

Vanuatu

Independent Country
of the French-Speaking
Pacific

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The Vanuatu Archipelago is situated more than 2000 km from the eastern coast of Queensland. It occupies a central position in the southern part of the Melanesian region, at the heart of a triangle defined to the north by the Solomon Archipelago, to the south-west by New Caledonia and to the east by Fiji. Port Vila, the capital of Vanuatu, located on the island of Efate, is about 800 km from Honiara, the capital of the Solomon Islands, about 400 km from Noumea, and about 800 km from Suva, the capital of Fiji.

Vanuatu consists of about 80 islands of various sizes, contained within a parallelogram 250 km wide and 900 km long, oriented north-north-west by south-south-east and lying between 166° and 170° E and 13° and 20° S. The total area of emerged land is 12,189 km², which makes Vanuatu the fifth largest country of those included in the South Pacific Commission's (SPC) zone of activity, after Papua New Guinea (426,243 km²), the Solomon Islands (27,556 km²), New Caledonia (19,103 km²) and Fiji (18,272 km²). The majority of the islands are less than 50 km² in size. Only about 15 have an area greater than 100 km²: combined, they cover a total area of 11,830 km², which accounts for 97 per cent of the national territory. Santo (4010 km²) and Malakula (2053 km²) are the two largest islands of the Archipelago; together they form about half of the total area of the country (see Table 1).

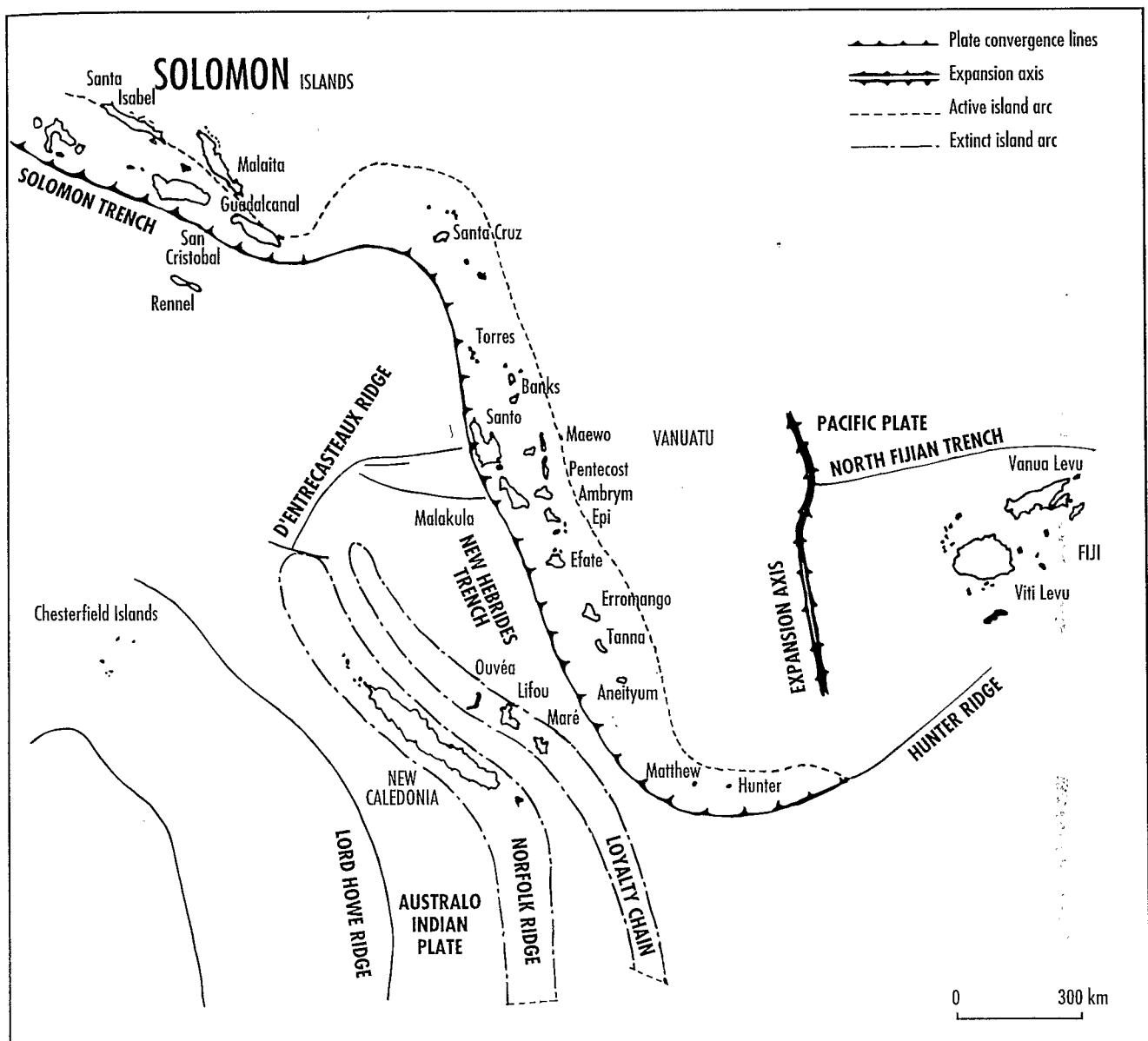
Table 1 - The Islands of Vanuatu according to surface area

Banks-Torres		Ambae-Maewo		Santo-Malo	
	km ²		km ²		km ²
Mere-Lava	15	Ambae	399	Santo	4 010
Mota	15	Maewo	300	Aore	58
Mota-Lava	31	Total	699	Malo	180
Ureparapara	39			Total	4 248
Torres Archipelago	121				
Gaua and Marig	330				
Vanua-Lava	331				
Total	882				
Shepherds		Paama		Tafea	
	km ²		km ²		km ²
Buninga	2	Paama	32	Tanna	561
Emae/Makura	35	Lopevi	28	Erromango	887
Mataso	1	Total	60	Aniwa	8
Tongariki/Falea	6			Aneityum	160
Tongoa	42			Futuna	11
Total	56			Total	1 627
Malakula		Efate		Epi	
	km ²		km ²		km ²
Malakula	2 053	Efate	887	Epi	446
		Emao	8		
		Nguna & Pele	28		
		Total	923		
Malakula		Ambrym		Pentecost	
	km ²		km ²		km ²
Malakula	2 053	Ambrym	666	Pentecost	499

PHYSICAL GEOGRAPHY

● GEOLOGICAL AND MORPHOLOGICAL FEATURES

From a geological point of view, the Vanuatu Archipelago constitutes the central part of a zone of subduction. This zone, known as the "New Hebrides", extends over about 1500 km, and marks the convergence of the Australo-Indian and Pacific plates; the former is sliding under the latter at an average speed of 10 to 12 cm per annum, in the direction $N 75^\circ E \pm 11^\circ$. Subduction is occurring according to an oceanic-island arc, trench-type structural system (see Map 1).



Map 1 The New Hebrides island arc (adapted from Bonnemaison, 1986)

The island arc, which Daniel (1982) likens to a topographic cushion situated between the inner slope of the trench and the ocean basin, is bordered by the 2000 m isobath. It begins north of 10° S at 165° E longitude, in the Santa Cruz Islands¹ and ends south of 22° S at 173° E, with the Matthew and Hunter Islands extension. The part of the arc above sea level comprises three ridges, which correspond to three distinct volcanic phases:

- an ancient western chain (from the upper Oligocene to the middle Miocene), formed by the Torres Archipelago and Santo and Malakula Islands;
- an eastern chain, from the upper Miocene age to the lower Pliocene, including Maewo and Pentecost Islands;
- a central, more recent chain including (from north to south):
 - the Santa Cruz and Banks Archipelagoes,
 - Ambae, Ambrym, Epi, Paamas and Lopevi Islands,
 - the Tongoa, Tongariki, Emae, Makura, Mataso group, which forms the Shepherds Archipelago,
 - Efate and its satellite islands: Nguna, Pele, Emao, Moso and Lelepa,
 - Erromango, Tanna, Aneityum and Matthew and Hunter Islands.

The oldest elements of this central chain date from the upper Pliocene and the most recent elements are from the present. The chain today includes nine active volcanoes above sea level (Tinakula, Vanua Lava, Ambae, Ambrym, Lopevi, Tanna, Matthew and Hunter) and some underwater volcanoes (see Map 2).

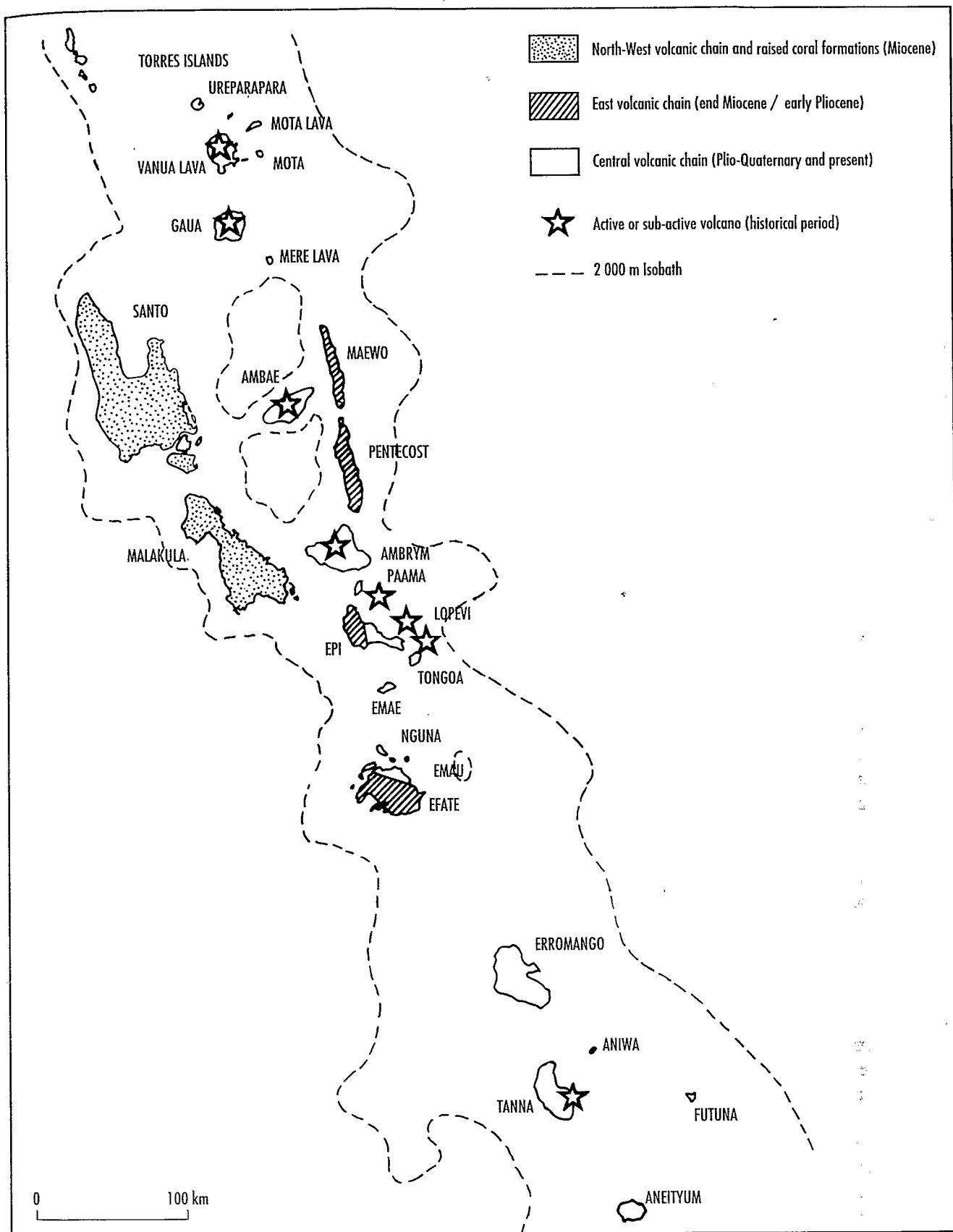
Known as the "New Hebrides Trench", the oceanic trench bordering the western side of the island arc is an extension of the Solomon Islands Trench. Demarcated by the 6000 m isobath, it includes two large areas separated by the Entrecasteaux Fold, a fracture zone which does not form a break in the trench, but an upthrust of the trench (Daniel, 1982). To the south of this fold, the central and southern parts of the trench are not as deep as the northern part: depths greater than 7000 m are rare, with a maximum depth of 7500 m observed near Matthew and Hunter Islands. In the northern part of the trench, north-west of the Torres Islands, the maximum depth reached is 9,174 m.

Because of the recent formation of the Vanuatu Archipelago and its volcanic origin, almost all the islands have an elevated surface relief. Bonnemaïson (1986) distinguishes four types of high, permanent islands:

- volcanic islands of the island arc's central chain;
- rubble islands, such as Ureparapara in the Banks Archipelago and the islands which make up the Shepherd Archipelago, which resulted from the break-up of pre-existing volcanoes;
- the horst islands of the eastern chain, e.g. Pentecost and Maewo;
- the continental islands of the western chain, e.g. Santo and Malakula.

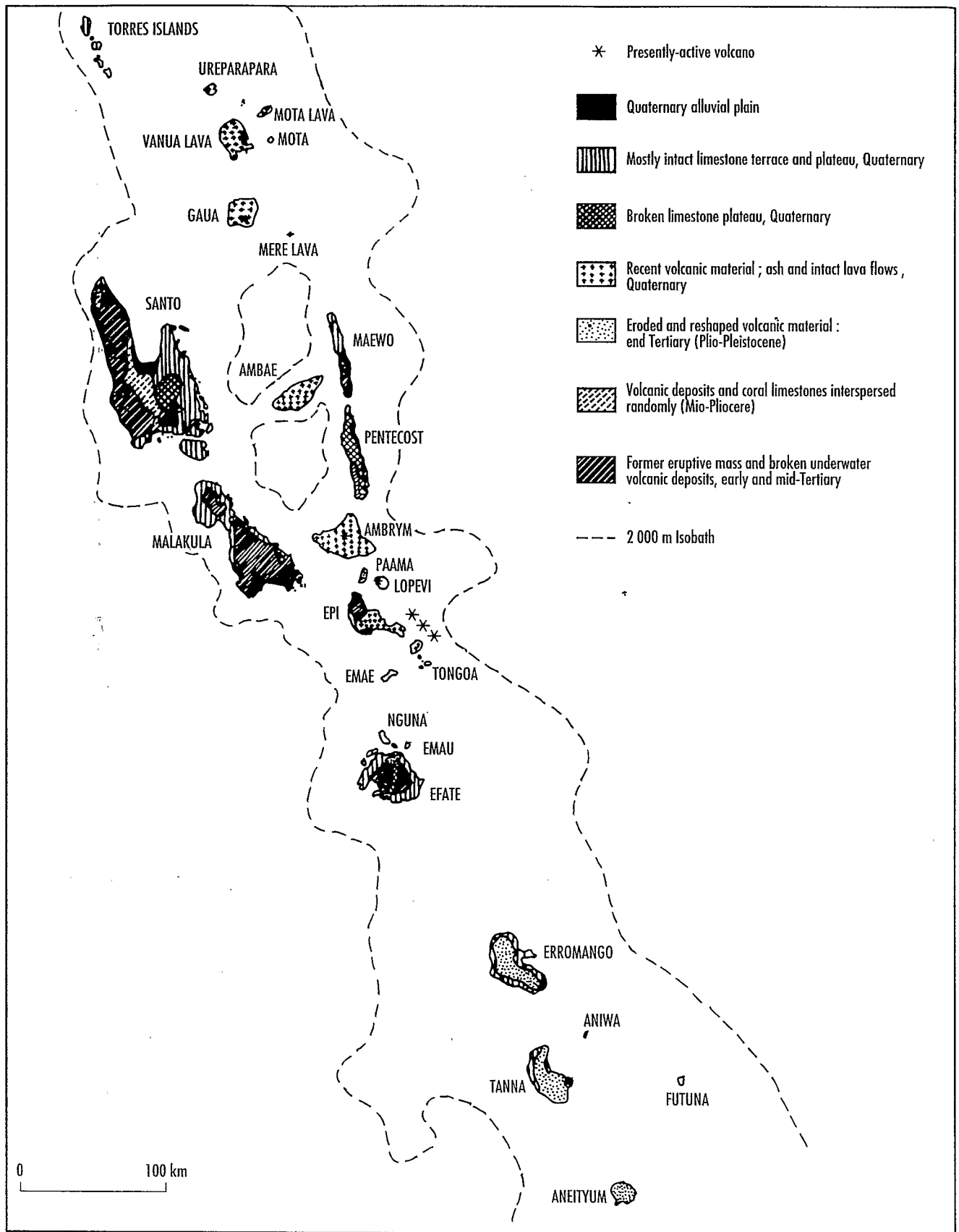
Low-lying islands are rare and most are small in size. They are frequently slightly submerged reef terraces, which have risen considerably following recent tectonic movements. The eastern sides of the islands of Santo and Malakula and the western and southern sides of Efate shelter many of these formations (see Map 3). Some of these islands are so low that they barely emerge from the water; this is notably the case with Reef Island, situated in the Banks Archipelago, at the centre of a triangle bordered by Ureparapara to the north, Mota Lava to the east and Vanua Lava to the south, and Cook Reef, situated to the west of Emae Island.

¹ - The Santa Cruz Archipelago forms the south-east limit of the Solomon Islands. It is located about 100 km from the Banks and Torres Islands.



Map 2

Geology of Vanuatu and volcanic activity (from Bonnemaison, 1986)



Map 3 Types of relief on Vanuatu (from Bonnemaison, 1986)

● CLIMATIC AND BIOGEOGRAPHIC FEATURES

1. TEMPERATURES AND SEASONS

Because of its geographical position between 13° and 22° S, the Vanuatu Archipelago is entirely situated in the inter-tropical region and its northern part has an equatorial climate. The annual average temperature recorded at Port Vila during the period 1961-1983 was 24.5°C. The annual temperature range is minimal: 4.2°C. The average temperature in the hottest month, February, is 26.8°C; in August, the coolest month, it is 22.7°C. When the average maximum and minimum temperatures are considered, the difference is more notable: it is slightly more than ten degrees (see Table 2). As the Vanuatu Archipelago extends in latitude over approximately 900 km, slight temperature contrasts are caused between the south and the north of the country, and there is a notable increase in the range of temperatures: the average annual temperature ranges from 26°C at Sola in the north of the country, to 24°C at Tanna and Aneityum in the south, at the Burtonfield and Anelghowhat stations (see Table 2). Generally speaking, the temperature range increases slightly with altitude. Maximum daylight temperatures are higher, while minimum night temperatures are lower.

The seasonal cycle is marked by the following stages: a five-month-long hot season (from December to April); two transitional periods, one in May and June, and the other in October and November; and a three-month-long cool season from July to September (see Table 3).

Table 2 - Maximum and minimum temperatures recorded at Vanuatu's six main weather stations from 1961 to 1983

	AVERAGE TEMPERATURES				AVERAGE MAXIMUM AND MINIMUM TEMPERATURES		
	Temperatures			Thermal amplitude (c-a)	Temperatures		Thermal amplitude (c-a)
	Minimum (a)	Average (b)	Maximum (c)		Minimum (a)	Maximum (c)	
Sola (Vanua Lava)	25.3	26.1	26.9	1.6	22.8	30.1	7.3
Pekoa (Santo)	24.1	25.2	26.2	2.1	20.8	29.6	8.8
Lamap (Malakula)	24.4	25.9	27.3	2.9	21.5	30.7	9.2
Port-Vila (Efate)	22.6	24.8	26.8	4.2	19.3	30.2	10.9
Burtonfield (Tanna)	21.3	23.8	26.3	5.0	17.8	29.7	11.9
Anelghowhat (Aneityum)	20.8	23.5	26.2	5.4	17.4	29.4	12.0

(Source: Vanuatu Meteorological Service)

Table 3 - The seasonal cycle of temperatures

AVERAGE TEMPERATURES OBSERVED FROM 1961 TO 1983

	May - June	July - September	October - November	December - April
Sola (Vanua Lava)	26.1	25.4	26.0	26.7
Pekoa (Santo)	24.8	24.2	25.1	26.0
Lamap (Malakula)	25.5	24.5	25.8	26.8
Port-Vila (Efate)	24.0	22.8	24.6	26.3
Burtonfield (Tanna)	23.0	21.4	23.6	25.6
Anelghowhat (Aneityum)	22.5	21.0	23.0	25.2

(Source: Vanuatu Meteorological Service)

2. RAINFALL PATTERN

Because of the country's latitudinal spread, the amounts of rainfall vary greatly from the north to the south: over the period 1961-1983, the annual averages varied from more than 4000 mm at Vanua Lava to less than 1500 mm at Aneityum (see Table 4). This situation is explained by the cluster isohyets of more than 5000 mm per annum around a central point situated in the immediate area of the Banks and Torres Archipelagoes in the north of Vanuatu and the Santa Cruz Archipelago in the Solomon Islands.

Table 4 - Seasonal rainfall averages, recorded in mm of precipitation from 1961 to 1983 by the six main meteorological stations of Vanuatu

Sola	Pekoa	Lamap	Port Vila	Burtonfield	Anelghowhat	
403	317	214	276	183	259	December - April
355	203	149	151	103	158	May - June
245	140	92	106	76	122	July - September
376	209	152	141	69	139	October - November
4 215	2 832	2 080	2 281	1 486	2 264	Yearly total

(Source: Meteorological Service)

To these zonal variations in the rainfall regime, variations attributable to the local climatic context should be added. The situation in relation to the prevailing wind and altitude, in particular, plays an important role: thus, at Efate in 1983, the pluviometer at Undine Bay, situated 3 m above sea level on the leeward side of the island, recorded only 744 mm of rain, or 2.5 times less than the rainfall recorded on Mount Boutouet at 455 m above sea level, exposed to the trade winds. On high islands, a pluviometric optimum appears several hundred metres above sea level at the base of the layer of moisture. Further down, rainfall frequently appears in the form of sudden piedmont downpours; further up, rainfall decreases regularly in intensity as the layer of moisture thins; in contrast, it becomes more regular and less diluvial around 800-1200 m above sea level where it is transformed into a permanent, semi-permanent or permanent sea of clouds, perpetually bathed by a persistent fine drizzle.

Maximum rainfall occurs during the hot season. The first three months of the year are two to three times wetter than August and September, the driest months of the year (see Table 4). Year-to-year variations can be quite significant. This is principally due to the passage of cyclones or tropical depressions, which are accompanied by particularly heavy rain. Thus in January 1985, 80 mm of rain was recorded in 6 hours by the pluviometer at Pekoa Airport on Santo during the passage of the tropical depression "Eric".

3. SUNSHINE AND ATMOSPHERIC HUMIDITY

The annual amount of sunshine varies only slightly from the north to the south of the Vanuatu Archipelago. The hot season from December to April, and the period which precedes it, in October and November, are the sunniest times of year; in contrast, the months of May and June, which are the transition period between the hot season and the cool season, are generally not very sunny (see Table 5). June is the month with the lowest insolation level; December is the month when it is highest. While the latitudinal insolation variations are not significant, the same cannot be said of variations in altitude. On high islands, contrasts are particularly marked between the frequently sunny coastal border and the mountainous zone bathed in a moist layer of air which generates frequent downpours up to the level of the pluviometric optimum, then fog and persistent fine drizzle at the higher altitudes.

Table 5 - Seasonal averages for hours of sunlight recorded at four meteorological stations in Vanuatu 1

IRHO-Santo	Port Vila	Burtonfield	Anelghowhat	
182	196	180	192	December - April
150	168	150	146	May - June
157	186	179	181	July - September
185	210	202	203	October - November
2 052	2 297	2 140	2 177	Yearly total

(Source: Vanuatu Meteorological Service)

(1) The study periods were respectively 1964 - 1983 for the IRHO station on Santo, 1968 - 1984 for Port Vila, 1980 - 1984 for Burtonfield and 1979 - 1984 for Anelghowhat.

Relative humidity is high over the whole archipelago, however the northern part is more humid (see Table 6). Generally speaking, seasonal variations are more marked in the south of the country than in the north.

Table 6 - Seasonal averages of the degree of relative atmospheric humidity, expressed as a percentage and recorded at midday

Sola	Pekoa	Lamap	Port Vila	Burtonfield	Anelghowhat	
77	77	76	76	72.5	75	December - April
78	79	75.5	74.5	73	72.5	May - June
77	76	73	69.5	69	68.5	July - September
77	74	75	68.5	67.5	70.5	October - November
77	77	75	72	71	72	Yearly total

(Source: Vanuatu Meteorological Service)

4. PRESSURE AND WIND SYSTEMS

4.1 General background

For each of the phases of the seasonal cycle, there is a corresponding type of weather determined by variations in latitude of the subtropical anticyclonic belt, which, with the intertropical convergence zone (ICZ) situated near the equator, is the major element of the dynamics of air masses in the South Pacific. All of the western part of the South Pacific between the equator and 20° south latitude is subject to the dominating influence of the south-east trade winds. These winds occur on the equatorial side of the tropical anticyclonic belt around the 30th parallel. In Vanuatu, the trade winds appear as winds from the east, east-south-east, and south-south-east which respectively account for 17.5 per cent, 18.5 per cent and 13.5 per cent of observations recorded over three years for all of the country's six principal weather stations (see Table 7 and Figure 1).

4.2 Pressure systems and wind directions during the cool season

During the cool season, the intertropical convergence zone (ICZ), where trade winds from the north-east of the northern hemisphere and trade winds from the south-east of the southern hemisphere meet, is situated at the thermal equator, around the 10th parallel north (see Map 4). "Trade winds from the SE blow with great regularity, and at strengths reaching 4 to 5 Beaufort" or from 8.5 to 19.5 knots

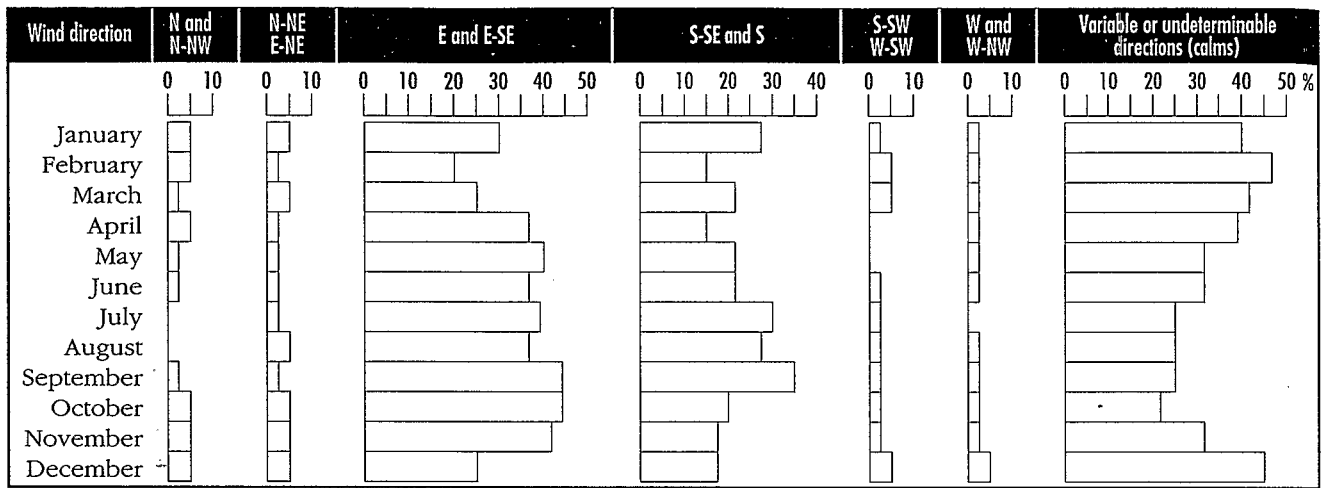


Figure 1.a - Winds directions

(SHOM, 1984, p. 4). An anticyclone is situated over the Australian continent. It frequently moves towards the east and becomes stationary over the Coral Sea to the west of New Caledonia, bringing high pressure and good weather to Vanuatu. When the anticyclone remains over the Australian continent, cold fronts connected to disturbances of polar origin cross the Tasman Sea and reach Vanuatu; they are accompanied by westerly winds (ORSTOM, 1981). These winds push the trade winds towards the east and create, depending on their speed, either a period of calm or, less frequently, "gales of westerly winds", particularly in the south of the country. Advice to Mariners (SHOM, 1984, p. 4) notes that "the ESE trade winds are sometimes interrupted by periods of calm, generally followed by easterly to north-easterly winds (very rarely north-westerly) accompanied by rains. Cool winds from the south-east then take over".

Generally speaking, from July to September the frequency of easterly winds, east-south-easterlies and south-south-easterlies which make up the trade winds is roughly equal (Table 7).

4.3 Pressure systems and wind directions during transitional periods

Prevailing trade winds are not unique to the cool season. The summer transitional period in May and June is marked by a higher frequency of east-south-easterly winds and south-south-easterlies, compared to the annual average, while the winter transitional season in October and November is characterised by a maximum frequency

Table 7 - Seasonal variations in the frequency of wind directions, recorded throughout the country, based on 50,350 observations in 1983, 1984 and 1985

	NNW-N (%)	NNE-ESE (%)	E (%)	ESE-SE (%)	SE-SSE (%)	S-SW (%)	SW-WNW (%)	Variables (%)	Total (%)
December - April	4	3.5	14.5	13.5	10.5	8.5	3.5	42	100
May - June	3	4	17.5	22	14	7.5	2.5	29.5	100
July - September	1	3	20	21	18	9	2	26	100
October - November	4	5	21	21	12.5	7	3	26.5	100
Yearly total	3	3.5	17.5	18.5	13.5	8	2.5	33.5	100

(Source: Vanuatu Meteorological Service)

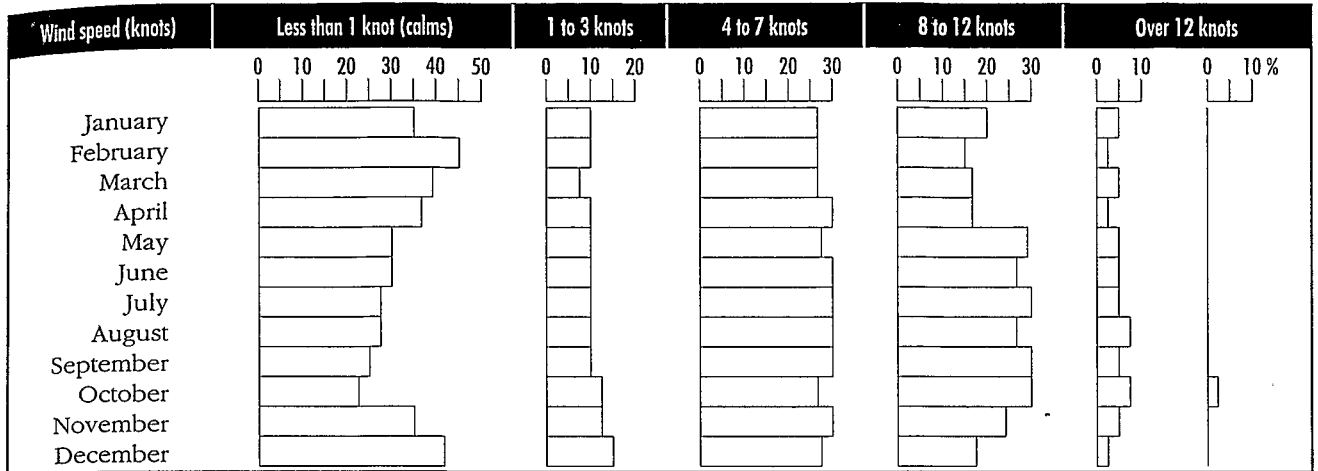
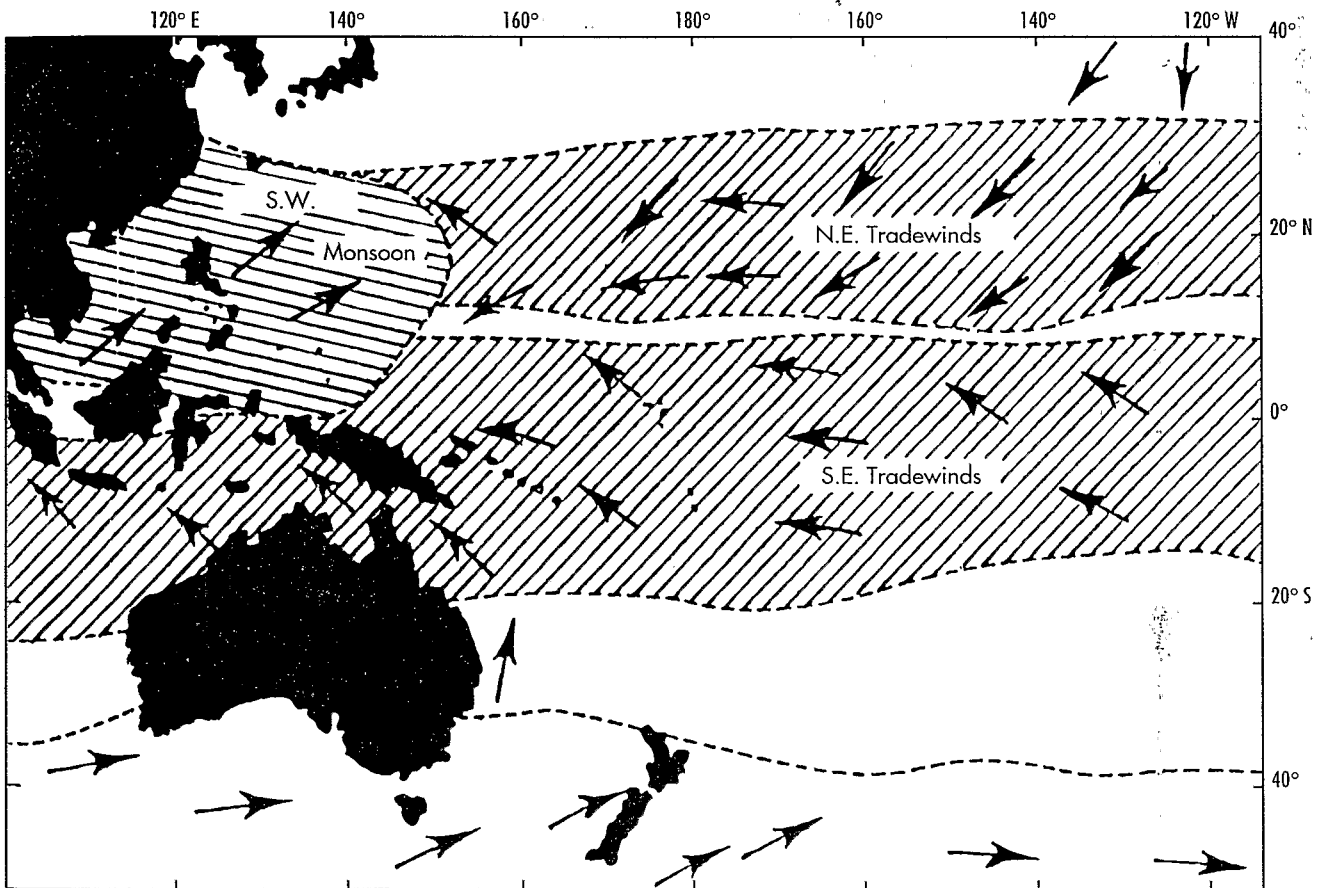


Figure 1.b - Monthly variations in wind direction and speed
 Average estimate determined for the entire country on the basis of 50,350 observations taken in 1983, 1984 and 1985 at the meteorological stations of Sola, Pekoa, Lamap, Port Vila, Burtonfield and Anelghowhat.



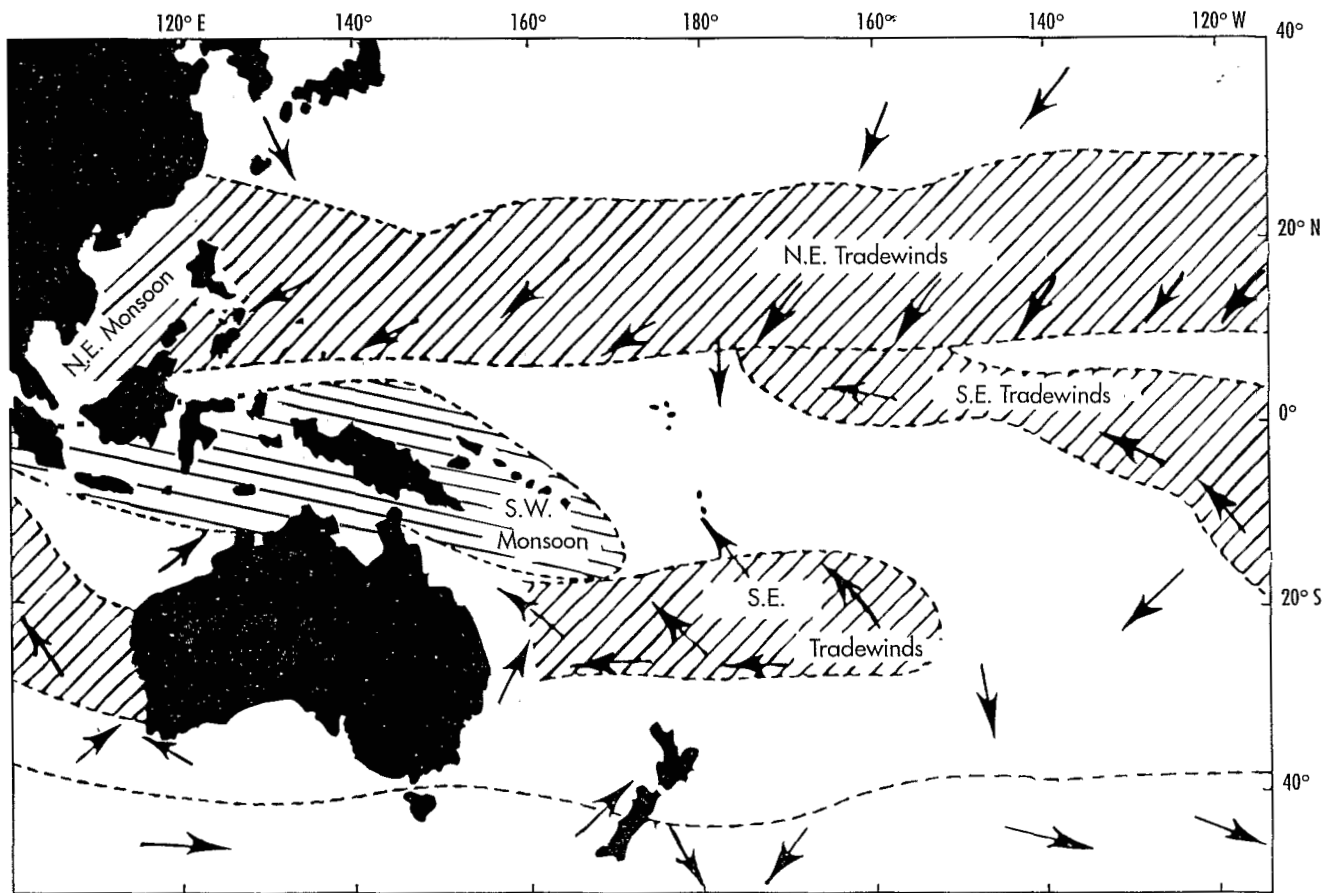
Map 4 General wind regime from May to October in the western Pacific
 (from SHOM, 1984)

of easterly and east-south-easterly winds (Table 7). These two months correspond to the movement of the intertropical convergence zone towards the south, when the subtropical anticyclonic belt extends practically uninterrupted over the entire south-west Pacific (ORSTOM, 1981).

4.4 Pressure systems and wind directions during the hot season

During the hot season, winds are more variable; non-fixed directions represent 46.5 per cent of the observations taken during the period from December to April (Table 7). The zone of stability corresponding to the south-easterly trade winds is situated around the 20th parallel, while the intertropical convergence zone oscillates between the Solomons Archipelago and the north of Vanuatu according to the movements of the Australian anticyclone. When it is stationary over the Tasman Sea, the ICZ is pushed back towards the north. South-East Asia (as far as Indonesia) is subject to the north-westerly monsoon (Map 5) which, blowing from November to March, reaches the south of Papua New Guinea and the Solomons Archipelago in December. Depending on the year, its influence can extend as far as the 15th parallel. In January, its arrival in the north of Vanuatu is accompanied by northerly winds, north-westerlies and periods of calm which frequently cover the whole archipelago. From December to March, winds with variable directions or of such low speed that direction cannot be ascertained account for 38.5 to 47.5 per cent of observations (average 42%).

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Map 5 General wind regime from November to April in the western Pacific
(from SHOM, 1984)

The hot season is the season of heavy rains, cyclones and tropical disturbances. Advice to Mariners (SHOM 1984, p. 5) warns that "when the south-easterly wind strength increases, with a drop in barometric pressure, one can generally expect the approach of a disturbance".

4.5 Wind speeds

Periods of calm (winds less than 1 knot) represent on average 30.5 per cent of observations. They are significantly more numerous during the southern summer from December to April (38.5% of observations) than during the other months of the year (24.5% of observations) which are characterised by strong east-south-easterly and south-south-easterly winds blowing with intensity. Generally speaking, the duration of calm periods diminishes with latitude: it is six months at Sola (from November to April) and shrinks to the single month of February on Aniityum; these variations probably result from the weakening influence of the monsoon from the north, which, as it moves southwards, meets increasingly stable trade winds. While winds from 1 to 7 knots occur regularly throughout the year, moderate to strong winds (greater than 12 knots) are more frequent from June to November than from December to May. They correspond mainly to south-east trade winds. Winds greater than 18 knots are rare. Winds greater than 30 knots are exceptional, and only occur during the passage of tropical depressions or cyclones.

2- Cyclones are distinguished from tropical depressions by a higher wind speed, always greater than 63 knots. When the wind is between 48 and 63 knots, it is not a cyclone but a strong tropical depression. When the wind has an average speed between 34 and 47 knots, the tropical depression is qualified as moderate.

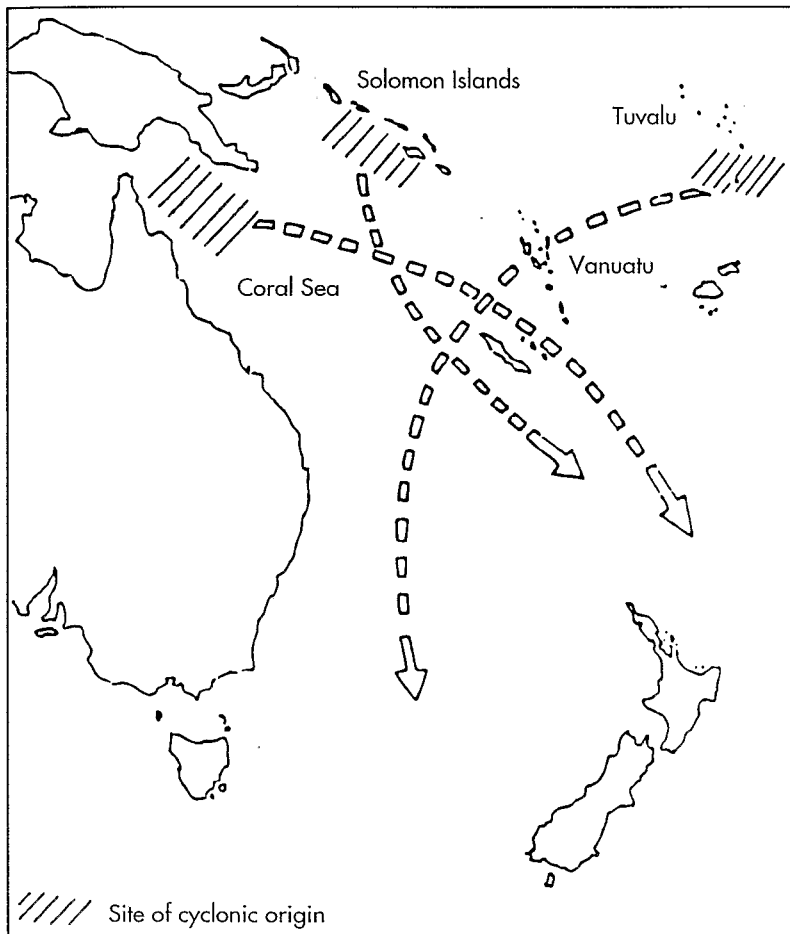
4.6 Tropical cyclones

The area of the South-west Pacific most frequently affected by the passage of cyclones or tropical depressions² lies between the 15th and 25th parallels, an area in which most of the Archipelago of Vanuatu is situated.

Cyclones and tropical depressions do not originate in this region. They all come from a more northerly latitudinal band, extending from the 5th to the 15th parallel, where three zones of cyclone formation are located (see Map 6) :

- one is situated north of Fiji and west of Wallis and Futuna, more precisely between the Tuvalu Archipelago and Rotuma;
- the second is situated in the immediate neighbourhood of the Solomon Islands;
- the final one is located to the north-west of the Coral Sea, south of Papua New Guinea.

More precisely, Vanuatu is in the trajectory of tropical depressions and cyclones forming in the eastern part of



Map 6

Place of origin and average trajectory of cyclones affecting the south-west Pacific

these three zones. Of the eight principal cyclones which affected the Vanuatu Archipelago from 1951 to 1976, seven originated in this region. From 1940 to 1985, the National Meteorological Service of Vanuatu gathered data on a total of 58 tropical depressions or cyclones which crossed some or all of the islands of the Archipelago during the "cyclone period". This extends from November to April. Twenty-five of these were studied; nine were classified as cyclones, 16 as tropical depressions. January and February are the months when cyclones are most likely to occur: in 45 years, 65 per cent of observations of cyclones or tropical depressions were made during this period. The islands in the south of the Archipelago (Aneityum, Aniwa, Futuna and Tanna) are more exposed to the risk of cyclones than are the northern islands.

5. BIOGEOGRAPHIC CONSEQUENCES OF THE CLIMATE

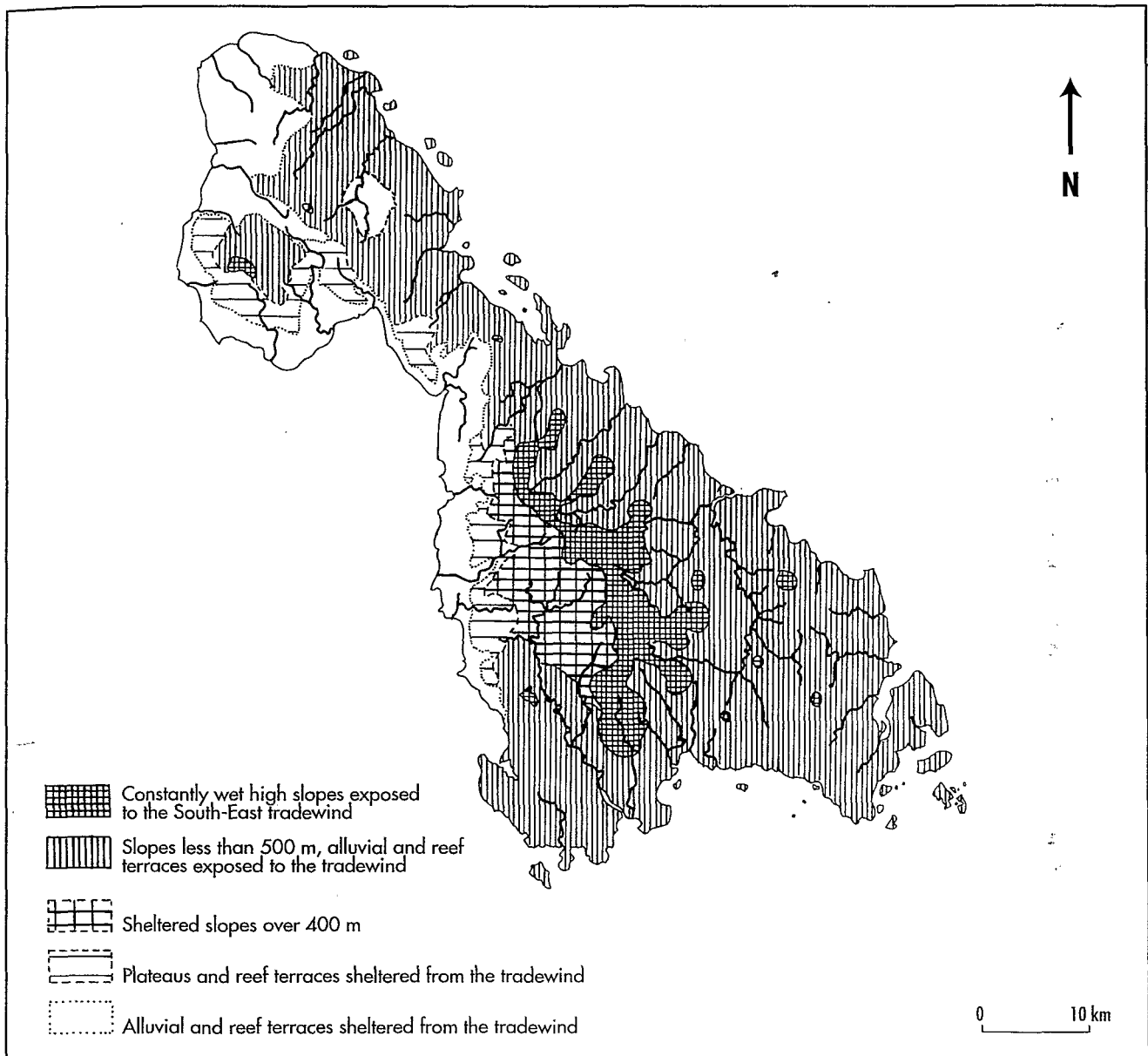
Because of the archipelago's humid climate, the evergreen forest is the dominant form of vegetation on Vanuatu's high islands. In its structure, its appearance and the composition of its flora, this forest has numerous similarities with the forests of the Indo-Malaysian Archipelago, which are the last remnants of the paleo-oriental realm; the same is true for the maritime mangrove forests. Around 1500 species make up the flora of Vanuatu. Because of the relatively recent formation of the Vanuatu Archipelago and its proximity to the Solomon-Papua New Guinea region, which species coming from Indonesia and Malaysia traversed, the rate of endemism is very low. Bourdy (1989) notes that the vegetation is composed of two main groups: genera originating from the paleo-oriental realm, which make up 52 per cent of the total flora; and the "pan-tropical" genera, with a wide geographical distribution, which make up 36 per cent of the country's plant life.

The dense tropical rain forests of Vanuatu have two principal layers: one composed of trees, bushes and herbaceous plants; the other formed by epiphytes such as orchids and strangler plants, e.g. ficus, such as the banyan. Generally speaking, composition of the flora and density of the plant cover vary according to latitude, altitude and the hillsides' exposure to prevailing winds.

- Thus a differentiation of flora can be observed from the north to the south of the archipelago. As Bourdy notes (1989) : the flora in the north shows "a significant affinity with the neighbouring islands (Solomon Islands, Papua New Guinea) and the flora in the south, despite its geographical proximity to New Caledonia, is more comparable to that of Fiji".
- However, the vegetation is more luxuriant in the north of the country, where the climate is hotter and more humid, than it is in the southern islands, where the influences from the South cause Mediterranean-type variations (Doumenge, 1966).
- A similar contrast appears between the eastern and southern sides of the islands exposed to rains brought by the trade winds, and leeward hillsides, where, depending on the permeability of the substrata, xeric groupings of savanna and prickly scrub can be found. It is the home of "white grass", often populated by numerous wild horses, as on Tanna or around Mount Erskine on Efate. Apart from Tanna and Efate, Ambae, Ambrym and Malakula are the islands in the archipelago which present the most noteworthy "leeward" areas. These areas are bordered by hillsides oriented north-west and, as a general rule, are limited in size, even on the larger islands such as Malakula (Map 8). Because of their narrowness and their north-south orientation, Pentecost and Maewo are among those of the larger islands where the leeward areas are the

smallest; they are limited to only a few square kilometres to the north of Namaram for the former, and to the north of Beterara for the latter (Quantin, 1980).

- At higher altitudes, contrasts between windward and leeward slopes tend to disappear. In reference to the island of Ambae, Bonnemaïson (1974) notes that the cloud cover becomes permanent above 400 m on those slopes exposed to the winds and above 500 m on the leeward ones; "humidity is such that evaporation becomes increasingly difficult". This perhumid climate favours trees which have a luxuriance unequalled at lower levels. These favourable conditions decrease rapidly at altitudes of 700–800 m, "the trees become stunted, scattered amongst a dense and marshy brush dominated by ferns, creepers and pteridophytes (mossy forests)". Because of the altitude of its western cordillera which peaks at 1879 m at Tabwemasana, Santo is the island with the most highly developed mossy forests.



Map 7 Morpho-climatic map of Malakula (Sources IGN; Quantin, 1980)

● MARITIME AREA AND ENVIRONMENT

1. PELAGIC DIVISION: THE EXCLUSIVE ECONOMIC ZONE

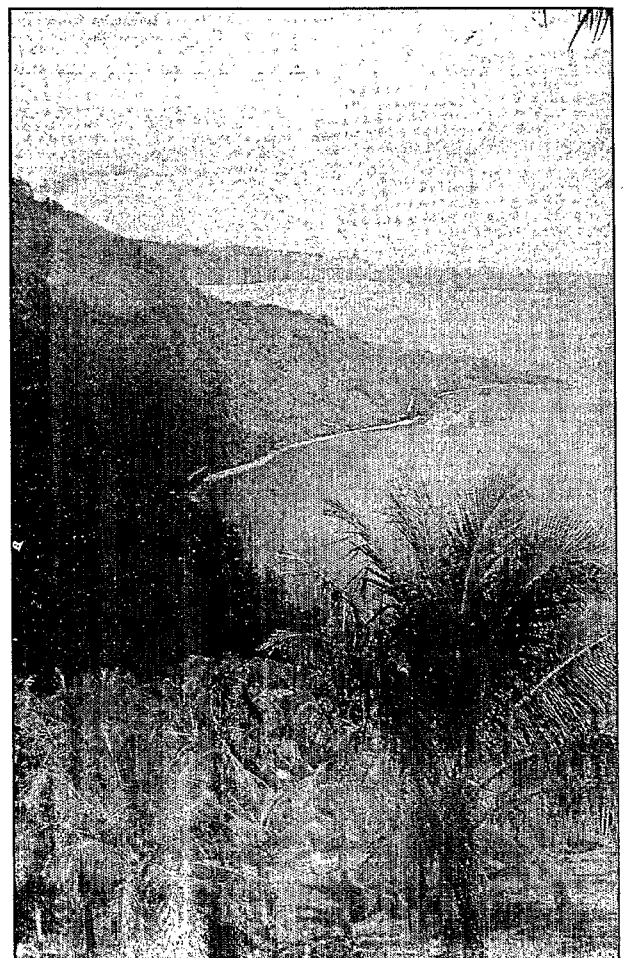
The maritime zone of Vanuatu, corresponding to the exclusive economic zone (EEZ) of 200 nautical miles, is approximately 680,000 km². This makes Vanuatu 12th among the countries and territories of the South Pacific Commission, a long way behind the Polynesian archipelagoes, which all have a maritime zone 1000 to 10,000 times greater than their dry lands. Compared to bordering maritime zones (New Caledonia: 1,740,000 km²; Solomon Islands: 1,340,000 km²; Fiji 1,290,000 km²), Vanuatu's maritime zone is 2 to 2.5 times smaller. In contrast, the ratio (area of maritime zone / area of land), that Doumenge (1985) equates with an isolation index, is comparable to that of the Solomons and Fiji.

2. COASTAL AREA

2.1 General oceanic circulation and the effects of islands

All the northern part of Vanuatu, to about 15° S latitude, is affected by a branch of the southern equatorial current which flows west. In contrast, the southern part, from 15° to 20° S, is subject to the influence of a branch of the southern tropical counter-current which flows east. The layout of the archipelago in a string of islands, stretching from north to south in the form of a Y, brings about significant local disturbances of the general circulation, with the archipelago playing the role of a grate to the sea currents (Cillaurren, 1987). These hydrologic disturbances, which oceanographers classify as the "island effect", have three main forms: (a) local rising of deep waters along the shore and near underwater mountains, (b) simple turbulence affecting the sea currents circulating between two close islands; the straits separating Maewo and Pentecost, as well as Pentecost and Ambrym, are frequently the site of such disturbances, favourable to the presence of tuna, (c) the "island wake" caused by refraction, then diffraction, of swells.

Pentecost island



The island effect can also be classified as nutrient enrichment of coastal waters. This process is vital for fisheries activity because it induces a rapid development of phytoplankton, followed by the arrival of numerous planktivorous fish, and then their predators, notably tuna. Four types of nutrient enrichment can be distinguished. The first two are directly related to the hydrological disturbances that we have just discussed. The two others occur independently.

- In the first instance, there is a situation of rising deep water, in which the nutrient concentration is clearly higher than that of surface waters. This phenomenon takes place in the direct neighbourhood of islands and can be classified as a "localised upwelling".
- The second type of enrichment related to hydrology can be produced both near islands and in the open ocean. It is caused by the appearance in the hot season of very

high densities of nitrogen-fixing cyanobacteria of the *Trichodesmium* genus, which constitute an important source of food for the pelagic food chain.

- A third type of enrichment of the coastal waters is caused by soil deposits, rich in nutrients and in organic matter, which are washed down from slopes bordering the sea, or from the river system.
- The rise, by capillary attraction, of deep water, richer in nutrients than surface water, across coral structures, a phenomenon known as "endowpelling", could also play a predominant role in the enrichment of coastal waters (Rougerie and Wauthy, 1986, 1990).

2.2 The littoral region

2.2.1 A very uniform coast with few harbours

Generally speaking, the littoral region of high islands is unbroken, peninsulas are rare and bays are wide and open onto the deep ocean. This topography is scarcely favourable to the establishment of ports. In the whole archipelago, Port Sandwich Bay, situated at the south-eastern extremity of Malakula is the only break in the coastline sufficiently large and deep to provide boats with a safe and practical harbour in all seasons. The majority of the country's ports have been created on the leeward side of low islands or islets located near larger islands (Segond Canal at Santo, Port Havannah at Efate).

A typology by area, shape (mountainous, jagged or stretched out), coastal index, and the ratio of the coastline³ to the land area (Doumenge, 1985) allowed the country's 34 principal islands to be divided into 13 classes (see Table 8), with 8 size categories: extremely small islets, extremely small islands, very small islands, small islands, average-sized islands, average to large islands, large islands, island bodies.

The more broken or stretched the shape, the higher its index. It is generally greater than 1 for the small islands and islets with an area less than 40 km² and ranges from 0.5 to 0.3 for the islands of 150 to 500 km² in area; the islands with a larger area are characterised by coastal indices of less than 0.3.

2.2.2 River mouths and mangrove swamps

Of all the coastal waters, the river mouths and mangrove swamps, along with the coral reefs, are the biotypes presenting the most abundant supply of fish, crustaceans and shellfish. Because of their proximity to villages, their ease of access and their rich food supply, the mangrove swamps and river mouths constitute privileged fishing zones for the coastal population. A total of 17 rivers with a flow sufficient to fertilise the coastal zone have been noted throughout Vanuatu, 12 of which are on Santo and Malakula; 271 other water-courses, with a more limited flow, probably also have an impact on the marine environment, but their effect is strictly localised to the area near their mouth.

Even if they cover only a small part of the coast, the mangroves offer a real economic resource for the country. They actually provide the triple function of protection, nutrition and fertilisation for the coastal environment and for the aerial, marine and terrestrial animal species which populate the area. Over the whole Archipelago, the mangroves cover an area estimated at 3000 ha, plus or minus 500 ha. The east and south-east coasts of Malakula are home to most of

3 - These islands total 3050 km of coastline (estimation calculated on the curvimeter on IGN maps with a scale of 50 000:1).

them (1900 ha). Forests large enough to be detected by aerial photography or high-resolution satellite images have been noted on eight islands. These are Hiu in the Torres Archipelago, Ureparapara, Vanua Lava and Mota Lava in the Banks, Malakula, Epi, Efate and Aniwa. Elsewhere the mangroves are not widespread. They consist of thickets several metres wide, fringing the length of the coast to the mouths of the estuaries and the offshore bars.

2.2.3 Coral reefs

Present coral formations are generally limited to a narrow band of reefs fringing the coast. This area covers the intertidal zone, including the reef flats and coral formations of a depth less than 10 m which form the summit of the reef slope. It barely exceeds 100 m in width and for the whole country provides an area of approximately 44 800 ha, 40 per cent of which is situated on Malakula and Efate. The Banks-Torres Archipelago also possesses vast expanses of reef flats and shallow coral formations. The flats end with an algal ridge and a zone of spurs which are subject to the action of the waves and the swell. In all the islands, the external slope of the reef is very abrupt; recent islands such as Ambrym and Banks, whose volcanic activity is still intense, are those where the bottom slope is most accentuated (see Maps 8 and 9).

Table 8 - The islands of Vanuatu according to their area and their coastal index

	Form	Area (km ²)	Coastal index	Number	%
Islets		< 5	> 2	3	9.0
Extremely small islands	Mountainous, jagged or stretched	5 - 20	0.6 - 1.6	4	11.5
		5 - 20	> 1.6	4	11.5
Very small islands	Mountainous, jagged or stretched	20 - 40	0.6 - 1	3	9.0
		20 - 40	> 1	4	11.5
Small islands	Mountainous, jagged or stretched	40 - 60	< 0.8	1	3.0
		40 - 60	> 0.8	2	6.0
Average islands	Mountainous	150 - 250	< 0.5	2	6.0
Average to large islands	Mountainous	250 - 500	< 0.3	1	3.0
		250 - 500	> 0.3	4	11.5
Large islands	Mountainous, partly	500 - 1000	< 0.25	2	6.0
	Mountainous, partly jagged	500 - 1000	> 0.25	2	6.0
Island bodies	Jagged or stretched	1000 - 5000	> 0.1	2	6.0
TOTAL				34	100

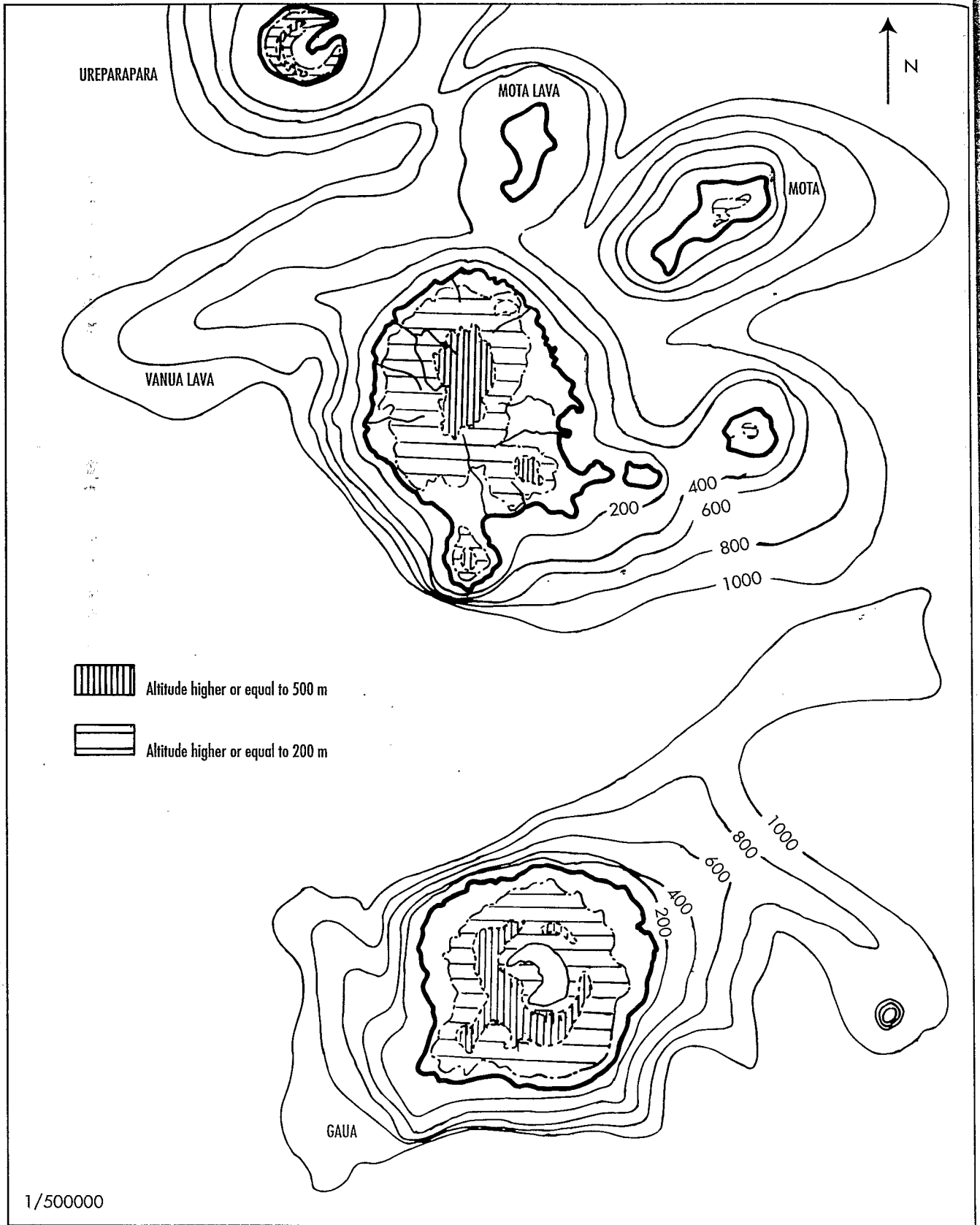
An island's total area of reef flats disguises the real importance of these features in the littoral geosystem. The relationship between the area of reef flats and the area of the island, as well as the reef index, i.e. the ratio of area of flats / coastline, are the best indicators. On average, the flats and their boundary represent 3.5 per cent of the land area for a reef index of 14 ha of flats per kilometre of coast.



Map 8

Topography and bathymetry of Ambrym, Epi and Shepherd Islands

(Sources: IGN, US Geological Survey)



Map 9

Topography and bathymetry of the Banks Islands (Sources: IGN, US Geological Survey)

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Only the country's most recent islands, whose volcanic origin explains the lack of reef flats, have a reef index of less than 5 ha per linear km of coast. Given the current state of technology used in Vanuatu's fishing sector, it is difficult to carry out fishing in depths greater than 400 m. This is why the 400 m isobath has been used as the depth limit for this area, which covers 1063.4 km² or 87 per cent of the total area of dry land (1218.9 km²). The flats and their boundary only represent 4 per cent. The outer reef slope is between 10 and 100 m in depth and significantly more extensive; with an area of 263.9 km², it makes up 25 per cent of the total exploitable reef and 22 per cent of the land area. (These are considerable areas, greater than the area of the coastal plains where the major activities are concentrated.) The reef drop-off, located at a depth from 100 m to 400 m, covers 754.7 km² or 71 per cent of the total reef area. Although the productivity of the area is less than that of shallower zones, this area is very large, corresponding to 62 per cent of the land area and because of this, constitutes a "reservoir" of food, the exploitation of which is a priority for public authorities through the development of local fishing in Vanuatu.

SOCIO-ECONOMIC AND HUMAN ASPECTS

● THE COUNTRY'S ADMINISTRATIVE DIVISIONS

Originally called the New Hebrides and administered jointly by France and the United Kingdom as a condominium, Vanuatu gained independence on July 30, 1980. Under this joint administration, the country was divided into four regions: the north, north-central, south-central and south, also known as Tafea. Nowadays, the Republic of Vanuatu is divided into six provinces (see Map 10), and two municipalities.

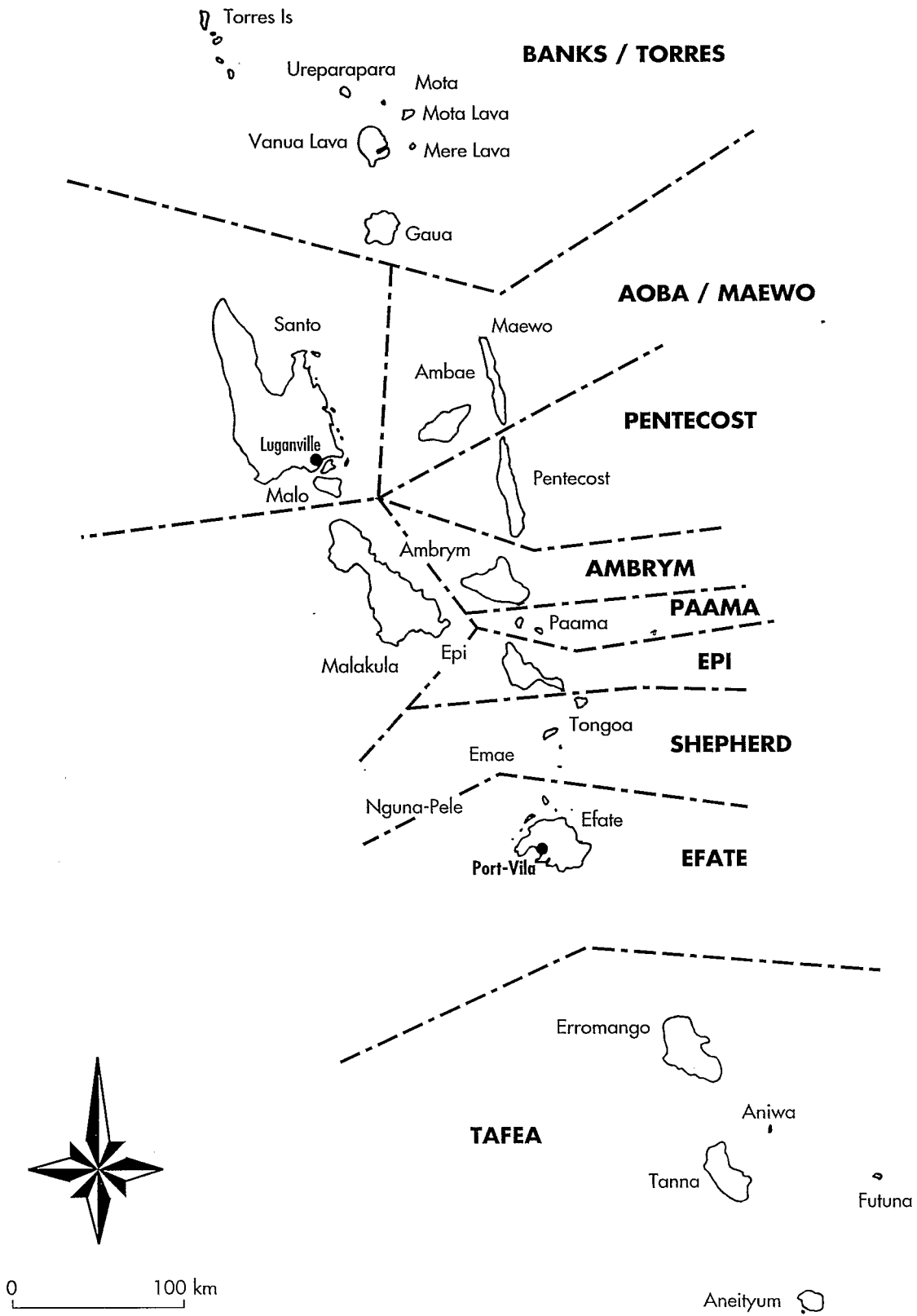
Each province is the seat of a council, comprising ten to thirty members,⁴ two-thirds of whom are elected by universal suffrage every four years; the other third, comprising representatives of the customary chiefs, women and youth, are appointed by the Central government. The executive branch of the province is made up of a secretary and a treasurer, supported by a small administration. Their tasks are threefold: firstly, the construction and maintenance of educational, health, transport and cultural infrastructures, such as schools, dispensaries, roads, bridges, secondary airports, cultural or community centres; secondly, the development and application of regional development plans; thirdly, the control of commercial activities and the levying of local taxes. These taxes are supposed to allow each local government to have a balanced budget: in fact, collection is still very irregular and an average of 22 per cent of budgets is assured by the Central government.

● POLITICAL PANORAMA

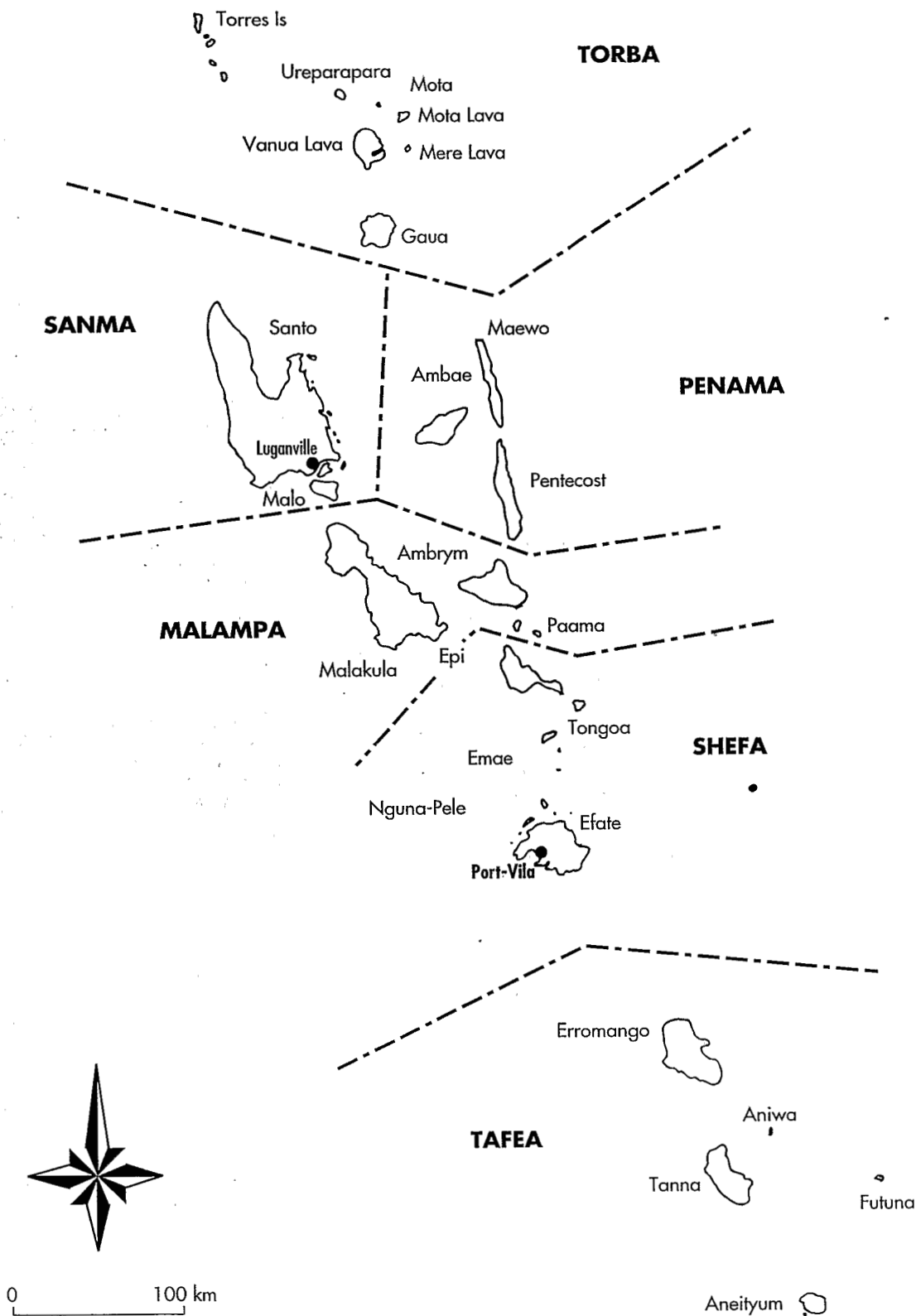
From independence until 1987, "the political chessboard" was always marked by bipolarisation of the country, with the Vanuaaku Pati (VAP), a "progressive" nationalist party with an English-speaking dominance, in power since 1980, opposed by the Union of Moderate Parties (UMP) which brought together all the "minority" cultural, political and religious movements which were hostile to the political hegemony of the VAP.⁵ Beside these two principal parties, there existed some minor groups, remnants of the pre-independence political context, such as Na Griamel and Namaki

4 - Total membership of councils varies according to the demographic size of the province they represent.

5 - In his thesis, J. Bonnemaison (1986) addressed the history of the birth, evolution and principal orientations of the VAP and the UMP before independence. The reader would also benefit from reading the article by J.M. Charpentier (1982), «French-speaking countries in Melanesia, extension and future», published in the journal, Anthropology and Society (vol 6, no. 2: 107 - 126) in which the author introduces the political connotation of the terms French-speaking and English-speaking in Vanuatu.



Map 10 Vanuatu and its eleven Local Government Regions in 1995



Map 11

Vanuatu and its six provinces in 1997 (Editor's map and note)

Table 9 - The legislative elections of 1983, 1987 and 1991

The results expressed by electoral region in % of seats held in parliament by the majority (Source: Vanuatu weekly)

	1983	1987	1991*	1991**
Rural zones				
Banks - Torrès	100%	55-85%	100%	100%
Aoba - Maewo	55-85%	45-55%	55-85%	55-85%
Pentecost	45-55%	45-55%	55-85%	55-85%
Ambrym	45-55%	45-55%	45-55%	45-55%
Malakula	55-85%	55-85%	45-55%	55-85%
Paama	55-85%	55-85%	15-35%	55-85%
Epi	55-85%	55-85%	15-35%	15-35%
Shepherds	55-85%	55-85%	45-55%	55-85%
Efate	55-85%	45-55%	55-85%	15-35%
Santo - Malo	15-35%	15-35%	15-35%	45-55%
Tanna	15-35%	45-55%	45-55%	45-55%
Southern Islands ***	55-85%	55-85%	55-85%	15-35%
Urban zones				
Port-Vila	45-55%	15-35%	15-35%	55-85%
Luganville	45-55%	45-55%	45-55%	55-85%



* In order to allow comparisons, MPP and NUP, which developed from VAP and had not formed a pre-electoral alliance with UMP, were classed as majority parties in 1991.

** The majority retained here is the parliamentary majority as a result of a post-electoral alliance between UMP and NUP. The new opposition is made up of VAP, MPP Tan Union, Nagriamel and FMP.

*** With the exception of Tanna : Aneityum, Aniwa, Erromango, Futuna.

Aute, or products of post-independence splits in the VAP, like the Labour Party, the New People's Party, or the National Democratic Party. All these could be considered opposition parties. During the 1983 legislative elections,⁶ the Vanuaaku Pati received 55.1 per cent of votes and 61.5 per cent of seats (24 out of 39), the UMP gained 28.6 per cent of votes and 30.8 per cent of seats (12 out of 39). The other opposition parties were credited with 16.3 per cent of votes but only 3 seats. Despite the seeming diversification of the political scene, shown by the presence of 9 parties on the ballot, the legislative elections of 1987 were also bipolarised. The small parties only obtained one seat. This election resulted in a net erosion of the position of VAP (47.3% of votes) to the benefit of the UMP which, by gaining 52.7 per cent of votes, became the voice of the majority in the country. Electoral divisions and the majority voting system, however, permitted the Vanuaaku Pati to keep the majority of seats in parliament (26 against the UMP's 19).

Table 9 shows the respective representation of the majority (VAP) and the opposition (UMP and the other parties) for the legislative elections of 1983 and 1987, expressed island by island as a percentage of the total number of seats in parliament. Five tendencies can be seen. The first is the existence of a monolithic bloc totally controlled by the Vanuaaku Pati, made up of the islands of Ambae and Maewo in the country's north, of Epi, Paama and the Shepherds in the centre, and finally of all the islands situated in the south of Efate with the exception of Tanna. The second tendency is a very marked and persistent bipolarisation in Ambrym and Luganville, where the majority and the opposition hold an equal number of seats. The erosion of the VAP, which held a large majority in 1983 and found itself in an equal position with the UMP in 1987, is the third tendency which has been observed. This concerns the regions of Banks-Torres, Pentecost and Efate. The increase of majority representation by the UMP is the fourth tendency: this has been noted in Port Vila and in the Santo-Malo region. The fifth tendency relates to the VAP representation in Malakula, where it has strengthened its hold, as it was already in a majority position in 1983, and on Tanna, where, while a minority in 1983, the Vanuaaku Pati succeeded in obtaining an equal number of seats with the opposition in 1987. Overall, these results show a clear push by the UMP in the Vanuatuan political scene, where generally speaking, the French-speaking opposition was scarcely represented after independence and the attempts at secession by Santo, south-east Malakula and Tanna, which accompanied it.

The 1987-1991 legislature was marked by a veritable political earthquake which saw an explosive end to the bipolarisation which had structured political life in Vanuatu since its independence. In chronological order, the following events occurred:

- in 1987, the departure from the VAP of one of its principal leaders, B. Sope (Efate Deputy), accompanied by his supporters and the establishment of a "progressive and nationalist" opposition party, the Melanesian Progressive Party (MPP);
- the exclusion of opposition parties from the National Assembly;
- in 1988, the departure from UMP of its main leader, V. Boulekone (deputy from Centre Pentecost) and his creation of a new party, the Tan Union, which became the only opposition party recognised by the VAP;
- partial legislative elections in order to replace the deposed opposition candidates, in which the only candidates to take part were the VAP and the Tan Union;
- the establishment of a "uniform" VAP-Tan Union parliament;

6 - The legislative elections are based on universal suffrage with uninominal majority vote. The country is divided into 14 electorates: 12 are in the rural zone, and two in the urban region.

- the closing of this parliament by the President of the Republic, during the inaugural session of the new parliamentary term;
- an attempt to depose the Prime Minister, W. Lini, by the President of the Republic and the establishment of a provisional government regrouping the principal leaders of the opposition around G.A. Sokomanu;
- the arrest of G. A. Sokomanu and his provisional government in December 1988, then their judicial proceedings in 1989;
- their release from several months of imprisonment following an eventful trial;
- the nomination of a new President of the Republic from the VAP, F. Timakata;
- in August 1991, the removal of W. Lini from his positions as President of the Party and as Prime Minister of Vanuatu by the VAP; then his replacement in these two posts by D. Kalpokas;
- the creation in the following weeks of the National United Party (NUP) by W. Lini;
- the legislative elections on December 2, 1991, which marked the end of bipolarisation in the country because four parties: UMP, VAP, NUP and MPP, each gained more than 15 per cent of the votes;
- the acquisition of power by a coalition of the UMP and the NUP, which surprised most observers, with the new Prime Minister of Vanuatu being M. Carlot, the President of the UMP.

The latter party was the principal beneficiary of this situation; with only 30.6 per cent of the votes, or a slightly lower vote than in 1987 (39.3%), but an identical number of seats, it became the country's main party. The splitting of the VAP into three antagonist parties proved fatal to it; these three parties received a total of 58.4 per cent of the votes in 1991, a higher result than that gained by the VAP "because of its power" in 1983. In contrast, the number of seats won (24) was two less than the number occupied by the VAP following the 1987 elections. The majority vote, which was a disadvantage to the UMP in 1987, undeniably benefited it in 1991 and the new electoral geography of the country is evident. Malakula and Paama, where the VAP was advancing or in control for many years, fell into the hands of the UMP. The latter's victory was also significant on Ambae-Maewo. In contrast, the position of the UMP eroded significantly on Efate, Pentecost and in Banks-Torres, to MPP's and NUP's benefit. Contrary to all predictions, W. Lini's new party performed well in these elections, carving itself two strongholds where it is in a position of control: Pentecost (W. Lini's home island) and Banks-Torres, home of the Anglican church in Vanuatu, of which W. Lini is a priest.

The results of the 1995 elections⁷ and the events following them suggest that Vanuatu is likely to be increasingly prone to political fragmentation and shifting political alliances (like the Solomon Islands and Papua New Guinea).

At the 1995 elections, for the first time, two independent candidates were elected. Nagriamel and FMP each won one seat; NUP won nine; UMP—now split into two factions—won 17; and a "Unity Front" composed of FMP, MPP, Tan Union and VAP obtained 20 seats. One UMP faction went into alliance with the Unity Front, and its leader, S. Vohor, became Prime Minister. Two months later, he resigned to avoid a motion of no confidence and was replaced by the leader of the other UMP faction, M. Carlot. In August 1996 new rifts appeared. The FMP, MPP and Tan Union withdrew from the Unity Front and, shortly afterwards, went into coalition with Vohor's faction of UMP, with Vohor back as Prime Minister. Since then, NUP has also joined the government and VAP is on its own in opposition.

7 - Editor's note: Information supplied by Caroline Nalo, SPC, based on Vanuatu Weekly.

Democracy is alive and kicking in Vanuatu, but the results of the constant political changes are discouraging for the country as a whole and make it difficult to put development policies in place and implement them. In mid-1997 the government, under the impetus of the Asian Development Bank, decided to put a comprehensive reform programme into place that, in the long term, will stimulate both development (with, it is hoped, major input from the private sector) and good governance.

● DEMOGRAPHIC PANORAMA OF THE COUNTRY

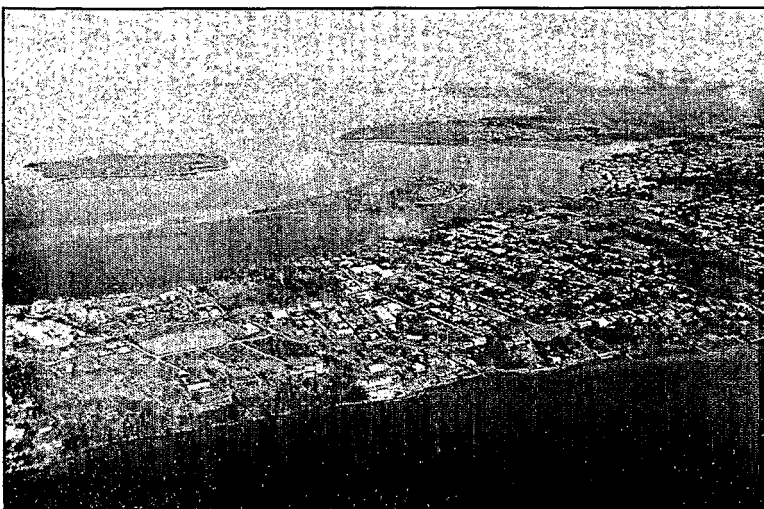
Because of its high rate of growth, the population plays an essential role in the economy of the young republic of Vanuatu. In the eyes of the public authorities, it constitutes an essential treasure. This economic role goes hand in hand with a political role; the birth rate is actually considered as an instrument for conquering the national territory, partially emptied by the demographic crisis of the beginning of the century.

8- On the 29 main islands of Vanuatu, 9—Aneityum, Aore, the Torres Archipelago, Epi, Erromango, Gawa, Lopevi, Santo and Vanua Lava—had a density less than or equal to 6 inhabitants per km² in 1979. All are characterised by a demographic weight, expressed as a percentage of the total inhabitants of Vanuatu, greater than the spatial weight, expressed as a percentage of the total area of the country. They cover 51.5% of the national territory and shelter only 20.8% of the population. Five other islands (Ambrym, Maewo, Malo, Malakula and Ureparapara) total 27% of the area of the country for 23.5% of the population, presenting a density varying from 6 to 13 inhabitants per km². The density of the last 15 islands is greater than 18 inhabitants per km². These 15 islands—Mere Lava, Mota, Mota-Lava, Nguna Pele, Paama, Pentecost, Tanna, Tongoa, Tongariki—cover 21.5% of the total area of the country. In 1979, they sheltered 55.7% of the population.

1 - POPULATION DENSITY AND DEVELOPMENT DURING THE PAST 25 YEARS

At the 1989 census, the population was 142,419 people, which represented a growth of 31,168 people compared with the census of 1979. The annual rate of natural population growth has been about 28 per 1000 since the 1967 census. The country has one of the world's highest birth rates (38 per 1000) and a crude death rate of 9 per 1000. The census of 1989 showed a net decrease in the birth rate over the period 1979-1989; however, the rate of natural growth showed little change because of the concurrent diminution of the crude death rate (which fell from 13.6 to 8-10 per 1000), due to the youth of the population (44% less than 15 years of age). In 1989 the population had grown by 28 per cent from 1979 and 87 per cent from 1967. As a result of the country's independence, numerous plantation owners and entrepreneurs of European extraction left Vanuatu at the beginning of the 1980s, significantly changing the ethnic composition of the country: the ni-Vanuatu, who represented 93.8 per cent of the total population of the Archipelago in 1979, represented 97.9 per cent in 1989.

As the total area of the country is 12,189 km², population density in 1979 and 1989 reached respectively 9 and 11.7 inhabitants per km². In total, 77 per cent of the population of Vanuatu is concentrated on the country's seven main islands: Efate (19%), Santo (15%), Tanna (14%), Malakula (10.5%), Pentecost (8%), Ambae (6%) and Ambrym (5%). Density varies greatly, depending on the island⁸: maximum densities are over 100 inhabitants per km², minimum densities are less than 3 inhabitants per km². As a general rule, the islands with a small area have a higher density. Over the centuries, tribal wars have caused many groups of people to seek refuge on the smaller islands, which are easier to defend than the shores or the interiors of the large islands. On the islands or islets with a religious mission, high densities can also be interpreted as the regrouping of Christian families



View of Port-Vila

around the place of worship. In contrast, on islands with a larger area, there is no relationship between density and area; some, such as Santo and Erromango, are sparsely populated, while others, such as Tanna, Pentecost and Ambae, are heavily populated. The reasons for these disparities are largely associated with the arrival of whites and with epidemics imported from Europe, as well as the politics of forced labour by sandalwood traders and other "blackbirders". Some islands, such as the Banks Archipelago, Erromango and Aneityum saw their population literally decimated by "white contact" (Bonnemaison, 1986).

The concentration of the population along the coast certainly facilitated this process; where the population densities were originally low and no significant human settlement existed in the interior of the islands, the demographic haemorrhage could not be compensated. In contrast, the islands which received less frequent contacts, whose population was more hostile, or more numerous in the interior—which then allowed a demographic reconquering of the coast—resisted better.

Taking into account the reduced size of the population, its low density and the dispersion of the population, Vanuatu can appear to be an Archipelago which is largely under-populated: the demographic thrust which exists will thus be the principal means of reaching minimal economic viability,⁹ notably in terms of the local consumer market. While it constitutes a prerequisite for the development of the country over one or two generations, today the increased rate of population growth raises significant problems for public authorities, because of the costs it engenders, especially in the areas of health and education.¹⁰ As emphasised by Doumenge (1983): "the maintenance of a medical organisation capable of assuring cover of pathological risks remains one of the fundamental demands if one wishes to assure demographic viability". Every time the population doubles, the country's education and health capacity must at least double in order that children experience a standard of living similar to that of their parents, and this demands the mobilisation of a large part of the State's resources in these two sectors: this is the price of development.

2 - URBANISATION AND URBAN POPULATIONS

Generally speaking, the country is not very urbanised: in 1979 the rate of urbanisation was 13.5 per cent but the situation is changing rapidly. The urban population has grown by 74 per cent in ten years. In 1989, the population of Port Vila and Luganville, the country's two urban areas, reached respectively 19,311 and 6,943 inhabitants, for a growth of 93.5 per cent in the former and 34.5 per cent in the latter, despite the departure at independence of a large number of the 4000 and 1000 foreigners respectively who lived in these two towns in 1979. The period 1986 to 1989 was marked by a spectacular rate of growth in Port Vila, which reached 10.8 per cent per year. If this rate of growth continues, the population of Port Vila will double in 9 years, reaching 38,620 inhabitants in 1998.¹¹

This spectacular urban growth is principally due to very strong immigration. From 1980 to 1989, all the regions of Vanuatu had a negative migration balance, except Santo-Malo, Efate and Epi. Paama and the Shepherds Archipelago, in the centre of the country, are the two main regions touched by this rural exodus, losing 23.8 and 10.5 per cent of their populations from 1979 to 1989. In total, since independence, 1160 people have left these two regions, for a population of permanent residents numbering 3489 people, or triple the number.¹² These immigrants from Paama and the Shepherds represent 32 per cent of the new urban dwellers of Port Vila and 12 per cent of those in Luganville. The majority of them are young adults, seeking employment. In the city, they find relatives or friends who have preceded them. Family and ethnic affinities therefore play a large role in the population of urban dis-

9 - According to F. Doumenge (1983), viability shows both a static state: «it is the combination of a sufficient number of required conditions in order to exist and last»; and a dynamic state which will allow conditions «to combine to be able to develop as much on the level of the most complete possible use of natural resources as on the progression of the social and economic standard of living of the population». On the question of demographics, while emphasising «that there is not a minimum threshold of viability in an island community», he indicates «that below a threshold of 20 inhabitants per km², the emptiness of space is felt, and on a small island, a population of 50 inhabitants per km² is useful for exploitation purposes.

10 - 1996 population estimates by SPC give the total population of Vanuatu as 173,900, with a density of 14 inhabitants per km².

11 - In 1996, urban growth was estimated by SPC to be 7.3 per cent per year. Eighteen per cent of the population lived in urban areas.

12 - Tafea is another large source of migration, with a quarter of urban immigrants originating from here.

tricts, while the lack of accommodation resulting from the general growth of the population tends to make their ethnic composition uniform. Problems of employment, low-cost housing, education, health, water supply and pollution are the corollaries of this spectacular urban growth. Added to this is the risk of a deterioration of the social climate.



SPOT image of Port-Vila
(1986)

In effect, contrary to the classic situation prevalent in circular migration (Bonnemaison, 1985), the economic crisis which has hit the country hard has not been translated into a return of immigrants to their home islands, where the subsistence sector constitutes a "now classic" remedy for unemployment. On the contrary, the countryside is progressively emptying into the city, weakening family structures and hospitality customs, as the number of immigrants is now excessive. A slow but noticeable growth of minor crimes shows that these structures are progressively weakening (The number of crimes recorded in Port Vila in 1996 was double that in 1995). If cultural integration and the loss of roots affects some of the new arrivals who have decided to settle in Port Vila, and they then also experience a deterioration in their standard of living, the conditions for a major crisis will exist.

3 - POPULATION IN THE RURAL AREAS, LAND FOR CULTIVATION AND DEMOGRAPHIC PRESSURE

In rural areas, settlement is very dispersed. A "locality" constitutes the smallest unit of settlement. Its size varies from one to several dozen houses. Community buildings, such as schools, dispensaries, and churches, are then added and the settlement becomes permanent. The village is the territorial entity which englobes the locality; in the 1979 census, it was defined as "all those localities linked by customs, religions or social and economic factors". The majority of villages are thus a locality with at least 5 or 6 homes, surrounded by smaller satellite localities. In total 2,289 localities grouped into 792 villages were recorded in 1979; they were home to 96,097 people, 74 per cent of whom (in 71.5% of villages) lived on the coast, which, depending on the island's topography, consisted of a band one to two km wide from the high tide mark (David, 1994). In five of the then eleven administrative regions of the country: Banks-Torres, Epi, Efate, Malakula and Paama, more than 90 per cent of the population lived along the coast: in contrast, 50 to 40 per cent of the rural population lived in the interior of Tafea,¹³ Santo-Malo and Ambae-Maewo.

This coastal settlement is one of the most remarkable characteristics of the demographic situation of Vanuatu. It plays a large role in the economic domain because it leads to a concentration of the work force, economic activity and consumers into this very limited space on the coast. This is a recent development, resulting from the spread of Christianity in the Archipelago, which attracted the population to the coastal missions where there were churches, schools, dispensaries or hospitals, stores selling manufactured products and sufficient income to acquire "cargo", through jobs on the coconut plantations developed by the missionaries.

Of Vanuatu's 12 190 km² of land area, 41 per cent is estimated to be arable, which equals 4971 km²; 64 per cent of this area consists of land with a good agronomic potential and 36 per cent of lands of average fertility (Quantin, 1980). Around 1450 km² were actually cultivated in 1989, which represents 29 per cent of arable land and

¹³ - From this point of view, the «weight» of Tanna in the region is a determining factor. All the other islands in the Tafea region are characterised by an exclusively coastal population.

12 per cent of the total area. In ten years, from 1979 to 1989, demographic pressure especially increased on the arable lands; the number of hectares available per household fell from 26 to 22. These figures vary greatly according to region. With 52 ha of arable land per household, Santo-Malo offers the greatest potential for development. This contrasts with Ambrym and Pentecost, where each household only has an average of 8 to 9 ha available. The situation is even more critical on Paama and in the Shepherds, where the arable area is limited to 5 to 6 ha per household: rural exodus appears therefore as the principal alternative to this land pressure. Undoubtedly, if demographic growth continues in the coming years, a land famine will be witnessed on numerous islands.¹⁴ This could translate into serious soil erosion problems, the probable appearance of malnutrition in rural areas, and an increased exodus to Port Vila and Luganville. In fact, a serious land management problem is appearing in Vanuatu. In the current context of land ownership, characterised by the refusal of customary owners to welcome outside populations onto their land, any migration from fully populated areas—where arable land has become rare—to empty areas is difficult to imagine. Such a stalemate, if it continues, can only favour rural exodus and therefore constitutes a danger to the country's economic viability.

● AGRICULTURAL ACTIVITIES

The agricultural sector plays a dominant role in the economy of Vanuatu, in terms of both employment and export revenues. In 1979, agriculture involved 77 per cent of the country's total work force; ten years later, there was a slight decrease due to the rural exodus. In rural areas, 86 per cent of the work force surveyed in the 1989 census stated that they were farmers. Agricultural and livestock products, notably copra, cocoa and beef, are, with tourism, the country's main source of foreign exchange. Over the period 1982-1992, they represented on average 83 per cent of total exports. A net decrease can be noted, however, between the beginning of this ten-year period (1982-1985), during which time agriculture made up 91.5 per cent of exports, the period 1986-1988 during which agriculture fell to 84.5 per cent of exports, and the end of the ten years (1989-1992) which saw agricultural products and livestock fall to 72 per cent of exports. Despite its concentration in rural areas, agriculture, because it is essentially subsistence in nature, provides only one quarter to one fifth of the country's Gross Domestic Product (GDP), with a net tendency towards decrease. Thus from 1985 to 1989, it decreased from 24 per cent of GDP to 19 per cent. The percentage of service industries increased during the same period from 62.5 to 68 per cent of GDP.

1 - SUBSISTENCE AGRICULTURE

Subsistence agriculture plays an essential role in the economic activity and food supply of rural populations. Each family possesses at least three subsistence gardens with a total area of 0.12 ha, in which they spend about 17 per cent of their annual working time. The centre of the plot is generally reserved for root crops—taros (*Alocasia*, *Colocasia*, *Xanthosoma*), yams (*Dioscorea*), cassava (*Manihot esculena*), sweet potato (*Ipomea*), which, along with bananas, provide the basis of traditional food—and some vegetables, among which the most common are pumpkins, cucumbers, tomatoes and onions. Closer to the garden's edge, we find bushes, such as bele (*Hibiscus manihot*), pawpaws and pineapple, some clusters of Gramineae, especially sugarcane and corn, and fruit-trees, among which the most common are mangoes and breadfruit, with citrus fruit being more rare. These subsistence gardens are generally temporary. After being cultivated for a few years, they are left fallow for ten

¹⁴ - Apart from Pentecost and Ambrym, the other regions of Vanuatu endangered by this change are Ambae-Maewo and Tafea where the arable area per household is respectively 13 and 12 ha.

years or more. This period is indispensable for the establishment of tree cover, the only guarantee of the regeneration of soil fertility. Decomposition of leaf litter reintroduces to the surface layers of the soil the nutritive elements, which, washed by rain to the deeper layers, had been trapped by tree roots and taken up by the leaves. In many places, demographic pressure has led to an extension of cultivated areas and a very noticeable reduction in fallow time. As it does not allow sufficient soil fertility regeneration the land loses much of its agronomic value. During the agriculture census of 1983, 37 per cent of gardens were made in the forests; 28 per cent were on fallows which had remained fallow for a minimum of 8 years; 18 per cent occupied land already cultivated in the previous 2 to 4 years. In the latter gardens, plants for commercial use (coconut, cocoa, kava, pepper) were frequently grown alongside subsistence plants. Although they did not come directly from the subsistence gardens, but rather from more extensive agriculture of the forest, the considerable local importance of almonds and nuts (*Barringtonia*, *Terminalia*, *Inocarpus* and *Canarium*) for the rural population's food supply should be noted.

2 - PLANTATION AGRICULTURE AND COMMERCIAL AGRICULTURE IN THE VILLAGES

2.1 - Coconut trees and copra production

Copra production is the principal source of currency for Vanuatu's foreign trade. The end of the 1970s and the beginning of the 1980s were marked by a reduction in the number of exports and a concurrent increase in the position of copra which was often greater than 70 per cent of total exports (Figure 5) with an annual average production of 40,000 tonnes (period 1978-1986). Since 1986, copra exports have experienced a net decrease and barely exceed 30,000 t. Copra now represents less than 50 per cent of Vanuatu's exports (a third in 1990 and 1991). This change is due to the passage of cyclones and tropical depressions in 1985, 1987, 1988, 1991 and 1992, and even more to unfavourable fluctuations in copra prices on the international market which have discouraged producers.¹⁵ 1984 was the one exception in this ten-year period. Coconut plantations in the Philippines, which provided 85 per cent of the world's copra exports in 1981, were ravaged by a large number of cyclones in 1983, and copra prices soared to \$600 per tonne on the international market.¹⁶ They then fell to \$300 in 1988 and 1989, even dropping below \$150 during the first quarter of 1991, and then climbing back to \$300 in September 1991 and \$500 in January 1992; prices declined regularly throughout 1992 to reach \$300 in March 1993.

Over the entire country, coconut plantations covered 91,290 ha in 1983, which corresponds to 18 per cent of the total arable area and 63 per cent of actual cultivated land. Only 21 per cent of this total, or 18,838 ha, came from European-style plantations. For the past 40 years, the production of small village coconut plantations has continued to grow to the detriment of the European-style plantations, rising from 50 per cent to 79 per cent of national copra production. Vanuatu has therefore become the main producer in the Pacific of copra from village plantations. These results should not, however, hide future difficulties.

- World demand is decreasing and the price of copra will continue to fall. The World Bank forecasts that in 2005, the price of copra will stagnate around \$300 per tonne. It is now urgent to develop manufacturing activities, such as oils and soaps; derivatives such as coconut fibre, which has been shown to be an excellent insulating material, superior to polystyrene; and coconut wood, which can be used for furniture, objets d'art, or roof tiles.¹⁷
- Numerous coconut trees planted in the first quarter of this century are at

15 - During the partial agricultural census of 1991, 51% of households with coconut trees stated that the low price of copra was the principal reason for which they produced less copra, with natural disasters being cited by only 6% of producers.

16 - Exports of copra therefore brought 2,734 million vatu to Vanuatu, which represents 85% of the total value of exports.

17 - As coconut wood is very rich in silica, it can only be cut with special saws. These are undeniably expensive but their purchase could prove profitable if the product was good quality or targeted niche markets.

the end of their productive life. This is particularly true of the European-style plantations, where 64 per cent of coconut trees are more than 50 years old and where only 7 per cent of trees are aged less than 30 years. The extension of the village coconut plantation was therefore one of the priorities of the first and second National Development Plans (1982-1988 and 1989-1992). This activity benefits from the financial support of the European Union and technical support from IRHO,¹⁸ based on Santo, for the selection of new, more productive species and easier harvests, and for the protection of crops against parasites and disease. Thus 1,147,000 coconut trees were planted from June 1988 to June 1991, which represented 8,077 additional hectares.

- Vanuatu's copra suffers from a very bad reputation on the international market because of its mediocre quality. This situation led to a serious market slump in 1981 and 1982, following the closure of the company in Marseilles which, until 1980, had bought most of the country's exports. Since then, substantial efforts have been made: during the first National Development Plan, many hundreds of coconut dryers and smokehouses were set up. Significant progress has therefore been accomplished without, however, having definitively rehabilitated the image of Vanuatu copra. The race for quality remains to be won.

2.2 - Coffee and cocoa

Coffee is an old plantation crop on Vanuatu, where it has been produced for more than 100 years (Weightman, 1989). Maximum production occurred in the 1930s and 1940s, then, in the 1950s to 1960s, numerous planters attracted by livestock preferred to convert their old coffee plantations into pasture. The decline of industrial coffee-growing was scarcely compensated for by new crops in the village setting. Of the 747 ha recorded in 1983 throughout Vanuatu, only 135 ha were cultivated in the village setting; 82 per cent of cultivated areas were made up of 21 plantations, 18 of which were located on Santo and Aore. These coffee plantations, exclusively of the robusta type, are very old; 16 per cent of them were established more than 50 years ago and 74 per cent between 30 and 50 years ago. Until independence, exports were maintained at around 100 t per annum. Most European planters on Santo and Aore left the country at independence; their coffee plantations were returned to customary owners who were not interested in coffee, and so in 1983, half the 612 ha of industrial coffee plantations were no longer maintained. In this context, it is not surprising that production slumped, falling from 116 t in 1979 to 54 t in 1980, 61 t in 1981, 17 t in 1982 and 33 t in 1983. This situation led the Vanuatu government to include the relaunching of the coffee sector as one of its priority objectives for the period 1982-1992. Emphasis was placed on the setting up of an arabica plantation on Tanna, the island where 88 per cent of the 135 ha of the country's village plantations are concentrated, through a joint venture between the Government of Vanuatu, the customary owners of the north of the island, and the Commonwealth Development Corporation. A total of 475 ha has thus been planted by a single tenant in the north of Tanna, with this operation to serve as a development model for the 250 ha of village coffee plantations, each one with an area of 1.5 ha. For the moment, these efforts have not had an effect on the country's commercial balance, with only 37 and 25 t respectively having been exported in 1990 and 1992. Production should take off in the next few years.

Like coffee, cocoa is an industrial crop cultivated in Vanuatu for more than 50 years. Maximum production was reached in 1925, with 2672 t, exclusively from

18 - The Institut de Recherches pour les Huiles et Oléagineux (IRHO) is an arm of the CIRAD (French Centre for International Cooperation in Agricultural Research for Development).

European-style plantations. Since the 1940s, cocoa has spread to the village environment and the country's total production stabilised around 500-1000 t per annum. There has therefore been a smaller decline in cocoa than in coffee in Vanuatu. According to the agricultural census, in 1983 it covered an area seven times larger (5223 ha), two-thirds of which was in the form of European-style plantations and a third in the form of village crops, essentially located in the north of the country (50% in the Santo-Malo region and 29% on Malakula). Like coconuts and coffee, the cocoa plantations need to be renewed. In total, 86 per cent of the plants are more than 30 years old and only 6 per cent are less than 15 years old; of the country's 62 plantations, only 600 ha of the 3353 planted are maintained and harvested, or less than 20 per cent, which explains why in the period 1977-1983 the plantations only provided 24 per cent of the total exported (223 t on average, in comparison with 701 t for village crops).

This situation should improve dramatically with the establishment in 1983 in west central Malakula of a 1700 ha plantation extending over 3500 ha of cleared forest, the result of a joint venture between the Government of Vanuatu, the customary owners and the Commonwealth Development Corporation. As the project is located on the leeward side of the island, where rainfall is insufficient to assure optimum cocoa development, only 500 ha were planted. There has also been an effort to develop village growing of cocoa through the Cocoa Development Project, which, begun in 1983, envisaged the planting of 800 ha throughout the archipelago. In the single period 1989 to 1991, a total of 2,094,000 plants were planted through this project, which corresponds to about 1590 ha based on 1320 plants to the hectare. The results of these efforts have been spectacular. While over the three years from 1984 to 1986, exports remained around 1000 t per annum (average 934 t), they grew to 1209 t average annually for the next three years and approached 2000 t (1976 t) for the period 1990-1992. Most of this production came from the village sector. Because of the depressed cocoa prices on the international market, the spectacular progress in quantities produced was not matched by a similar evolution in export receipts: while tonnages doubled between the periods 1944-1986 and 1990-1992, the value of these exports only increased 42 per cent, passing from 155 to 221 million vatu (see Fig. 2).

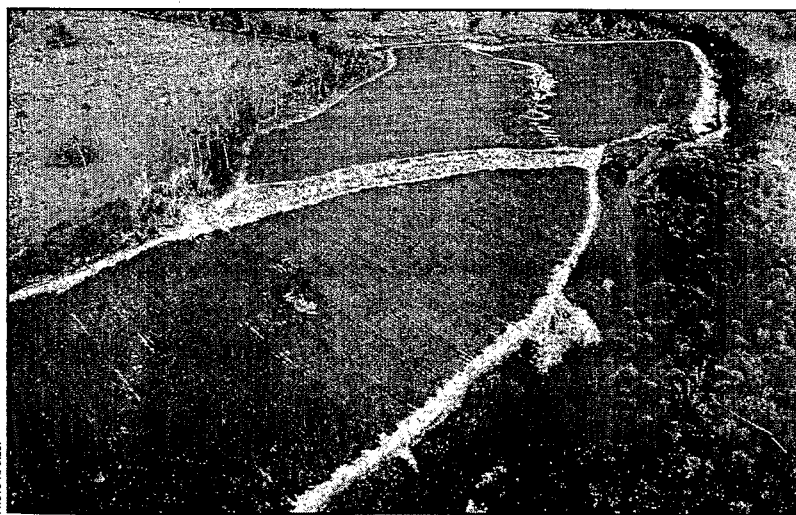


PHOTO A. BIZET

Efate - Squash crops near the airport

Taking into account the saturation of the world market and the massive plantations being established by countries such as Malaysia, it may seem astonishing to develop cocoa and coffee plantations when the international economic environment is so unfavourable. However markets exist, notably for high-quality products which benefit from the Pacific's positive brand-name image. This "commercial slot" needs to be targeted so that Vanuatu can find its place in the world market. The neighbouring markets also offer interesting opportunities. Thus, New Caledonian coffee production has stagnated at 100 t per annum for a consumer market of around 600 t; this market could absorb most of the future production of coffee from Vanuatu, which, like coffee from Papua New Guinea, benefits from a preferential clause in New Caledonia.

All these cocoa and coffee development projects at village level benefit from the technical and scientific support of the Coffee and Cocoa Research Institute (IRCC), one of CIRAD's research units which, like IRHO, is based on Santo, making this island an essential nucleus of agricultural research in Vanuatu.

2.3 - Kava and livestock

Kava, *Piper methysticum*, is a plant of the pepper family whose powdered root is mixed with water and is used as the traditional drink in Vanuatu (Lebot and Cabalion, 1986). Along with cocoa, it is the crop which has seen the most spectacular expansion over the past few years in Vanuatu. In 1983, 3.13 million plants were counted. Eight years later, in 1991, 4.64 million plants had been planted, for an increase of 48 per cent. The growth was particularly significant (+20%) in the two years from 1989 to 1991. In rural areas, this growth in production was in response to a very marked increase in domestic consumption and the appearance of an active trade representing 19 per cent of the quantity consumed (175 t sold for 937 t consumed). In the urban zone, it corresponds to the development of strong commercial demand: the consumption of kava in the city is now the object of commerce. In Port Vila alone, the number of "kava bars" grew from ten in 1983 to more than 200 in 1990. In 1989, urban consumption of kava was estimated at 400 t, or 30 per cent of the amount consumed throughout the country and 70 per cent of commercialised amounts. This growth in consumption is widely encouraged by public authorities, who see kava as an effective means of counteracting the use of alcohol, deemed both ruinous for the country's economy (although a brewery was opened in 1990 in Port Vila) and even more disturbing for its social life. Apart from the national market, attractive export opportunities exist in the international market, as kava is being used by the pharmaceutical industry for its analgesic properties.

Exports have therefore increased from an average of 9 t annually for the period 1984-1986 to 16.5 t for the

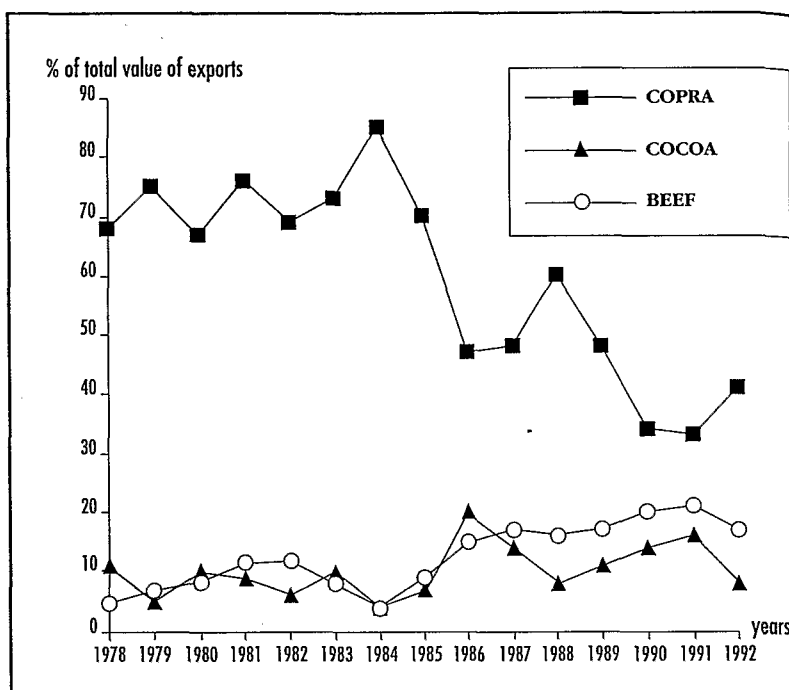


Figure 2 Export variations, Vanuatu

the period 1984-1986 to 16.5 t for the

Table 10 - Evolution of exports of copra, cocoa and beef from 1978 to 1992, expressed as a percentage of the total value of exports

YEARS	COPRA	COCOA	BEEF
1978	68	11	5
1979	75	5	7
1980	67	10	8.5
1981	76	9	11.5
1982	69	6	12
1983	73	10	8
1984	85	4	4
1985	70	7	9
1986	47	20	15
1987	48	14	17
1988	60	8	16
1989	48	11	17
1990	34	14	20
1991	33	16	21
1992	41	8	17

(Source: Vanuatu Statistical Service)

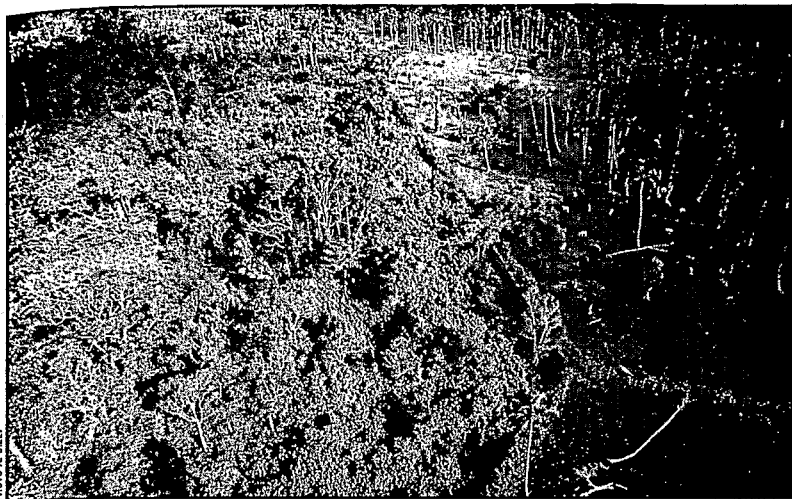


PHOTO A. BRET

Efate - Degraded coconut plantation and cow breeding

period 1987-1989 and to 42.5 t for the period 1990-1992. In 1983, the three islands of Tanna, Pentecost and Ambae provided 81 per cent of national production. Eight years later, Tanna represented no more than 12 per cent of national production compared to 38.5 per cent in 1983, while Ambae fell from 9.5 per cent to 5 per cent; in contrast, Pentecost became the principal production area. 57 per cent of kava consumed in 1991 came from there, while the island's share in national production had been only 31.5 per cent in 1983. This change saw the integration of kava into commercial production.

Now, production no longer follows increases in private use in rural zones; a manifest desire to produce kava for sale has appeared. Thus, the average number of plants per household planted on Pentecost has grown from 587 plants in 1989 to 867 plants in 1990 and 1213 plants in 1991, i.e. the figures doubled in two years. 90 to 95 per cent of the population of Pentecost is involved in this activity. The strong demand for kava has also brought about a significant increase in the number of producers in the country. The most spectacular sign of this is the development of kava-growing in the islands which traditionally did not cultivate it, or grew very little. Thus, Malakula, which in 1983 only had a very marginal production, represented 7.5 per cent of the kava-growing area in the country in 1991.

We will close this overview of agriculture in Vanuatu by considering cattle farming, which is certainly the area in which Vanuatu can best make a claim to excellence in the region, and by which it can conquer a significant place on the world market. The growth of cattle farming is recent, dating from the 1960s, and constitutes an adaptation to the problems which coffee and cocoa encountered in this period. From 1961 to 1968, the number of cattle doubled; from 1968 to 1976, it increased by 70 per cent, reaching a maximum of 117,076 head, 78 per cent of which were raised on farms and 22 per cent at the village level. Vanuatu's independence was marked by a notable reduction in stock held on farms, which fell by 26 per cent from 1976 to 1983, when 99,320 head were recorded throughout the country, 32 per cent of which were not on farms. Since then, herds have steadily increased, notably the number of village livestock, which increased by 82 per cent from 1983 to 1989 to reach 47,800 head. This spectacular increase was brought about by the European Community, which financed an ambitious development programme in this sector. The revitalisation of livestock farming was also part of the first National Development Plan as a joint venture between the Government of Vanuatu and two Australian investors. The aim is to develop a herd of at least 5500 breeding stock, producing around 5000 head per year, over an area of 8400 ha in the south of Santo. The Santo-Malo region is the centre of cattle farming in Vanuatu; 48 per cent of cattle were concentrated there in 1983. Of the 18,000 to 20,000 head slaughtered each year, 73 per cent pass through the Port Vila or Luganville abattoirs. The latter, under Japanese control, exports around 75 per cent of its production to Japan; in contrast, the Port Vila abattoir principally supplies the local market. Since 1978, the share of beef in exports has

increased steadily, to reach 20 per cent in 1990 and 1991 (see Figure 5). Taking into account the uncertainty of the Japanese beef import market, it would be desirable to follow up on this development by diversifying the export market towards the European Union and the United States of America.

● FISHERIES ACTIVITIES

1. THE FISHING INDUSTRY

From 1957 to 1986, the fishing industry played an important role in the country's economy, providing 26 per cent of total exports, just behind copra which represented 42 per cent. This involved mainly frozen tuna unloaded at the South Pacific Fishing Company in Santo (SPFC),¹⁹ stocked in cold storage, then exported to American and Japanese canneries. Despite a slight gain in 1979, returns and production declined steadily from 1972-1973, falling from 15,000 t to 7,887 t in 1979 and 3,906 t in 1984. Over 4 years (from 1980 to 1984), the fleet decreased from 57 to 18 boats. This decline in longline fishing was not confined to Santo, but was a general trend across the intertropical area of the Pacific. It resulted from changes to the world tuna market, over which the Japanese market exercised a controlling influence, and the spectacular increase in the fleets of foreign fishing vessels, which have moved over the past few years from the fishing waters of the eastern Pacific to the south-west Pacific (Cillaurren, 1991). Despite efforts to halt the decline in production, Santo's tuna base had to cease production in May 1986. Since then, there has been no hope of reopening the base, as the equipment rapidly became obsolete. A page in the country's economic history has been turned. Now the only revenues that Vanuatu obtains from the fishing industry come from licences granted to Taiwan under a bilateral agreement to exploit the tuna reserves of its EEZ, or those from the United States under the general agreement with the South Pacific Forum Fisheries Agency, an international organisation of which Vanuatu is a member. Revenues are also generated by the salaries of the 300 to 350 Ni-Vanuatu sailors who are crew members of the Taiwanese longline fishing boats that frequent the South Pacific.

2 - COASTAL FISHING

Traditional fishing continues to be practised in the coastal zone throughout the country. It is essentially a subsistence activity organised at the village level. It uses a wide range of gear and techniques (lines, spears, spear guns, nets) to catch a large number of species. Fishing is mainly concentrated in tidal waters, which provide two-thirds of the catch. Most of the catch is consumed by the fishermen and their families, as the area where fish products are sold is limited to the coast. As this small-scale industry is deemed unproductive by public authorities and incapable of assuring self-sufficiency in fish products for the country, an ambitious plan for the development of commercial fishing at village level was established in 1983. It targeted the creation of a core group of some ten to one hundred commercial fishermen, who would supply a structured commercial sector, thereby providing fresh fish to the urban area as well as the interior of the islands, and, where possible, a small export market. Based on the specialisation of fishing techniques and harvest strategies and promoting exploitation of a previously virgin resource, i.e. species living on the reef drop-off at depths of 100 to 400 m,²⁰ this modern fishing received considerable financial and technical assistance from the public authorities and the EEC, at both the production and marketing levels. Thus two government fish markets, centralising the sale of fish in urban areas, were created. Despite these efforts, this development programme was a failure; the catch never surpassed 200 t while small-scale fishing produced between 4500 and 5000 t (David, 1991).

19 - Operating in Vanuatu since 1957, the SPFC was originally the result of a joint venture between two Japanese companies (Mitsui Bussan Kaisha, a subsidiary of the Mitsui group; and Taiheyo Suisan Daisha, an industrial company specialising in fisheries); an American company (Washington Fish and Oyster Company) and a local company, the Donald Gubbay Company (Daumenge, 1966; Samples, 1987). The majority of the SPFC's capital was provided by Mitsui, which then acted as head of the company, and the Palekula management staff was chosen from its personnel. In 1981, the government of Vanuatu took control of 9% of SPFC's shares, with 76% of the capital remaining in Mitsui's ownership.

20 - The development of tuna fishing through the establishment of aggregating devices aimed at concentrating resources in a clearly limited and localised area was the other component of this fisheries development programme (Cillaurren, 1987).



PHOTO G. DAVID

Fishermen village
(Moskelynes Islands, south
of Mallicolo)

Currently, the harvest of trochus (*Trochus niloticus*) and green snails (*Turbo marmoratus*) represents the only contribution to exports from Vanuatu's coastal fishing. This activity has been carried out since the beginning of the century. Until 1979, when a factory for the manufacture of pearl buttons from trochus was set up in Port Vila, all production was exported. In 1984, all export of raw trochus shell was banned, in order to protect supply to one company: Melanesian Shell Products (MSP), in which the Government holds shares. From 1969 to 1984, 1201 t of trochus were exported and 300 t were processed by the MSP at an average rate of 50 t per year,²¹ which corresponds to an average catch of around 94 t of trochus per year. Production increased rapidly from 1970 to 1978; then there was a stagnation which could be attributed to over-exploitation of stocks. The trochus is a fragile resource. In order to guarantee its continued supply, public authorities set a 9 cm minimum size for collection of trochus and an annual quota of 75 t of shells to be processed by MSP. Because of the growing demand for shell on the international market and the accompanying increase in prices, two new button factories have been set up in Port Vila, one with the aid of Korean capital, the other with Taiwanese capital, and the quotas have been abolished. An attempt to monopolise market supply forced these businesses into a price war which resulted in the closure of MSP in 1992. Because of the drop in copra prices on the international market, trochus and green snail appear to an increasing number of coastal inhabitants to be an attractive source of income, and production has increased significantly over the past few years. Exports increased from 61 t in 1990 to 93 t in 1991 and 135 t in 1992. If this continues, it can only lead to overexploitation of stocks and an important decrease of trochus processing in Vanuatu due to a lack of raw materials.

● THE TERTIARY SECTOR

Service industries play a central role in the economy of Vanuatu; they generated 66 per cent of GNP over the period 1985–1989. The financial centre created in 1971 is the most original element. Based on the supply of a complete range of financial, investment, banking, accounting and management services, it employs around 400 people, most of whom work in the three commercial banks, the five international accounting companies and the five law firms which have set up business in Port Vila. Company registration is one of their most important functions: in mid-1988, 1325 companies, only 44 per cent of which did business within the country, were registered in Vanuatu. Among these companies, there were about 100 banks or "offshore" financial institutions and about 40 insurance companies. Since 1981, the financial centre has offered a new service, the registration of ships at Port Vila, which increased from 161 in 1987 to 206 in 1988, to 336 in 1989, then to 402 in 1990 and 437 in 1992, almost tripling in five years. The increase in revenues for Vanuatu is even more significant; these have practically quintupled, increasing from 32.3 million vatu in 1947 to 153 million vatu in 1991. The financial centre's contribution to the country's economy is therefore considerable. In 1986, apart from direct employment,

²¹ - A tonne of shell allows an average production of 200,000 to 220,000 standard buttons.

the revenue it generated represented around 11 per cent of the State's budgetary receipts (400 million out of 3651 million vatu).

Tourism is the other strong point of the tertiary sector. Its expansion dates from the 1970s and concerns mainly the Japanese (one third) and New Caledonians (another third). Tourism figures almost tripled in ten years to reach 30,450 visitors in 1979. After a significant fall of 30 per cent in the year of independence, the 30,000 visitors mark was again reached in 1983, the direct result of Vanuatu's ambitious tourism campaign in Australia, as direct flights had been set up. Profiting from beautiful scenery, a hospitable population, a still vibrant traditional culture and an infrastructure network put in place during the last years of the Condominium, superior to the average small Pacific island countries, Vanuatu possesses considerable advantages in the area of tourism. It is an activity which public authorities consider to be a precious tool for the diversification of the economy, which has been deemed too reliant upon agriculture, especially copra. This activity is, however, fragile and vulnerable to problems in the tourists' home countries, such as the economic situation and local politics. Thus, the four years from 1985 to 1988 were marked by a significant reduction in arrivals, which dropped by a half from 1984 to 1987. The reasons for this development are numerous: they were linked to the devaluation of the Australian dollar in relation to the vatu, a very significant decrease in the promotional activities for the destination "Vanuatu" in Australia, and an end to the agreement between Vanuatu and the Australian company Ansett which serviced Port Vila. They were also due to Cyclone Uma which ravaged Port Vila and a large part of Efate in February 1987 (David and Lille, 1993) and to the political instability which the country experienced in 1988, as the December 1988 crisis was extensively covered by Australian and New Zealand media. The return to calm in 1989, accompanied by the establishment of many weekly connections to Australia and New Zealand, an active promotional campaign in these two countries, and finally the opening in March 1991 of a new international terminal at Port Vila Airport, has allowed this situation to be righted. From 1990, tourism arrivals exceeded 35,000 visitors, i.e. double the number in 1988; in 1992, they reached a record number of 43,000 tourists.

The vulnerability of tourism is also due to the fact that when it is unregulated, it produces ecological, cultural and social disturbances, which are likely to erode the natural and human resources on which it is based and considerably reduce the power of attraction which the country has for tourists. This is the main reason why the authorities in Vanuatu decided to limit the flow of tourists to the islands of Efate, Santo and Tanna. In fact, this flow is mainly concentrated in Port Vila, which is the site of nearly 90 per cent of the country's hotel capacity, including three international-class hotels, and of most of the employment created directly or indirectly by tourism. In 1985, a total of 693 people worked in the hotel sector, with a capacity of 414 rooms, for a rather high ratio of 1.7 direct employees per room, characteristic of a country with low labour costs.²² Each direct employment generates two or three indirect jobs, so there are around 2000 people who live off tourism, or 35 per cent of the total number of employees in the urban private sector, estimated at 5800 people over the period 1983-1986. Since 1985, the country's hotel capacity has increased by 120 rooms and nearly 200 new rooms will be created in the coming years, creating more than 1000 additional jobs. The establishment of a direct line Tokyo-Port Vila and renovations to the sanitary infrastructures, combined with the current excellent telecommunications network, could stimulate tourism investors to take an interest in Vanuatu in the future.

²² - As a comparison, this ratio is 0.42 in Hawaii, a region of high salaries (Huetz de Lemps, 1989).

The French-Speaking Pacific: Population, environment and development issues

Christian JOST (Ed.)

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This is an important contribution to our understanding of the geography of the Pacific Island countries. It consists of studies on the French-speaking Pacific Territories (Vanuatu, New Caledonia, French Polynesia, Wallis and Futuna), the greater part of which are the fruit of entirely new and original work. It both constitutes an in depth presentation of these territories, their particularities, their problems, and contains much food for thought in its analyses of the natural (terrestrial and marine) and the human (socio-cultural and economic) environments of these islands.

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