4. South Pacific

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Introduction

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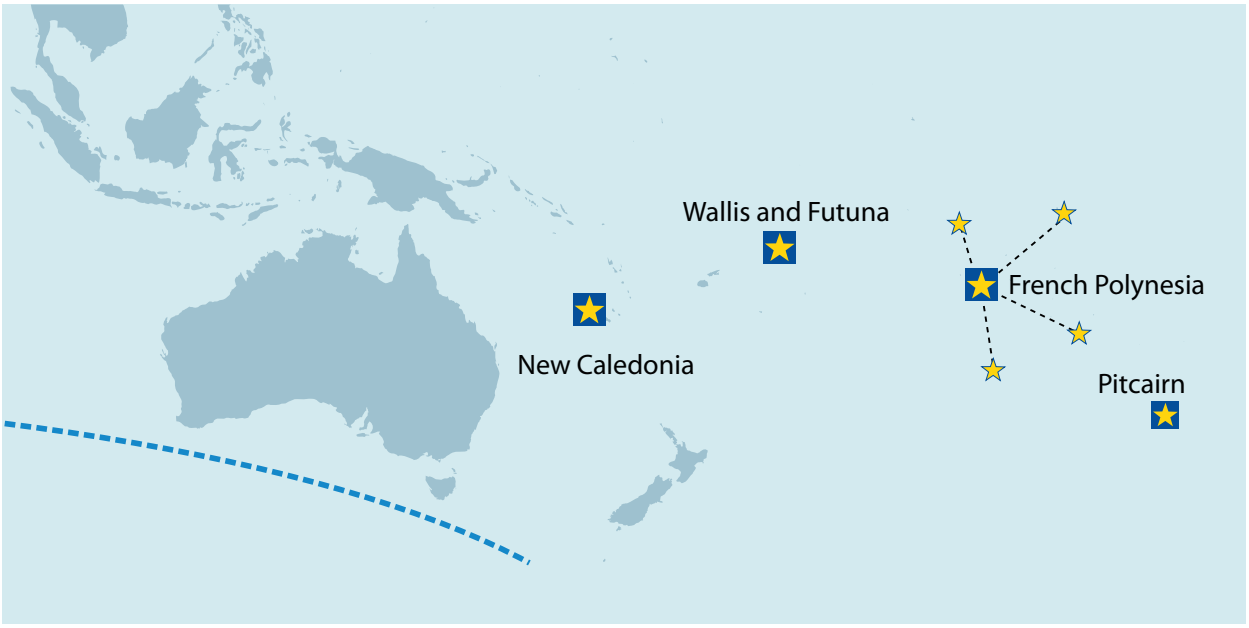


The Pacific Ocean is a huge body of water stretching over 166 million km²; it is home to some 25,000 islands. These are divided into three groups: Melanesia to the west which includes, among others, the Indonesian islands; Micronesia to the north; and Polynesia to the east, in the New Zealand-Hawaii-Easter Island triangle. The Pacific island chain is made up of scattered volcanic islands – some of which are high and geologically recent – and much lower, older coral islands. The South Pacific includes four overseas countries and territories (OCTs) of the European Union (see Map): French Polynesia, Wallis and Futuna (France) and Pitcairn (United Kingdom) situated in the Polynesian Triangle in the middle of the Pacific; and New Caledonia (France) situated in Melanesia, 1,500 kilometres east of Australia. French Polynesia and New Caledonia are the most populated European overseas territories with 283,019 and 224,824 inhabitants respectively, while Pitcairn, with a population of 50, is the least populated political entity in the world. French Polynesia's economy is based primarily on the public sector (national grants), tourism and pearl farming, while New Caledonia's is based mainly on nickel mining. Wallis and Futuna and Pitcairn, for their part, depend on agriculture, subsistence fishing and grants from their national States.

Biodiversity

The chief distinguishing feature of the Polynesian islands is their remoteness from any continent. The island of Tahiti, for example, is almost 6,000 kilometres from Australia and 7,000 from North America, the two closest continents. Because of their isolation, the number of terrestrial species found on these islands is limited, but their level of terrestrial endemism is exceptionally high. Indeed, the few biological families which managed to reach these islands have evolved in isolation over several million years, to occupy unfilled ecological niches (a process of "adaptive radiation"). The islands of French Polynesia, Wallis and Futuna and Pitcairn are part of the "Polynesia–Micronesia" global biodiversity

Milia Zinkova

New Caledonia and its dependencies are important reproductive areas for the green turtle (*Chelonia mydas*)

hotspot (Myers, 2000). French Polynesia has 118 islands, including 84 atolls, some 20% of the atolls of the planet. This territory is home to a remarkable variety of landscapes, ranging from high altitude volcanic islands to low-lying coral islands.

New Caledonia is a global biodiversity hotspot in its own right. Its biodiversity is three times greater than that of the Polynesian Islands. There are three reasons for this. First, it is in Melanesia, close to the Indonesian basin, itself particularly species-rich. Second, the unique mineral composition of its soils has greatly influenced the evolution of its vegetation. Finally, New Caledonia is not a volcanic island that emerged from the ocean, but a fragment of Pangaea, the original single continent. Numerous species were isolated early on in the planet's geological history and as a result developed in a unique manner. The rate of endemism in New Caledonia is one of the highest in the world. For example, the territory numbers 2,423 species of endemic vascular plants, while the whole of continental Europe only has 3,500 over a surface area about 500 times larger (Gargominy, 2003). New Caledonia is also home to the second longest coral barrier reef in the world, after Australia's famous "Great Barrier Reef".

Current threats

Apart from climate change, habitat destruction and the introduction of invasive species are the two greatest threats to biodiversity in the territories of the South Pacific. Bush fires and nickel mining also have important impacts on habitats in New Caledonia. For their part, the remaining natural zones of French Polynesia and Wallis and Futuna are subject to growing urbanization. French Polynesia also has to cope with countless invasive alien species which pose a threat to its endemic species. In Tahiti, for example, Miconia or Velvet tree (*Miconia calvescens*), a plant originally introduced as an ornamental species, today covers two-thirds of the territory (Gargominy 2003). The coastal waters of the South Pacific are also affected by over-fishing, land-based pollution (caused by erosion) and organic pollution (due to sewage water), especially round the main urban areas, which attack the corals. On the whole, however, the marine biodiversity of these territories remains relatively well preserved. Many reefs are still healthy, especially round New Caledonia and in the uninhabited Tuamotus islands in French Polynesia. Nonetheless, even these areas cannot escape the impacts of climate change, an added stress that is likely to have important consequences for the unique biodiversity of the South Pacific.

J. Y. Meyer

The invasive plant Miconia (*Miconia calvescens*) is present on two third of Tahiti Island

Climate projections for the region

Table 6: Variations in climate between now and the end of the century for South Pacific (IPCC, 2007).

Average for 21 global simulation models (scenario A1B). Margin of uncertainty between square brackets (25/75% quartiles).

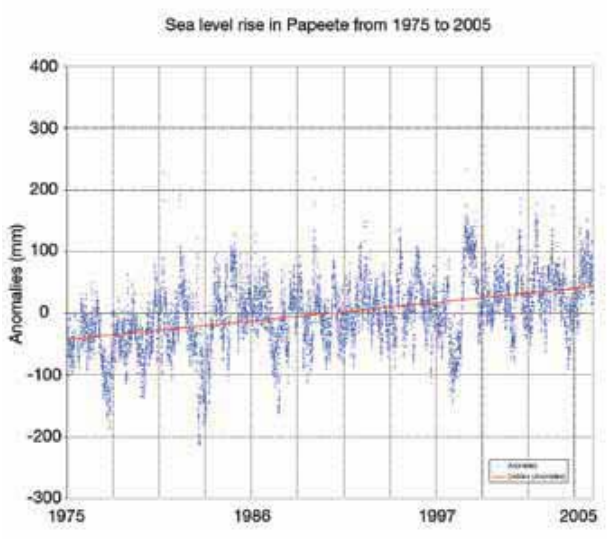
Climate indicator	Variations between 1980-1999 to 2080-2099
Air temperature	Increase of 1.8°C [+1.7 to +2] (in New Caledonia, increase from 1,8 to 2,1°C)
Precipitation	Increase of 3% [+3 to +6] (in New Caledonia, decrease from 5 to 8 %)
Extreme weather events	Increase in tropical cyclones intensity, with stronger peak winds and heavier precipitation
Sea level	Average rise of 0.35 metres (0.23 – 0.47 metres)

The South Pacific stretches over an area of several million km². Given its huge size, climate projections for the region are not uniform. Important variations are apparent between the different sub-regions (particularly between French Polynesia and New Caledonia). Overall, the IPCC predicts that average annual temperatures will rise by 1.8°C in the South Pacific between now and 2099 (see Table). This is similar to the predicted global average. However, several studies point to stronger temperature rises in the equatorial region of the South Pacific (+2.4°C north of French Polynesia) and weaker increases in the southern zone (+1.2°C south of French Polynesia). In New Caledonia, temperatures are expected to increase between 1.8°C to 2.1°C between now and the end of the century (Maitrepierre, 2006).

As far as precipitation is concerned, the figures are less clear; IPCC projections point to an average increase in rainfall of 3% over the entire region of the South Pacific between now and the end of the 21st century. Again, strong regional disparities exist. Most models foresee a strong increase in annual precipitation in the equatorial zone of the South Pacific (+20%) with a weaker increase, or even a decrease in precipitation levels, in the rest of the region. In New Caledonia, annual precipitation is set to decrease between 5 and 8% between now and 2099 (Maitrepierre, 2006). Decreases will not be very marked during the rainy season from January to March, but will be very noticeable during the dry season from August to November (as much as -24%).

Given greater the levels of warming predicted for the Central Pacific, the distribution of tropical storms in the South Pacific is also likely to change. Exact changes in the frequency and passage of cyclones through the region are still not entirely clear, however, an increase in their intensity is to be expected (IPCC, 2007).

Finally, the IPCC predicts a rise in sea levels of about 0.35 metres throughout the South Pacific, a figure similar to the global average (Church, 2006). However, variations between sub-regions will be important and the level of uncertainty remains high. A rise of 7.5 centimetres has already been observed in Tahiti between 1975 and 2005; while in New Caledonia the sea level remained almost unchanged over the same period (Sea Level Centre, 2005) (see Box 4.9).



ONERC – Sea level center

Impacts of climate change on biodiversity

Available data and scientific publications about the observed and potential impacts of climate change on the region's biodiversity are limited. At the marine level, the coral reefs are likely to be the most vulnerable ecosystems. The South Pacific corals have been affected by several bleaching episodes. However, the bleaching observed in the Pacific has not been as massive or as widespread as the episodes which affected the Indian Ocean in 1998 or the Caribbean in 2005.

The region's corals are also threatened by the likely increase in the number of tropical storms. In 2003, precise measurements were taken of the impacts of hurricane Erica on the reefs of the marine park in the southern province of New Caledonia (see Box 4.7). Rising sea levels caused by climate change also represent a serious threat to the coastal ecosystems of the region. In French Polynesia, the 84 low-lying coral islands could disappear altogether in the long term if sea levels rise significantly (see Box 4.1). The beaches and mangroves of New Caledonia are also particularly vulnerable, and some incidents of localized coastal erosion have already been observed in Wallis and Futuna.

At the terrestrial level, scientific data on the impacts of climate change are even more limited. However, some specific ecosystems will be more sensitive to expected changes than others. For instance, the subalpine forests of French Polynesia will not be able to migrate to higher altitudes if average annual temperatures rise (see Box 4.2). Furthermore, an upward migration of invasive species caused by changes in climate could threaten the last remaining populations of endemic species that have sought refuge in these hitherto relatively well-preserved zones. In particular, populations of relictual species endemic to Tahiti could be seriously threatened by the upward migration of their predators (see Box 4.3). Equally, the last remaining fragments of dry forest of New Caledonia, which are priority conservation zones, are also climate change-sensitive ecosystems. More intense droughts will increase the risk of fires, which are the biggest threat to these habitats (see Box 4.8).

N. Ferraton

Littoral submersion in Wallis and Futuna, likely provoked by a recent sea level rise

Socio-economic implications

Rising seas levels and the submersion of the coastal areas will have major economic and social consequences for the Pacific Islands; especially for the atolls of French Polynesia whose altitude, only a few metres above sea level, puts them in a fairly critical position. The consequences will be extremely serious for the local populations. This is particularly true of the inhabitants of the Islands of Tuvalu, who for the last few years have had to cope with the temporary submersion of their lands, as well as for the populations of the French Polynesian atolls who could become some of the first climate refugees (see Box 4.1). The atolls will not be the only territories threatened by rising sea levels; the submersion of the coastal zones could also have serious economic and social implications for the higher islands. Modelling, showing potential patterns of submersion, carried out in Wallis and Futuna and in Tahiti, round Papeete and the international airport, point to serious economic and social losses on these islands (see Box 4.11).

In addition, the impact of climate change on marine resources could seriously disrupt the region's economy. Black pearl farming is a pillar of the French Polynesian

Trackrecord ESA 2006

The 84 atolls of French Polynesia, laying a few meters above sea level, are directly threatened by sea level rise

economy. Pearl production, with its finely tuned farming conditions, could be severely affected by changes in the temperature and acidity of the water (see Box 4.4). The tourist industry is also a very vulnerable economic sector. The attraction of French Polynesia and New Caledonia rests in the quality of their beaches, their reefs, and their famous spectacularly coloured lagoons. A deterioration of these resources, compounded by the degradation of infrastructure as a result of more intense tropical storms, could have serious consequences for this key sector for the region. Damage to the reefs could also impact upon the fish stocks in the lagoons of the South Pacific and, indirectly, on subsistence farming, still largely practised throughout this region. Food-producing agriculture, which is vital for the rural populations of these islands, could also suffer as a result of changes in climate conditions. Longer dry seasons in New Caledonia could perturb breeding conditions and reduce crop production. Similarly, in Wallis and Futuna, traditional cultivation of taro (a root plant cultivated throughout the islands of the Pacific), will be directly affected by rising sea levels (see Box 4.12).

Finally, climate change represents a serious threat to public health in the Pacific territories. The deterioration of the reefs could lead to an increase in the prevalence of ciguatera in the region (see Box 4.5), while a rise in temperatures could lead to an increase in the incidence of certain insect-borne diseases, such as dengue fever or malaria.

Responses to climate change

Strategies for adaptation to climate change are relatively limited in the region. Adaptation requires first and foremost a thorough knowledge of the way ecosystems function. It is only once this information is known that impacts can be accurately anticipated. A number of long-term ecosystem monitoring programmes are being conducted in the region. Two such examples are described in detail in this report: the Reef Check Initiative, standard monitoring of coral reefs (see Box 4.10), and the Biocode project in French Polynesia (see Box 4.6).

Jeremy H.

Tourism in French Polynesia could be impacted by the climate change effects