



Thibaud Delrosses

New Caledonia



4.3 New Caledonia (France) OCT

Number of islands:	1 main island and 4 groups of secondary islands
Population:	224 824 inhabitant (2008)
Area:	18 575 km ²
Population density:	12,1 inhabitant / km ²
GDP/inhabitant:	12 000 € / inhabitant
Unemployment rate:	17,1% (2004)
Economic activities:	Nickel mining, tourism



New Caledonia is a French overseas territory situated in Melanesia, 1,500 kilometres to the east of Australia and 2,000 kilometres to the north of New Zealand. The territory consists of one main island, Grande Terre, and several groups of secondary islands, including the Belep archipelago to the north, the Isle of Pines to the south, the Loyalty Islands to the east and the Chesterfield Islands a little further away. Grande Terre, the Mainland, is over 400 kilometres long and 50 to 60 kilometres wide. The highest point on the island is Mount Panié which rises to an altitude of 1,628 metres. New Caledonia's exclusive economic zone (EEZ) extends over an area of 1,740,000 km². The territory's population density is particularly low (12.1 inhabitants per km²), and unevenly distributed: 69% of inhabitants live in the Southern Province

and 40% in the capital, Nouméa. The territory contains close to 25% of known global nickel reserves. Nickel mining is the main pillar of the island's economy; it accounts for 90% of export revenues. Other economic sectors include tourism (some 100,000 visitors come to the island each year), as as yet relatively little developed industry but considered to be a very important future driver of the economy. Financial assistance from France still accounts for 35% of GDP. Agriculture and livestock are poorly developed and have declined steadily over the last few years. However, subsistence agriculture and fishing for personal consumption still occupy an important place in the Caledonian economy. A referendum on New Caledonian independence is planned for 2014.

4.3.1 Current state of biodiversity

New Caledonia is home to an extremely rich terrestrial and marine biodiversity. It has one of the highest observed rates of endemism in the world for terrestrial flora. The territory is a global biodiversity hotspot (Myers, 2000). It is the smallest single biodiversity hotspot in the world.

Terrestrial biodiversity

The east coast of New Caledonia, which is exposed to prevailing winds, is characterized by tropical humid landscapes. The dense humid rainforest covers 21% of the territory and still occupies a single block of thousands of hectares. Conversely, the west coast, which is sheltered from the wind by a central mountain chain, was once covered by dry forest. Today, the landscape is covered by herbaceous vegetation and savannahs. This secondarized area is home to the Melaleuca (*Melaleuca quinquenervia*), a species of myrtle and a symbol of the territory. Subsistence agriculture is practised on 40% of the territory. New Caledonia displays remarkable plant diversity. There are 3,261 species of indigenous flora (74% of which are strictly endemic), almost as many as on the whole of continental Europe (3,500 species). New Caledonia is also host to 106 species of endemic reptile, including the world's largest gecko (*Rhacodactylus leachianus*), as well as six species of endemic bat and 4,500 species of invertebrates, of which 90% are endemic. The bird life of New Caledonia includes 23 species of endemic birds, among them the Kagu (*Rhynochetos jubatus*), an iconic crested bird and the last remaining survivor of the species family, and the Giant imperial pigeon (*Ducula goliath*), the largest arboreal pigeon in the world.



The Cagou (*Rhynochetos jubatus*) is an emblematic bird from New Caledonia

Marine biodiversity

New Caledonia's barrier reef is 1,600 kilometres long, making it the second longest barrier reef in the world after the Australian Great Barrier Reef. This reef surrounds a vast lagoon of some 23,400 km² and contains 14 280 km² of reef. Seagrass beds occupy almost a third of the lagoon. Despite their size, the New Caledonian reefs remain relatively unexplored. A recent inventory of the overall marine biodiversity of New Caledonia identified approximately 15,000 species, including 1,950 species of fish, 5,500 species of molluscs, 5,000 crustaceans,



The New Caledonian reef is 1,600 kilometers long

600 sponges and 300 corals (Spalding, 2001). The average endemism is about 5%, much lower than that of terrestrial biodiversity. The territory, which is a sanctuary for cetaceans, plays host to a dozen species of marine mammals including the Dugong (*Dugong dugon*), an iconic and endangered species. The territory is an important nesting site for three species of marine turtle, the Green turtle (*Chelonia mydas*), the Hawksbill turtle (*Eretmochelys imbricata*) and the Loggerhead turtle (*Caretta caretta*). Mangroves cover between 150 and 200 km². They are seriously degraded in the Nouméa region. There are 37,500 hectares of protected areas – about 2% of the surface of the lagoon – including 13 marine protected areas (MEDAD 2004).

Current threats

New Caledonia experienced massive deforestation during the 19th century, due to wood production, agriculture, livestock rearing and poorly managed bush fires. Today, only 1% of the original surface area of dry forest remains on the west of the island. It is highly threatened (see Box 4.8). The rain forest on the east of the island once covered 70% of the territory; today it only covers 21% (Gargominy 2003). Fires destroy thousands of hectares of forest every year. Compounding this threat is increasing pressure from invasive species such as deer, pigs, dogs, rats and even the Little fire ant (*Wasmania auropunctata*), which exert considerable pressure on the local flora and fauna. Similarly, invasive plant species such as the Lantana camara and the Guava (*Psidium guajava*) are strangling the indigenous flora. Bush fires and over-grazing are causing the erosion of the hillsides and land-based sedimentation, which are



The Rusa Deer (*Cervus timorensis russa*), introduced to Grand-Terre in 1870, is a big pressure for the endemic vegetation



Nickel mining activities cause important sedimentation of the lagoon

damaging the reefs. In an era of increasing tropical storms, this phenomenon is the foremost cause of coastal, fringe reef and lagoon deterioration, particularly on the east coast. Furthermore, the erosion is exacerbated by mining activities in the nickel-rich zones. A study of erosion around one of the hillsides (Ouenghi) was carried out by the IRD in 1991. Over a period of 28 years, natural erosion and mining have led to the dumping of a solid mass of some 1,000,000 m³. A 3-kilometre wide delta has advanced 300 to 400 metres over the lagoon (Danloux, 1991). Nickel mining is a politically sensitive subject; while it generates pollution and causes important sedimentation of the lagoon, it remains the most important economic sector on the island.

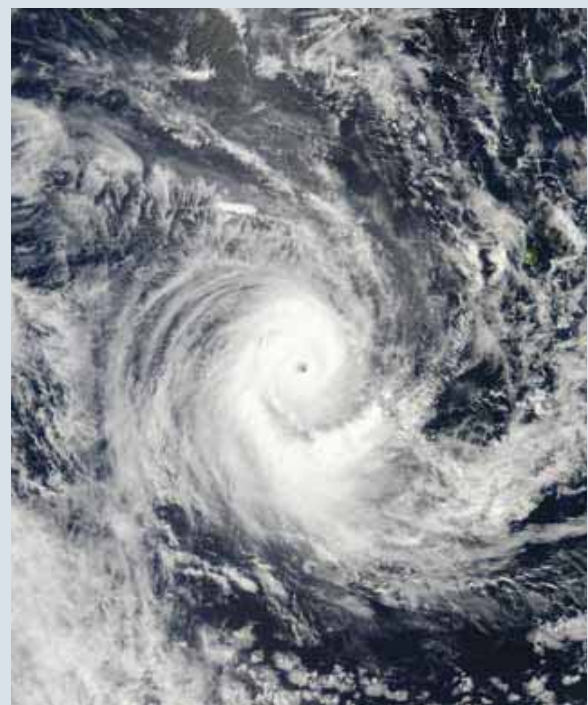
4.3.2 New threats resulting from climate change

Impacts on biodiversity

Current data about the potential or observed impacts of climate change in New Caledonia are very limited. The foremost impact on the marine environment is without doubt the degradation of the coral reefs as a result of successive bleaching events. Between January and March 1996, following unusually warm water temperatures, the corals of New Caledonia suffered a bleaching episode. Around Nouméa, the rate of coral mortality was as high as 80%,

Box 4.7: Impact of Tropical Storms on the Reefs: The Case of Hurricane Erica in New Caledonia

On 14 March 2003, hurricane Erica, a Category 5 storm, battered the marine park in the south of New Caledonia. A hurricane of such intensity is unusual in the region. The park's corals were studied in nine different observation stations a few days before the storm (8-11 March 2003), a few days after the storm (23 March - 15 April 2003), and, finally, 20 months later (14-16 November 2004). The hurricane had a significant impact on the reef formations and the fish populations in the park. The fragile coral formations (the branching, tubular and foliose corals) diminished significantly, resulting in a loss of habitat for the fish populations. The wealth of commercially-exploited fish and butterfly fish was seriously affected by Erica's passage. Twenty months after the hurricane, the reefs had not regenerated; the broken corals had turned into debris and were being colonized by algae. The medium-term impacts of the hurricane turned out to be even more damaging than the short-term impacts. Twenty months after the storm, the richness and density of the fish were even lower than before the storm, and lower still than those recorded a few days after the storm. Furthermore, a different species composition was observed in the medium term. Herbivorous fish, associated with debris and benthic species that feed on micro-invertebrates, had replaced the fish usually associated with corals. The corals of New Caledonia are not adapted to tropical storms of such intensity; the immediate impacts of these events on the reefs are very serious and profoundly degrade the reefs in the short and medium term. Intensification of tropical storms in the region, as predicted by the IPCC, could irreversibly modify the coral formations and the species' composition of New Caledonia (Wantiez, 2005).



Hurricane Erica

reaching as high as 90% on some shallow reefs (Richer de Forges and Garrigue, 1997). However, the affected areas were very limited in size. The coral reefs were also damaged by the tropical storms which battered the territory. The impact of hurricane Erica in 2003 on the reefs and the fish population has been accurately measured (see Box 4.7). An increase in the intensity of such extreme weather events is likely to hasten the degradation of the reefs. Another study has demonstrated that a warmer and more humid climate, with an increase in levels of precipitation and runoff, could affect the size of the reef fish (Wantiez, 1996). Indeed, the leaching of soil nutrients as they are carried towards the lagoon increases the turbidity of the water, thereby reducing the amount of light entering the water and changing the habitat structure and food resources of the reef fish.

At the same time, a rise in sea levels threatens the beaches and coastal ecosystems of New Caledonia. Estuaries and low-lying islands are likely to be particularly affected, especially during tropical storms. The Island of Ouvéa seems to be

the most threatened, along with some coastal plains and mangrove-lined estuaries on the west coast. The degradation of the beaches could also perturb the turtle populations that depend upon these habitats for their reproduction. There are no observations or projections of the impacts of climate change on terrestrial ecosystems. However, several experts consulted cited potential impacts on the already seriously degraded dry forests (see Box 4.8). The high level of species endemism in New Caledonia is the result of strong speciation caused by the evolution of species in environments or ecosystems with a limited surface area. A change in climate, even minimal, could affect the micro-climatic conditions in these environments and imperil the survival of the ecosystems (freshwater ecosystems, high altitude forests, etc.). The functioning of the wetlands in the south (lakes region) is as yet poorly known but a change in rainfall levels could influence these environments and their associated fauna and flora (Goarant, personal communication).

Box 4.8: Dry Forests of New Caledonia Threatened by Fire

Once upon a time, the dry forests of New Caledonia covered the entire west coast of the island up to an altitude of 300 metres, or about one-quarter of the territory. Today, only a few dispersed fragments of these habitats remain (253 in total); their total area is 50 km², or 1% of their original area (Papineau, personal communication). These last remaining vestiges of dry forest are a conservation priority. They are home to 262 species of endemic plants, of which about 60 are only found in these habitats. These are species that are particularly well adapted to the dry conditions, such as, for example, the dry forest Gardenia (*Gardenia urvillei*). These forests are also home to specialized fauna including reptiles, birds and invertebrates, and 33 species of butterfly that occur only in these ecosystems. The already severely degraded dry forests have a very limited resilience in the face of the pressures with which they are currently confronted. They are further threatened by human impacts such as bush fires,

invasive species (deer and wild pigs) and extensive cattle farming. Climate change will likely further diminish the resilience of these habitats. There are no observation data or projections about the impacts of climate change on these ecosystems, but the experts consulted put forward certain hypotheses. The longer and warmer dry seasons predicted, are likely to increase the incidence and spread of fires. Similarly, some plant species will likely be affected by repeated periods of drought, leading to change in their fructification patterns and limited growth (Papineau, personal communication). Since 2001 a programme to conserve these ecosystems has been led by the region in close collaboration with several partners (French State, WWF, IRD, Conservation International, etc.). Some of the activities being carried out under this programme include ecosystem mapping, inventorying of flora and fauna, protection, restoration, and awareness raising activities (www.foretseche.nc).



Dry forests in New Caledonia cover only 1% of their original distribution

C. Pauzeblauer

Box 4.9: Impact of Rising Sea Levels on Mangroves in the Pacific

Mangroves have a very high ecological, cultural and economic value. They provide indispensable nurseries for fish (see Box 2.5), filter coastal pollution and provide wood for local populations. Some 20% of the global area of mangrove coverage has been destroyed since 1980, largely on account of deforestation, construction of infrastructure or development of aquaculture (FAO, 2008). Rising sea levels resulting from climate change represent a new threat to mangroves in part because of the direct stress caused by submersion, but also because of increasing salinity.

A recent study conducted by UNEP modelled the vulnerability of indigenous mangroves in 16 Pacific island states and territories (including New Caledonia) in the face of potential increases in sea level. Most of the islands studied have already had to deal with significant increases in water levels, resulting from an average rise of 2 millimetres per year over the last few decades. Between now and the end of the century, if sea levels rise by 88 centimetres (the worst-case scenario proposed by the IPCC), UNEP models foresee the potential disappearance of 13% of the mangroves throughout the 16 Pacific islands studied (UNEP, 2006). According to this same scenario, New Caledonia could lose up to 3,000 hectares of mangroves (or 14% of the existing 20,250 hectares). That said, these estimates need to be fine-tuned because rises in sea levels are unlikely to be uniform but rather will vary depending on the region. New Caledonia in particular has experienced very limited increases over the last few decades (0.2 millimetres per year only), while other territories, like the Solomon Islands for example, have even experienced a drop in sea levels (UNEP, 2006).



Mangrove in New Caledonia

Christophe LeChouther

Socio-economic implications

Repeated droughts caused by climate change could damage subsistence agriculture and livestock farming, which still play an important role in New Caledonia. The resulting deficits could force the populations to purchase certain foodstuffs, which would lead to a drop in the standard of living (Blaffart, personal communication). Some agricultural production will be more affected than others. Litchis and mangoes are difficult to grow in the absence of a cool season. Subsistence fishing also plays an important role in the territory's economy. A reduction

in fish stocks, caused by the degradation of the reefs, will have a non negligible impact on this sector. Variations in temperature and precipitation could also have an impact on public health by facilitating the spread of certain vector-borne diseases such as dengue fever or malaria (see Box 2.5). Malaria is currently absent from New Caledonia, but present in Vanuatu. With a rise in temperatures, the risk of this disease being introduced would increase (Goarant, personal communication). Finally, a large majority of the inhabitants of New Caledonia lives along the coast. Low-lying urban areas are highly vulnerable to rising sea levels.

Responses to climate change

Box 4.10: Reef Check: A Global Database on the State of the World's Coral Reefs

Reef Check is a rapid standardized protocol to evaluate coral reefs. It was devised primarily for use by non-professionals and volunteers. Launched in 1997, it has been implemented worldwide and involves a large network of independent volunteer divers. Regional, national and local coordinators put non-professional diving teams in contact with professional marine scientists. The scientists are responsible for training volunteers to collect precise data. Reef Check uses carefully chosen bio-indicator organisms selected on the recommendation of the Global Coral Reef Monitoring Network (GCRMN). The methodology, which can be learned in one day, involves a very strict system for guaranteeing the quality of the observations (Westmacott et al., 2000). This protocol has been implemented in more than 80 countries worldwide and, in particular, in most of those overseas territories

of the European Union which are home to reefs. Reef Check allows a fairly comprehensive monitoring of the state of the world's coral reefs and highlights the greatest global threats to coral reefs such as the impacts of climate change. In 2002, Reef Check published a report based on five years of monitoring activities entitled "The Global Coral Reef Crisis: Trends and Solutions". This report concluded that there is not a single coral reef in the world that has been spared from the impacts of human activities like over-fishing, pollution or climate change. In New Caledonia, the Reef Check protocol has been applied to 51 monitoring sites by the territory's provinces and several local diving clubs. The data collected will subsequently be centralized by IFRECOR (the French coral reef initiative).