marketing Authority slogan to differentiate the Seychelles from all the other sun, sand and sea destinations is 'Seychelles – as pure as it gets'.

The key documents guiding sustainable development in the Seychelles are the Government's environmental management plans for the Seychelles (EMPS) for 1990–2000 and 2000–2010 (GRS 1990a, GRS 2000b). The President supported the EMPS initiatives, which served to propel the progress of the 1990 National Development Plan in the direction of sustainable development for the country. The 1990–2000 EMPS was also approved internationally, but has since been criticised for a lack of input from stakeholders during its formulation, and for its inflexibility with regard to incorporating new programmes. Nonetheless, about 90% of the projects discussed in the 1990–2000 EMPS have been implemented.

The 2000–2010 EMPS (GRS 2000b), on the other hand, was prepared with significant stakeholder involvement and presents a far more flexible approach to environmental management. In the introduction to the latter EMPS, Vice-President Michel, as Minister of Environment, stated the following:

Capacity-building will be one of the most important challenges for this new EMPS, as the importance of planning and environmental responsibility continue to permeate throughout all levels of society. Being a small island developing state, severe constraints work against us. Our challenge bas always been to achieve much with little because we believe in improving the prosperity of our people and the quality of our environment.

Additionally, there is increasing pressure for economic development and international environmental issues. We will continue to integrate economic development and environmental protection as guided by Agenda 21.

Biophysical profile

The Republic of Seychelles comprises 115 islands: 41 islands and islets constituting pre-Cambrian rock, and 74 coral islands. The total land area is 455 km², with the islands distributed over the exclusive economic zone of 1,374,000 km². Mahé, the main island, is 148 km², rising to a maximum height of 914 m at Morne Seychellois.

The islands rise from the Seychelles Bank, a shoal area covering approximately 31,000 km², with water depths of up to 60 m. The Seychelles Bank forms the north-western portion of a curved offshore feature that includes the Mascarene Plateau, Saya de Malha, the Nazareth Bank, and the islands of Mauritius and Réunion.

The islands of Mahé, Praslin and La Digue are composed of pre-Cambrian granite between 700–750 million years old. These three islands are considered to be the main islands of the Seychelles – they are the most densely populated and economically active – and, unless otherwise specified, most of the information provided in this chapter refers to them. Silhouette Island and the Ile du Nord are composed of syenite, diorite and microgranite, whilst the Amirantes Group to the west comprises low coralline islands that rise 2–3 m above sea level. The five westernmost islands of the Aldabra Group are composed of limestone reefs up to 8 m high.

Mahé has the highest relief of the three main islands, which are typically rugged and hilly. It has a coastal strip rising fairly sharply from the coast to heights of up to 300 m in the south, reaching 914 m in the northern portion of the island. Praslin and La Digue have less severe relief, reaching heights of just over 300 m.

Climate

Temperature and humidity remain generally high throughout the year, with a mean temperature of $27 \,^{\circ}$ C and humidity of



WSP Walmsley

Because of its steep topography, Seychelles is in short supply of land suitable for large infrastructure. Here, land was reclaimed to accommodate the airport.



80%. There is very little seasonal variation in climate, although between June and October, south-east trade winds result in cooler, drier conditions.

November to April is the cyclone season for the south-west Indian Ocean, and although the Seychelles is not in the direct track of tropical cyclones, cyclonic activity can result in gale force winds, flash floods and severe thunderstorm activity.

During the summer, the wind is predominantly northwesterly, bringing warm weather with a high moisture content.

The length of the dry season varies significantly from island to island, meaning they have highly variable rainfall. Mahé, for example, has an annual average rainfall of 3,237 mm, whilst the northern atolls receive 1,700–2,000 mm and the southern islands 850–990 mm. There is also extremely high inter-annual variability in rainfall in the Seychelles, and this has a significant effect on socio-economic activities there.

Vegetation

The flora of the Seychelles is highly altitude-dependent. Prior to disturbance by humankind, the island shores were fringed with coconut palms and other plants whose seeds were carried in by the sea. The only endemic species thought to occur along the coast was *Pandanus balfourii* (Vakwa Bord-d-mer). Subsequent anthropogenic activities such as sand mining and construction have resulted in the destruction of most of the original coastal vegetation.

The Coastal Plains used to be dominated by lowland and coastal forests (200–300 m above mean sea level), which typically comprised tall (20–25 m) tree species. Indigenous vegetation is no longer common in these areas because it has been significantly altered by agricultural and development activities.

Intermediate Forest occurs between 200–500 m in altitude. Formerly rich in endemic species, much of it has now been felled. Remaining areas have been invaded by exotic species or have been planted with exotics.

The relatively high-altitude Mountain Mist Forests originally covered most of the land above 400–500 m. These areas are typified by rainfall of over 3,000 mm per annum. The transition between the Intermediate Forest and Mountain Mist Forests has been obscured by the dominance of exotic vegetation, which is threatening the sustainability of these highaltitude forests. The Mountain Mist Forests are typified by mosses, lichens, ferns and epiphytic orchids. Tree ferns and creepers are common, and tall trees are still found in undisturbed sites at higher altitudes. The number of endemic species is lower at this altitude than in the Intermediate Forest.

Mangroves were common along the coastline of the granitic islands, but many have been destroyed by development activities. Mangroves are re-establishing in the lagoon areas created by coastal land reclamation. The Mangroves are important bird habitats.

There are approximately 69 km of rocky shores on Mahé, 22 km on Praslin and 7 km on La Digue. Plants associated with these environments include the coconut (*Cocos* spp.), *Casuarina equisetifolia*, the *Hibiscus tiliaceus*, some scramblers and grasses, Mauritius hemp (*Furcraea gigantea*) and the endemic Vakwa Bord-d-Mer.

Wildlife

There is a total of about 65 km of sandy shoreline on the three islands, and although the vegetation has been severely modified, the shores still provide an important habitat, particularly for seabirds and marine turtles (for nesting). Most notably, the hawksbill and green turtles are dependent upon the sandy shores for breeding.

There are three species of snake on the Seychelles – two of which are endemic; 25 species of lizard; and three species of terrapin (the terrapins are endangered due to habitat loss). Four species of turtle occur, all of which are endangered because of human activities. Giant tortoise (*Dipsochelys* spp.) were the dominant terrestrial herbivore throughout the Seychelles prior to the introduction of domestic animals. Conservation efforts have resulted in an increase in the tortoise population from 1,000 in the 1890s to more than 150,000 today (the majority of these inhabit Aldabra).

Thirty endemic taxa of birds occur on the Seychelles, including eight globally threatened species. At least three species of birds have become extinct as a result of human activities, and several others are currently under threat on the islands – including the Seychelles magpie robin (*Copsychus sechellarum*), the Seychelles white eye (*Zosterops modesta*), the Seychelles black paradise flycatcher (*Tersiphone corvine*) and the Seychelles scops owl (*Otus insularis*). The Seychelles also hosts some of the most globally important seabird colonies.

The only indigenous land mammals on the Seychelles are bats, although various other mammals have been introduced. There are five species of bats on the islands, two of which are endemic. The Seychelles sheathtailed bat (*Coleura seychellensis*) is highly endangered.

Marine life

The marine environment is an extremely important part of both the Seychelles ecology and its economy. For example, the two species of nesting turtles, ten species of breeding seabirds and 900 species of marine fish are all significant natural capital of the Seychelles. At least 70 of the fish species are important to the country's fishing industry. Marine mammals are strictly protected in the waters around the Seychelles. Some 21 species of marine mammals have been positively identified there, including the densebeaked whale (*Mesoplodon densirostris*), the fin whale (*Balaenoptera physalus*), the killer whale (*Orcinus orca*), the melon-headed whale (*Peponocephala electra*), the right whale (*Eubalaena glacialis*), the Sei whale (*Balaenoptera borealis*), Risso's dolphin (*Grampus grisius*), the roughtoothed dolphin (*Steno bredanensis*), and the spotted dolphin (*Stenella attenuata*).

Three main types of reef occur, namely fringing reefs, platform reefs and atolls. All are sensitive to disturbance and many are being damaged by dropping anchors and by other human activities.

Seagrass and algae are abundant and diverse, and the *Sargassum* beds are some of the largest in the world. The beach environment is rich in molluscs, crabs, rockhoppers, small limpets, barnacles and nerites.

Water resources

There are difficulties associated with the provision of an adequate and reliable supply of fresh water on the main islands. Demands are relatively high (five-star hotel accommodation uses a particularly high quantity) and space for storage is limited due to the topography.

Rainfall is abundant, but up to 98% of rainfall is lost through run-off and evaporation, while only 2% infiltrates the ground. The principal source of potable water, therefore, is groundwater. The majority of the population is connected to the main water supply (on Mahé), but during dry periods, the water supply is unable to meet demand and water rationing is common. Table 1 illustrates the current and predicted deficits in water supply on Mahé.

Several industries and all the new large hotels are installing desalination plants to ensure a reliable supply of water, partly because the Public Utilities Corporation (PUC) is currently unable to guarantee an uninterrupted supply.

The PUC, too, is currently constructing a large desalination plant on reclaimed land adjacent to the new sewage works. This development aims to increase the water supply capacity, as there is no space on the islands to build additional storage.

Ecological sensitivity

On many of the islands biodiversity is under great pressure and threat, partly because of the problems associated with the lack of land, and partly because endemic species are particularly vulnerable to disturbance and to being out-competed by alien invasive species. Climate change and the associated potential rise in sea level also represents a threat to island ecology.

Current and projected land use

Some 47% of the land surface area of the Seychelles is protected under various conservation designations. The total land surface area suitable for farming is approximately 10,000 ha, of which about 6,000 ha are coconut and other tree-crop plantations. A considerable proportion of the agricultural land has been lost to other land uses, particularly housing.



Source: Payet (1998).

On the main granitic islands, the predominant land use (42%) is forest. Forest cover comprises unprotected natural forest (41%), those in national parks (48%) and plantations (11%). These areas are not suitable for other use due to the nature of the topography, although, as land becomes increasingly scarce, housing developments are encroaching into the higher forested areas at a relatively high rate.

The need for industrial land is growing as well, due to an economic desire to add value to local products. This has resulted in the development of coconut oil and soap manufacturing factories, a tuna-canning operation and various related operations. There is also a mounting need for land to be appropriated to public utilities such as sewage works and desalination operations. The airport, the Victoria Sewage Works and the desalination plant on Mahé are all located on reclaimed land, along with other industry and some housing.

Key environmental limitations

The most significant environmental limitations in the Seychelles relate to the lack of flat land for development, as this leads to pressure on the ecologically sensitive, steeper slopes and problems with water supply and sewage disposal. Only a small portion of the land surface of the three main islands has slopes of less than 10% (gentle): the remainder of the land comprises heavily vegetated steep slopes.

The unreliable supply of fresh water is another significant issue on the islands, particularly in view of the high demand from upmarket tourist establishments.

Wastewater disposal is becoming an increasing problem on the islands. Larger hotels have their own treatment plants, but since many of these do not operate in compliance with the

Table 1: Comparison between water supply and demand (k per day)				
	1996	2000	2005	2010
Projected gross demand	19,150	27,350	27,390	27,450
Safe yield (1996)	13,500	13,500	13,500	13,500
Deficit	5,650	13,850	13,890	13,950

required standards, they impact on the water quality at their discharge points. Smaller hotels and most houses have septic tank and soak-pit systems. These, too, have significant impacts on inland water quality and hygiene, as access to these tanks for maintenance and repair is often extremely difficult due to the topography and density of habitation. In order to cope with the problem more effectively, a new sewage works has been constructed at Victoria and a second works is under construction at Beau Vallon. A feasibility study has also been completed for the construction of two government sewage works on Praslin.

Key environmental impacts caused by development

Direct impacts associated with development on the islands include -

- soil erosion on steep slopes
- biodiversity loss (endemic species, forests, mangroves, wetlands)
- increasing alien plant invasion
- water pollution associated with sewage disposal
- the visual impact of developments, and
- disturbance of animals such as turtles during nesting activities.

Indirectly, development results in impacts associated with increased power and fresh-water consumption, as well as increased waste production (air pollution, lack of available land, etc.).

Importance of natural capital to socioeconomic development

The dynamic but diminutive economy has been supported by tourism and fisheries, which are the major foreign exchange earners in the economy. The sustainability of these two sectors is clearly essential to the economy and the survival of the Seychelles. As their sustainability depends on the maintained integrity of the terrestrial and marine environments, the country needs

Figure 3: Economic value of Seychelles' biodiversity



to be especially careful to avoid the consequences of biodiversity loss and degradation. (GRS 1997)

It is estimated that agriculture, fishing and forestry contributed US\$15 million to the gross domestic product (GDP) in 2000, whilst tourism generated US\$144 million – the highest single contribution. Together, therefore, these sectors generated 27% of GDP in 2000. However, the sectors concerned are totally reliant upon the preservation of the Seychelles' natural resources. In 1992, for example, the St Anne Marine Park received more than 27,000 visitors, who spent an estimated US\$2 million there. The preservation of natural resources offer other, less tangible benefits – for example, the physical protection provided to the city of Victoria by the reefs from wave action and current.

The Seychelles marketing drive ('as pure as it gets'), which uses the relatively undisturbed nature of the environment on the islands to differentiate itself from other similar destinations, relies totally upon the conservation of natural capital. Plans for expanding tourism on the islands involve creating an ecotourism market, which will also be based on a wellpreserved environment.

Figure 3 shows the economic value placed on biodiversity in the Government's Seychelles Biodiversity Strategy and Action Plan (GRS 1997).

Transboundary environmental impacts

There are very few transboundary risks in the Seychelles due to the islands' relative isolation. However, the islands lie on a major international oil transportation route and, therefore, are at risk from a major oil spill. The last incident occurred in 1972, when a Royal Navy vessel ran aground near Aldabra, discharging 40,000 t of oil.

Other risks include -

- the importation of alien vegetation (the cinnamon plant, *Taraserianthes salcataria*, and *Albizia* are currently outcompeting local species)
- the introduction of foreign plant pests and diseases such as the fungus attacking the indigenous takamaka tree (*Calophyllum inophyllum*)
- the introduction of alien animals (rats are causing significant problems on many of the islands), and
- the illegal export of plant and animal products (e.g. turtle shells).

The conservation of migratory seabirds in the Seychelles is dependent on the preservation of their habitats along their migration routes.

Socio-economic profile

Population

The population of the Seychelles reached approximately 81,000 in 2002, with an almost equal ratio of men to women.

Population growth has been constant at around 1% for several years. At least 90% of the population of the three main islands live on Mahé, whilst 8% are resident on Praslin and 2% on La Digue.

Health facilities on the main islands are adequate and there is a notable lack of many serious diseases, such as malaria, on the islands. In addition, HIV/AIDS¹ rates are fairly low (GRS 2001) and life expectancy high (77 years for women, 67 years for men).

The education system in the Seychelles is good, with an average pupil-to-teacher ratio of 14.5:1. There are 26 primary schools and 14 secondary schools in the Seychelles, but no universities. There are, however, eight colleges for 'post secondary' education, namely the Polytechnic, the Industrial Training Centre, the Maritime Training Centre, the Farmers' Training Centre, the National College of the Arts, the Seychelles Hospitality and Tourism Training Centre, the Centre for Health Studies, and the National Institute of Education.

The Gini Co-efficient of equality for the Seychelles during the period 1990–1998 was 0.47 (on a scale of 0–1, where 1 is total inequality). This indicates the Seychelles has less disparity between the rich and poor than the majority of African countries, which tend to have co-efficients of around 0.5. The Seychellois people do not consider that there are any 'disadvantaged communities' in the country, and gender issues do not arise. The Seychelles has one of the world's highest percentages of women in Parliament. There are also initiatives to empower children, and ensure they have appropriate legal rights and representation (Nirmal Shah², pers. comm. 2002).

The Seychelles workforce comprises only 30,000 people and unemployment rates are low at about 10%. There is a shortage of labour at most levels, and, due to the paucity of tertiary education on the islands, many people leave the islands to further their education and do not return. There are, therefore, insufficient Seychellois graduates to undertake technical positions within the economy.

Figure 5 illustrates that approximately one-third of the economically active population is employed directly in the primary production and tourism sectors, with a further 38% employed in service industries.

While some 5,000 people – about 22% of the labour force – are currently employed directly in the tourism sector, an additional 5,000 are estimated to be required within the next ten years as a result of existing facilities being upgraded and additional resorts being developed (GRS 2000c). This will result in tourism becoming the single largest employment sector in the country.

Table 2: Health statistics, 1997–2000

Source: MISD (2001).

01
56
44
14.5
50.5:49.5

Source: MISD (2001).

Figure 4: Population, 1990-2000



Figure 5: Employment by sector, 2000



Source: MISD (2001).

¹ Human immunodeficiency virus / acquired immune deficiency syndrome. ² Nirmal Shah, Birdlife, Sevchelles,



Source: MISD (2001).



The development — and retention — of people in the Seychelles is imperative to the continued success of the tourism industry in particular. There is currently only one hotel school, although another is being developed. The image of the Seychelles as a five-star destination is partly reliant upon the presence of enough well-trained staff. However, appropriately trained people are in short supply in most areas, with many people performing several different tasks at once.

Main economic activities

Since Independence in 1976, per-capita output in the Seychelles has expanded to approximately seven times the original subsistence level. This growth has been led by the tourism sector, which provides more than 70% of hard currency earnings and is the single largest contributor to GDP, contributing 23% in 2000. The fishing industry is also an extremely important part of the economy, with the opening of the tuna-canning factory in 1990 adding further value to the product. Canned tuna generated US\$108 million in trade exports in 2000, i.e. over half of the total export trade.

Whilst the Government has recently encouraged foreign investment for upgrading hotels and other tourist facilities, it is also promoting the growth of the farming, fishing and smallscale manufacturing sectors in an attempt to reduce the dependence of the economy on tourism. This is because the tourist industry is unpredictable, and because the market is facing strong competition from other destinations that are perceived to be better value for money (Mauritius, the Comores, the Maldives and Madagascar).

Economic growth in the Seychelles is highly variable, being dependent mainly upon the tourist and fishing industries: these industries are influenced by global economies and events as well as local factors such as climate and marine productivity.

Tight controls on exchange rates and the scarcity of foreign exchange have hindered short-term economic prospects, and further by the low black market value of the Seychelles Rupee (US1 = 5.62 Seychelles Rupees), which is half of the official exchange rate.

Key capital development projects envisaged for the next ten years include the development of ecotourism facilities, the continuation of land reclamation projects the provision of

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