



The coast of the Erongo Region

Namibia's Coast



Introduction



Namibia's coastline falls within four political regions: Kunene, Erongo, Hardap and Karas. This booklet is about the coastal area in the Erongo Region which includes the Dorob National Park, the northern section of the Namib-Naukluft Park and the towns of Walvis Bay, Swakopmund and Henties Bay.

Few people lived permanently in Erongo prior to the arrival of foreign settlers and traders about 150 years. Fresh water for both people and livestock was usually hard to find, grazing was often in short supply and crops were difficult to grow. These inhospitable conditions meant the local environment remained largely unspoiled. The only original, perhaps indigenous coastal inhabitants are limited to a few hundred Topnaar people who live mainly in Walvis Bay and along the Kuiseb River.

Currently, about 110,000 people live in Erongo's three main coastal towns and this number is growing rapidly. In addition to the coastal residents, the number of people changes dramatically seasonally, with a huge influx of holiday-makers to the coast in December and January. Environmental impacts are increasing as result of the escalation of exploration and mining activities along the coast and varied impacts from tourism.

Coastlines are the narrow interface between the Earth's three great realms – the land, the atmosphere and the oceans. This is the zone where diversity of life is often concentrated, with some organisms from the sea, other species from the land, and those that occur only in the thin inter-tidal strip itself. Processes operating in one domain affect the other. For example, the ocean temperature affects that on land, while the land provides nutrients to the oceans. Conditions along coasts are also influenced by tidal changes and particularly by weather, such as wind and the waves and currents driven by atmospheric circulation.

The Erongo coastal area is characterised by extreme aridity, frequent fog and southerly winds. Offshore, the cold Benguela Current and its associated upwelling system is rich in nutrients and brings cool conditions to the coast. Most of the coastline consists of sandy and rocky beaches with salt pans and gravel plains inshore.

The section of Namibia's coast within the Erongo Region incorporates what was formerly the National West Coast Tourist Recreation Area, recently proclaimed as the Dorob National Park, and the northern section of the Namib Naukluft Park, part of which was originally gazetted as Game Reserve 3 in 1907 (Figure 1). Within the coastal section of the Erongo Region are some key areas for biodiversity, especially birdlife and lichens, including the Walvis Bay lagoon, Sandwich Harbour and the gravel plains near Wlotzkas Baken.

The Climate

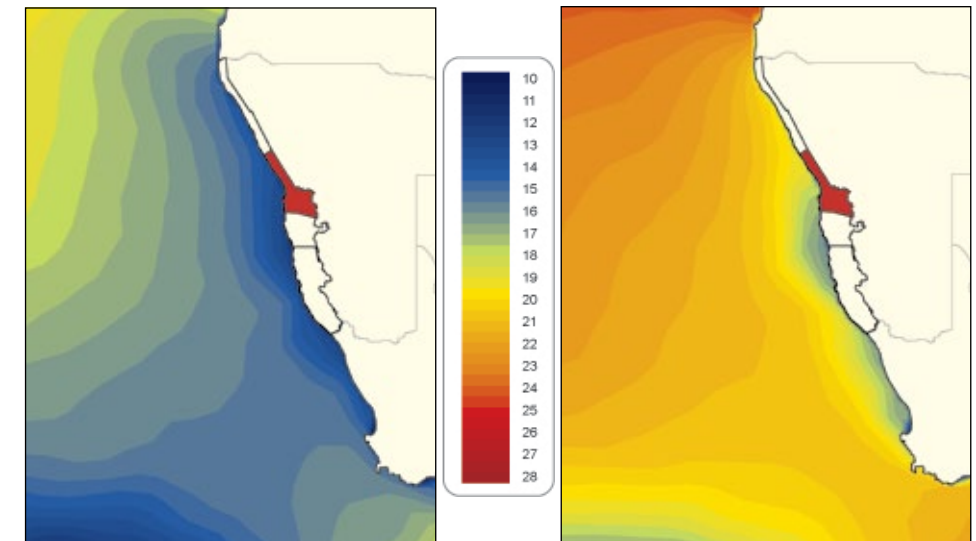
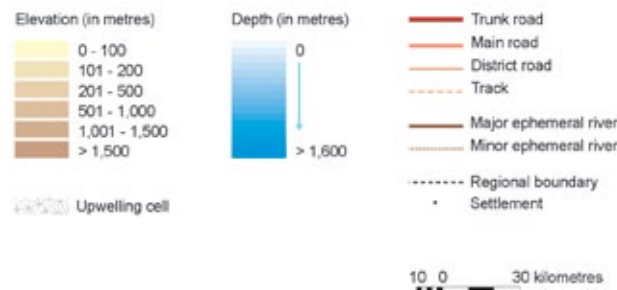


Figure 2. Average temperatures (°C) of the sea surface over the past 20 years in August (left) and February (right). The upwelling of deeper, colder water is evident close to the coast.

The climate of the coast of the Erongo Region is strongly influenced by the Benguela Current which carries cold water from the southern ocean all the way up to near the Kunene River mouth. Low sea surface temperatures – ranging from monthly averages of 13 to 18°C – keep the air above the sea cool and dense (Figure 2). Winds along the coast are predominantly from the south, being generated by the South Atlantic high pressure cell far to the south-west of Namibia. The cool, relatively dry air usually cannot rise enough over the coast to form rain clouds, and so moisture normally only condenses into fog and low clouds. Fog occurs on about a third of the days each year (Figure 3), and is most prevalent during mornings and evenings. The Erongo coast receives an average of only some 5 to 6 hours of sunshine per day.



Figure 1. The coastal zone of the Erongo Region. The arrows show the direction of flow of the Benguela Current.



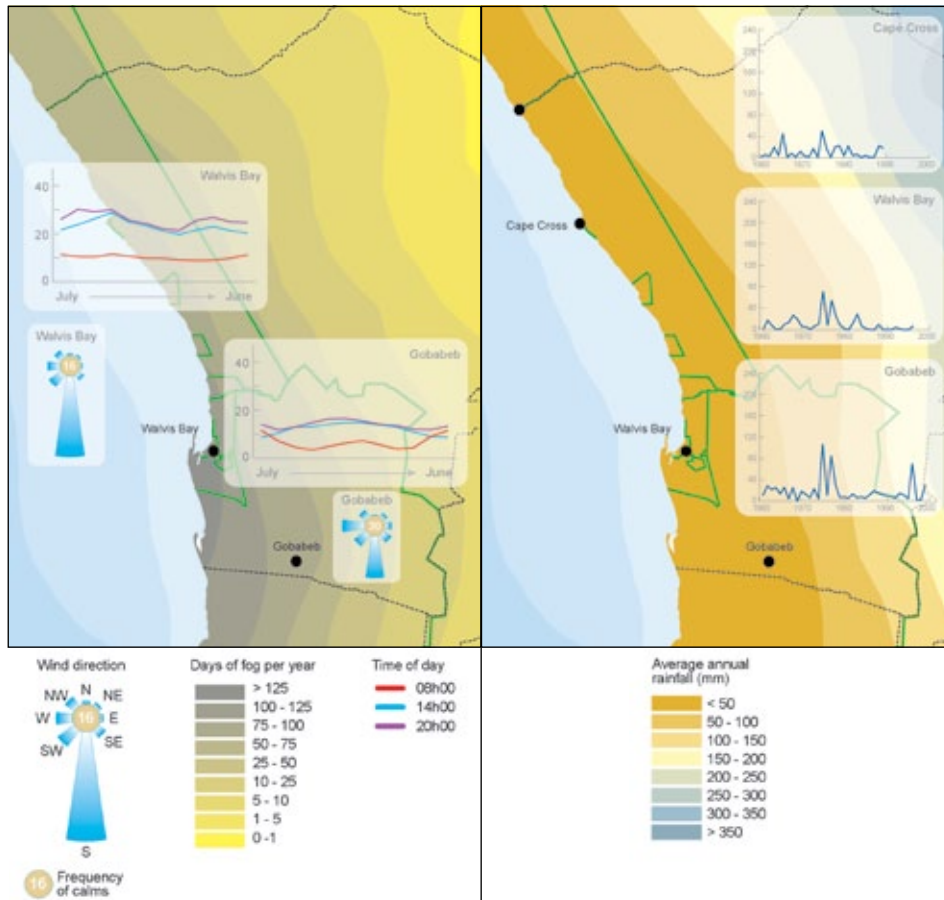


Figure 3. The map shows the average number of days on which fog occurs, while the graphs are of average wind speed at different times during the year.

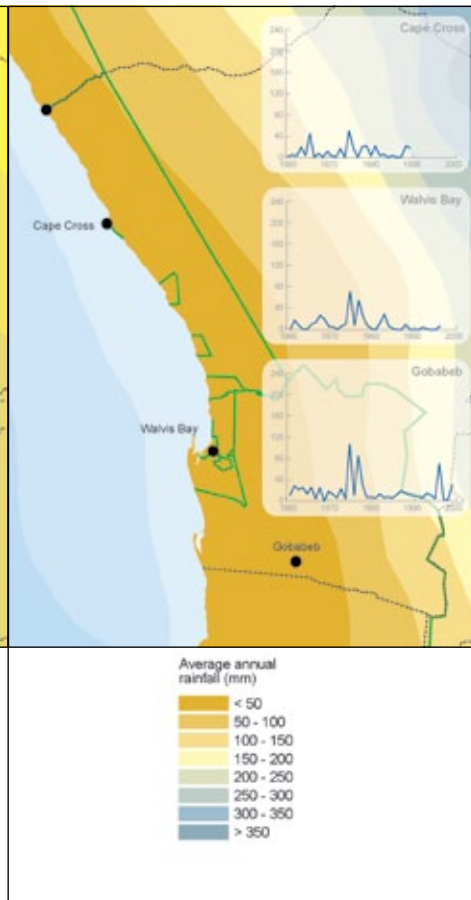


Figure 4. Average annual rainfall and the total recorded each season at three places within the Erongo coastal area. Note how greatly the totals vary from year to year.

The strong prevailing southerly winds (Figure 3) combined with the effects of the Coriolis Force cause surface waters to be deflected away from the shore. Cold water from the deeper layers then moves upwards to replace the surface water. These circular upward movements are known as upwellings and bring nutrients water from the depths of the ocean up to the sunlit surface. The Central Namibia upwelling cell is offshore of Swakopmund and Walvis Bay while the northern edge of the Lüderitz cell is in the vicinity of Sandwich Harbour. These and other cells are the key to the high productivity of Namibia's coastal waters (see Figure 1 on page 2).

Cool dry air from the South Atlantic anti-cyclone prevails over the Erongo coast for much of the year. However, the dominating effects of this anti-cyclonic cell weaken when it shifts south during summer, and tropical moist air from the east and north may then reach down to the coast, bringing rare showers of rain which are usually light. The coast gets an average of less than 20 millimetres of rain each year. While precipitation generally increases to the east, rainfall in Erongo is highly variable everywhere (Figure 4). Temperatures along the coast are lower and less variable than those inland (Figure 5).

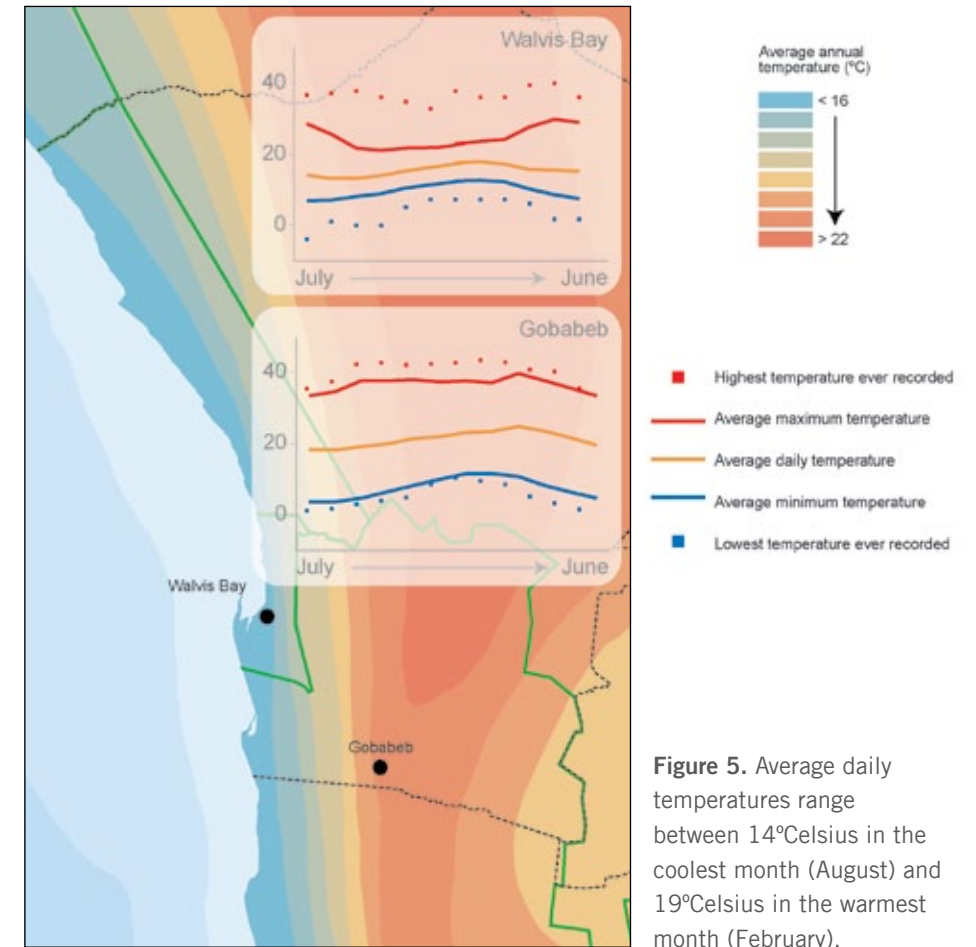
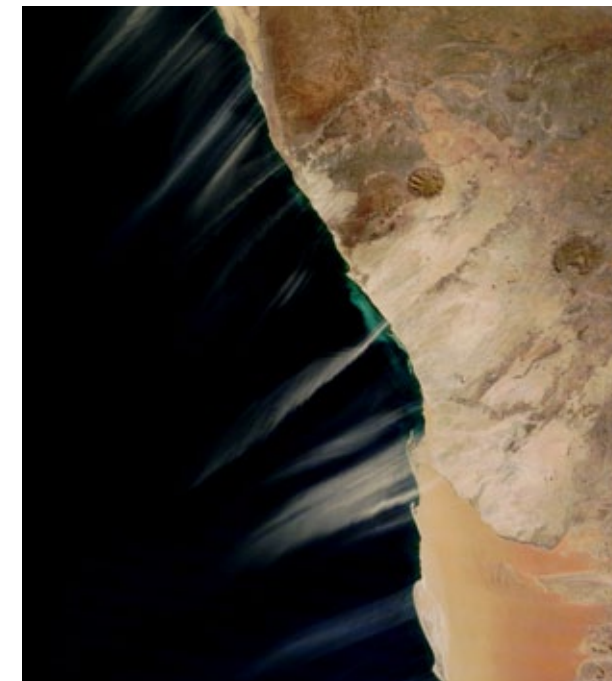


Figure 5. Average daily temperatures range between 14°Celsius in the coolest month (August) and 19°Celsius in the warmest month (February).



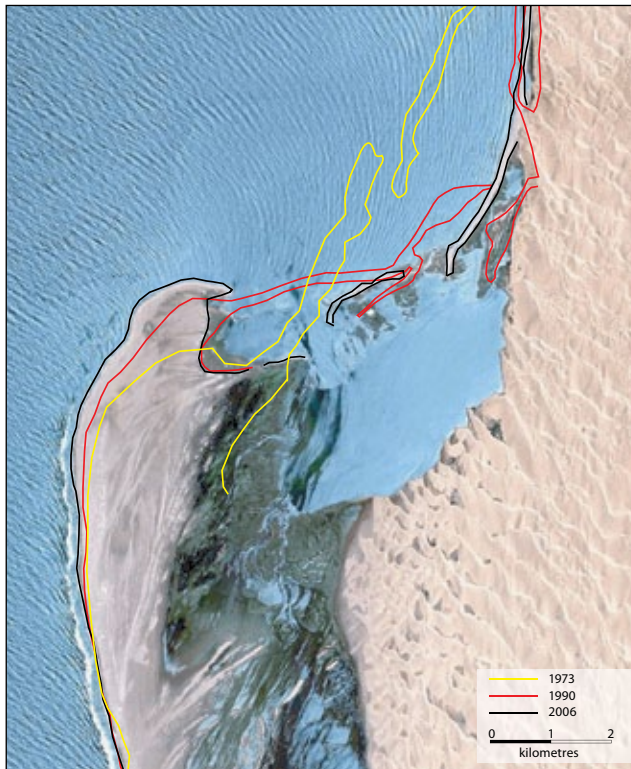
Surprisingly, the highest maximum temperatures are measured in winter when berg or east winds blow. Temperatures then can reach 44°C. These winds are driven by the Botswana anti-cyclone which is situated over the interior of southern Africa in winter. The dry air heats up as it drops down from the higher interior and moves out across the coastal plains, and sometimes blows great quantities of sand into the Atlantic.

Landscapes and shapes of the Erongo Coast

The north-south orientation of the Erongo coastline has its origins in the break-up of the Gondwana continent around 132 million years ago, when part of this ancient landmass divided along a north-south line into what became Africa and South America. Since then, marine and terrestrial processes have shaped the details of the shoreline we see today.

However, shorelines shift as sea levels rise and fall, and the present coastline has only been in its current position for a relatively short period. For example, sea levels were about 120 metres lower as recently as about 12,000 years ago. This was towards the end of the last ice age when large amounts of sea water were stored in polar ice caps, and the land area of what was to become Namibia was consequently much larger. In fact, the land probably extended another 30 – 50 kilometres westwards. The most recent episode of sea level rise occurred about 2000 years ago when the beach was about 5 – 6 metres higher than it is now.

The Erongo coast is dominated by a sandy shoreline with two major coastal spits at Sandwich Harbour and Pelican Point. Inland of Sandwich Harbour are the northernmost dunes of the main Namib Sand Sea which is bordered to the north by the Kuiseb River. The irregular floods of the Kuiseb River occur frequently enough to wash away any sand in the river bed, thus preventing the dunes from migrating across and blocking the river. However within 20 kilometres of the coast floods occur less often, allowing the more mobile coastal dunes to cross the river. These continue northwards as far as the Swakop River where their movement is finally halted. Large transverse dunes have formed close to the coast where the south-westerly winds are dominant and the sand supply is high.



The Sandwich and Pelican Point spits are migrating steadily northwards, as shown by the well-developed and growing ridges of sand (Figure 6). Over time, spits like this develop shallow lagoons on their inland side which fill with sediment and become salt pans.

Figure 6. The changing shape of Sandwich Harbour. The underlying image shows the bay in 2006. The yellow line traces the shore in 1973, while the red line marks the shore in 1990.

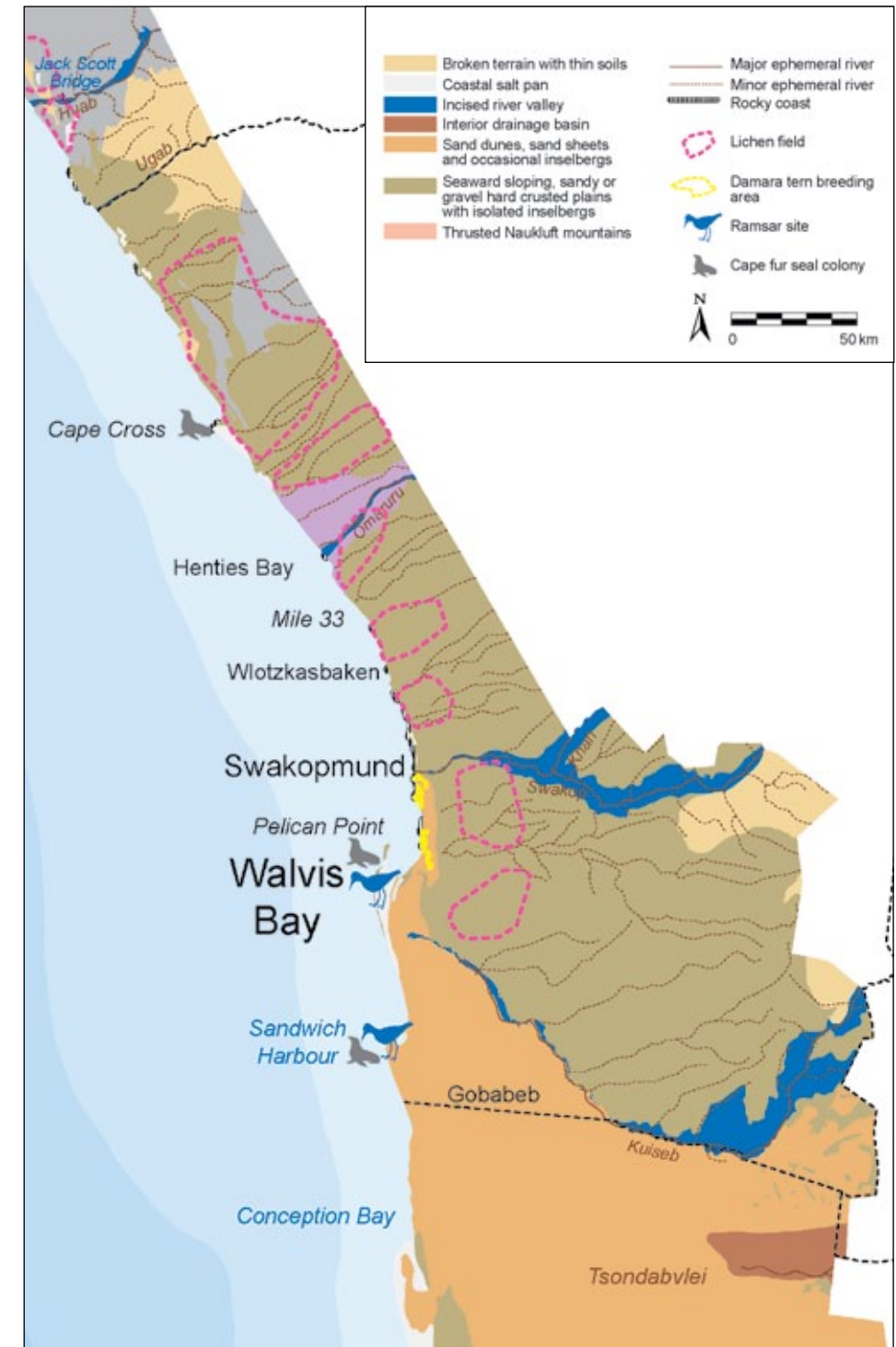


Figure 7. Important habitats, geomorphological features and sites of special interest along the Erongo coast.

North of the Kuiseb River the entire area is underlain by granites, gneisses, marbles and schists of the Damara Supergroup formed some 500 to 800 million years ago. The many dark, fine-grained dykes of dolerite that form prominent ridges intruded during the tectonic activity that accompanied the continental breakup some 132 million years ago. A particularly thick dyke that runs out to sea forms the prominent bay at Rock Bay just south of Wlotzkas Baken.

The coast north of Walvis Bay consists of rocky promontories interspersed with sandy beaches. At Cape Cross an intrusion of granite forms the headland of the bay. Inland of Cape Cross, the land surface is covered with a thin veneer of gravels deposited over the aeons by a network of rivers. Occasional ridges and inselbergs are found at various places including Rössing Mountain, Swartbank, Rooibank and the Hamilton Range. The Messum Crater is the core of an ancient volcano that intruded around the same time as the dolerite dykes.

The major rivers (Kuisseb, Swakop, Omaruru and Ugab) have eroded deep valleys into the coastal plain, sometimes as much as 80 metres deep. These canyons are best developed inland, while the valleys closer to the coast are shallower. The Kuiseb and the Omaruru River have developed alluvial fans close to the coast which contain important aquifers. The Swakop River has a less well-developed and obvious fan, but many houses near the river have been built on gravels and sands deposited by the river.

Life on the coast

Many of the plants and animals found along the Erongo coast are unusual, and some are rare and/or endangered. Certain species are endemic to the area, occurring only here and not in other parts of the world. High concentrations of migratory shorebirds and seabirds congregate in some places along the coast. The Erongo coast is therefore important for the survival of all these species. The major habitats that support living organisms are shown in Figure 7 and are described below in three categories: terrestrial, riverine and marine.

Terrestrial habitats

Erongo's coast falls entirely within the Namib Desert biome which, in terms of vegetation, supports only sparse grasslands, shrublands and lichen fields. Fog, rather than rainfall, is the most important source of water for many plants and animals in this biome.

The following areas deserve special attention for their conservation value:

- Breeding areas for Damara terns. These dainty, elegant terns are endemic to the southwestern coast of Africa, and are listed as a Namibian Red Data species, which means that their conservation is a national priority. The densest breeding colony known is at Caution Reef, just south of Swakopmund.
- Walvis Bay / Swakopmund shore. Densities of invertebrates along the shore between Walvis Bay and Swakopmund are higher than anywhere else on the coast of southern Africa. This abundance of food means that the density of shorebirds is consequently

the highest in southern Africa with a total of some 13,000 shorebirds of approximately 31 species counted on this 30 kilometre stretch of coast. BirdLife International has designated this zone as an Important Bird Area under its IBA Programme which aims to identify, monitor and protect a global network of IBAs for the conservation of the world's birds and other biodiversity.

- Lichens are important pioneer species that colonise bare desert habitats. These composite organisms of fungus and algae grow extremely slowly and depend on moisture from coastal fog. About 100 species occur in the Erongo coastal area and many of these are endemic. They provide ecological niches for other flora and fauna and are an important food source for beetles, gerbils, springbok and other animals. Lichens also prevent wind and water erosion by stabilising the soil. They are highly vulnerable to damage from off-road driving and mining.
- Walvis Bay and Sandwich Harbour. These are designated Ramsar Sites (wetland areas recognised to be of international importance) due to the numbers and diversity of birds they support. The wetlands of Walvis Bay include the lagoon, inter-tidal mudflats, the sheltered bay side of the Pelican Point spit, and the artificial evaporation ponds of the salt works. Together, these areas comprise the most important coastal wetland for birds in all of southern Africa. Sandwich Harbour regularly supports over 50,000 birds in summer and over 20,000 in winter. The density of shore birds may exceed 7,000 birds/square kilometre, which makes it amongst the highest in the world.
- Cape Cross Seal Reserve is probably the largest land-based seal breeding colony in the world. In addition, the lagoons and guano platforms are an important breeding site for Cape Cormorants and also regularly support up to 11,000 birds of other species.
- Dune hummocks support a variety of salt-tolerant plants such as *Salsola* and *Zygo-phylum*. They extend along the coastline and provide an important habitat for many species of wildlife.
- The dunefields and gravel plains are the major habitat of a wide range of invertebrate and vertebrate species. Some of these are found only in the Erongo coastal areas whilst others are endemic to the Namib. Some species have tiny ranges. Indeed, the global distributions of about half of the 94 Central Namib endemic invertebrate species cover less than 25 square kilometres. One of these, a beetle called *Zophosis triangulifer*, is only found in the dunefields between Swakopmund and Walvis Bay and only on dune crests. The gravel plains are fragile habitats that are easily damaged by vehicles and other surface disturbances such as mining.

As one of Namibia's most endangered bird species, the rare and near-endemic Damara tern has become a flagship species for coastal conservation. Its global population is estimated to be about 14,000 adult birds, of which about 98% breed in Namibia between late October and mid-November. The highest densities of breeding pairs are found in the central coast between Sandwich Harbour and the Ugab River. Nesting pairs and their single chicks are very sensitive to human disturbance.



Riverine habitats

The rivers that cut down towards the coast are ephemeral (see Figure 1), only carrying water after occasional heavy rains in their inland catchments. The flows are often short-lived, lasting a day or less but rare, lasting flows also occur when the rivers run for several weeks at a time following repeated rainfall events in their catchments. Many of the smaller rivers seldom, if ever, reach the coast.



Environmentally, the ephemeral rivers are of high value in creating linear oases in this very arid landscape. Trees along the rivers provide shade, forage and places to rest, nest and hide. Water for drinking, bathing and cooling is available in pools that are scattered along the lengths of the rivers, allowing animals to live in areas that would otherwise be completely inhospitable to them. Many of these animals traverse the coastal zone seasonally, their movements taking them up and down the river courses.

The !nara melon, a keystone endemic of the Namib Desert, is a valuable natural resource. In 2006, it was estimated that the harvesting of !nara fruit generated about N\$88,400 in direct and N\$160,000 in indirect Gross National Income (GNI), respectively.



Marine environment

Namibia's offshore environment supports one of the greatest concentrations of marine life in the world. This includes large populations of commercially valuable fish which are one of Namibia's most important renewable natural resources. The wealth of life is due to extremely high rates of primary production as a consequence of upwelling caused by the Benguela Current. Water in the upwelling cells moves up carrying nutrients from the depths of the ocean to the surface. The Lüderitz cell – which provides the strongest upwelling along the Namibian coast – lies south of Erongo. Nutrients from this cell have a massive impact on Namibia's marine life since the nutrients, floating plants (phytoplankton) and animals (zooplankton) are further distributed by northward currents.

The great numbers of phytoplankton use the nutrients to grow and multiply, and they, in turn, provide food for zooplankton. Further bouts of production occur as the zooplankton provide supplies of food for other, larger consumers up the food chain, such as fish, whales and dolphins, seabirds, seals and, of course, humans by way of the commercial fishing industry.

Much of the production and wealth of life is far offshore where fishing boats ply the waters to catch hundreds of tonnes of fish each year (Figure 8). However, the inshore marine environment, which includes the inter-tidal and sub-tidal zones, is crucial to fish breeding and shellfish populations. This is also where recreational angling – a significant contributor to tourism in Erongo Region – is concentrated.

People and resource uses

Archaeological sites scattered along the Erongo coast indicate a long history of human occupation. A number of middens of shells are known with associated stone tool assemblages, ostrich eggshell beads and pottery. Shellfish, seals, seabirds, whales and mussels all featured in the diet of these early inhabitants, while early explorers also reported the widespread use of !nara melons along the Kuiseb River. These early inhabitants are most likely to have been nomadic, moving from one water source or good hunting area to another. Livestock farming in the form of nomadic pastoralism over the last 2,000 years is evident from the remains of domestic stock.



More recently, the coast served as a contact point with the rest of the world when early explorers made their first contact with coastal inhabitants. In the latter half of the 18th century there was trade on a significant scale between American whalers and sealers and coastal people. The whalers needed to replenish their stores of meat and water which they did by trading goods such as tobacco, rum, tin ware, wire, cloth and soap. By the end of the 18th century 20 to 30 American whaling ships stopped over in Walvis Bay every season.

In 2011, the entire population of the Namibian coast numbered approximately 143,000 residents, three-quarters of whom were in the Erongo Region, with about 62,000 in Walvis Bay and 45,000 in Swakopmund. Although the coastal population is relatively small, its size has grown enormously in recent decades, and much of the overall growth has been in Walvis Bay and Swakopmund. Largely as a result of migration, the number of residents in Walvis Bay has more than trebled over the past 30 years, while the populations of Swakopmund and the other towns have doubled over the same period. Many of the new residents were attracted by opportunities stemming from expanding economic activities, such as harbour trade, tourism and mining. However, urban growth has also been driven by migration from rural to urban areas by people hoping to earn cash incomes rather than being limited to a food-based economy.

Mining: A wide range of minerals with varying levels of commercial viability has been found along the coast, and most of the area has been licensed for exploration at some stage. The Erongo coast has seen successions of mineral prospectors come and go and is currently experiencing a proverbial 'boom' due to the renewed global interest in uranium. Active mines include the Rössing and Langer Heinrich Mines, but most other mining activities have not lasted or been viable. Unfortunately, some ventures have left environmental scars since they were developed without environmental controls or consideration of sensitive habitats.

Salt: The Walvis Bay operation produces some 700,000 tonnes of coarse salt per year; Panther Beacon (north of Swakopmund) some 75,000 tonnes/year and Cape Cross around 30,000 tonnes/year. Some salt is used as a livestock feed supplement and in the chemical industry, while some is exported to South Africa and West Africa for human consumption

Fishing: The highly productive Benguela system has supported a vibrant fishing industry off Namibia for the last 60 years. Over 20 species are exploited commercially, in particular horse mackerel, hake, pilchard, monkfish, tuna, kingklip, deep-sea red crab, orange roughy and rock lobster. Between 1999 and 2007 the fishing industry contributed an average of 6.6% to Namibia's Gross Domestic Product. In recent years the industry has landed between 400 and 600 thousand tonnes of fish each year and it is the largest employer on the coast. About one-third of the total value of the fishing industry is earned by onshore processing.

The fishing industry has faced severe challenges over the years including the total collapse of fish stocks such as sardines in the early 1980s, followed by anchovies and rock lobsters. Harvests of hake are now less than half of what they were in the 1970s and orange roughy stocks have also dropped substantially. It is generally believed that the declines were due to over-fishing but environmental factors have also been important. Measures such as establishing the 200 nautical mile Exclusive Economic Zone and curtailing poaching by foreign fishing fleets, setting annual quotas and the development of international co-operation agreements were put in place and may allow stocks to recover to levels where sustainable yields are possible.

Recreational angling is important, both as a use of marine resources and in attracting tourists. Most fishing is from the shore and the most frequently landed bony fish is kob.

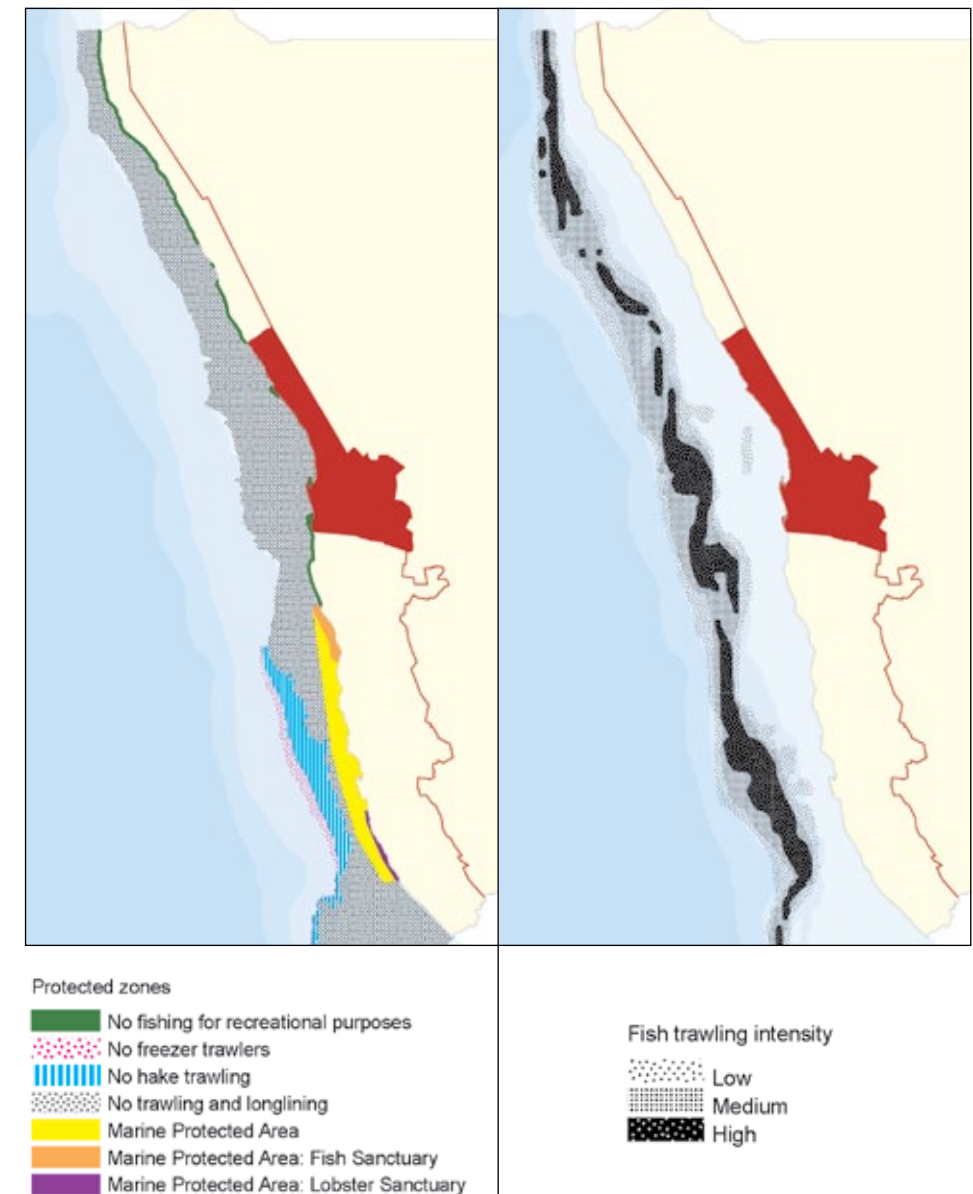


Figure 8: Fishing areas and protected zones off the Namibian coast.

Various species of sharks are caught as game fish. Limited recreational crayfish harvesting takes place from the shore. Populations of the main species targeted by recreational fishers appear to have declined.

Sealing: Sealing in Namibia has a history that probably goes back several centuries when the animals were slaughtered for blubber oil. There is an annual quota for harvesting seals, predominantly pups and some bulls. Harvesting takes place at Cape Cross in the Erongo region and at Atlas Bay and Wolf Bay near Lüderitz in Karas region. The seal harvest continues to be a contentious and emotive issue.

Mariculture: Pacific and European oysters are cultivated in Walvis Bay and Swakopmund for local consumption and for export, mainly to South Africa, China and Singapore. In 2009, oyster production in Namibia yielded over N\$26 million, and abalone over N\$1 million.

Guano: In 1931 a platform - now known as Bird Rock Platform was erected between Walvis Bay and Swakopmund as a place where birds can roost, nest and defaecate. The guano is still harvested regularly and used in fertilisers. Other platforms have since been built in evaporation ponds in the salt works north of Swakopmund and at the Cape Cross salt works.

Trade: As an entry and exit port for many goods moving in and out of Namibia and beyond, Walvis Bay is important to the Namibian economy, and is vital to the economy of the central coast. The value of trade increased with the establishment of the Walvis Bay Corridor Group through which the Namibian harbours provide access to neighbouring countries via the Trans-Caprivi and Trans-Kalahari corridors.

Trade through the coast will be further enhanced by the intended establishment of a dry port facility for Botswana in Walvis Bay, while the purchase of a floating dry dock will enlarge Walvis Bay's capacity to service large vessels and oil rigs. There are also plans to increase the container handling capacity at Walvis Bay from 140,000 to 500,000 containers per annum.

Tourism has been the fastest growing sector of the coastal economy over the past 20 years. Much of the growth has been in foreign visitors. The number of international visitors to the coast, both for leisure and business, was estimated at about 422,000 in 2007. The use of the coast as a holiday destination for Namibians has grown rapidly, and many Namibians have invested in their own accommodation at the coast. Thus a high proportion of upper income housing in Walvis Bay, Swakopmund, Wlotzkas Baken and Henties Bay is owned by people who mostly live inland.

It has been estimated that tourism on the coast directly contributed N\$956 million of GNI and indirectly N\$1,309 million to the economy in 2006. About 8,350 jobs along the coast were then dependent on the tourism industry. The predominant focus of tourism on Namibia's coast is on Swakopmund and Walvis Bay, where a wide variety of activities are available to satisfy many tastes. These include eco-tours and adventure sports such as sky-diving and quad biking.

Challenges for the future

The overarching challenge facing the Erongo coast lies in how to achieve a balance between conserving its environmental wealth and health while adding value to the coast. The Erongo coast is one of the mainstays of Namibia's tourist industry and attracts large numbers of visitors. The coastal area includes several internationally important conservation sites, but much of the area is under pressure from tourism-related activities such as off-road driving. Most of the new Dorob National Park (previously the National West Coast Tourist Recreation Area) has already been extensively negatively impacted through years of unregulated vehicle access. Current and proposed mining activities are also of



Figure 9. Conservation areas and tourism facilities in and around the Erongo coast.

concern due to their environmental impacts. A Strategic Environmental Assessment of uranium exploration and mining activities was recently carried out to help address these concerns.

Coastal towns and communities need to be prepared to deal with the effects of rising sea levels. Currently sea level is rising at around three millimetres per annum but this is anticipated to increase rapidly over the next 100 years. The main threats are to infrastructure close to the coast, particularly facilities at Walvis Bay harbour. With rising sea levels, the protective barrier now provided by Pelican Point may be breached, thus exposing the port facilities to the full impact of waves rolling in from the ocean. Other low-lying developments are likewise at risk, and greater caution will be needed before plans for new buildings near the shoreline are approved.

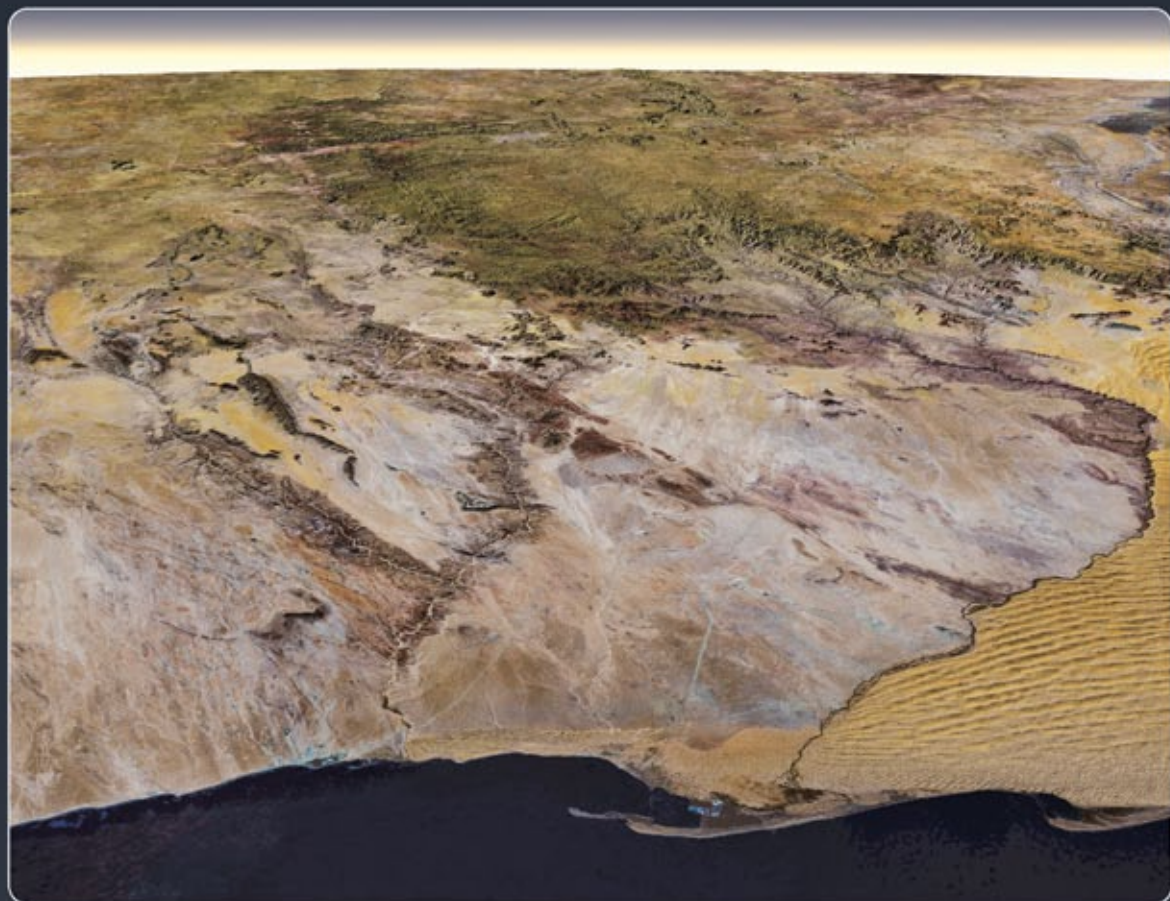
So which economic developments are possible or desirable? Large-scale agriculture is not viable due to the obvious constraints of water and poor soil fertility. Areas suitable for crops and vegetables such as just inland from the Swakop River mouth are limited. Water for irrigation is also in short supply. Significant expansion of recreational fishing would not be sustainable because these coastal waters are breeding grounds for many species. Mariculture has significant potential, and has been identified as a priority for development by the Ministry of Fisheries & Marine Resources. However, all maricultural developments require stringent controls to prevent the accidental introduction of alien species and any detrimental effects of chemicals used to enhance production.

In the minds of many people, mining provides the great hope for major economic growth in Erongo. Mining has long been a mainstay of not only the coastal economy, but also that of Namibia as a whole, and there is indeed potential for coastal mining to continue contributing to economic development. However, much prudence and precaution is needed before more mining ventures are permitted. Namibia's coast has already been too scarred by mining activities that produced little value to the country. Whilst new mines may bring short-term economic benefits, the extent of long-term environmental degradation needs to be carefully assessed. Many of the impacts of mining are especially harmful in the fragile arid environments found along the coast. Mining in national parks – if it is to be allowed at all – needs particularly careful management.

Further urban growth is expected as a result of increased trade through Walvis Bay, mining and tourism. This will make additional demands on coastal infrastructure and services. Supplying enough water to the coast is already a challenge. Desalination, although a technically viable option to provide fresh water, is expensive for domestic consumption. Electricity is in short supply in Namibia as a whole, but new ways of generating power are also expensive. Just as efforts should be made to find new sources of water and power, measures are likewise required to reduce consumption and manage demands.

Considering the beauty of much of the coast, tourism has a major role to play in its future development. Tourism now generates a large proportion of Namibia's GDP (Gross Domestic Product), being second only to mining in terms of economic value. Recent studies suggest that the sector, directly and indirectly, supports some 72,000 jobs nationwide. By 2016, the travel and tourism economy is expected to contribute about 23% of Namibia's GDP.

A balance must be achieved between high-volume, budget tourism and exclusive tourism. The former often leads to environmental damage caused by tourists who have little respect for unscarred, pristine landscapes and other natural assets of the coast. Exclusive tourism is less damaging but often results in low and middle-income Namibians being prevented from using and enjoying their own tourism areas. Access for Namibians to the coast is not only a right, but is also highly desirable so that they too can visit, experience and learn about the desert environment. The more people know about the Namibian coast, the more aesthetic and popular appeal it will have. Likewise, allowing people to sample the delights of desert and sea will help to build a community of people in Namibia and across the world who hold the Namibian coast to be special and valuable. It is these people who will be the ultimate, staunch guardians of our coast.



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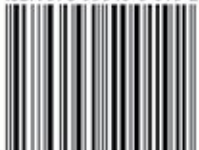
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