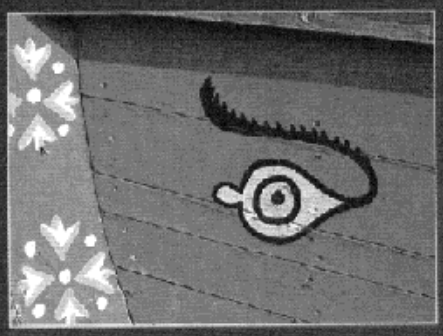
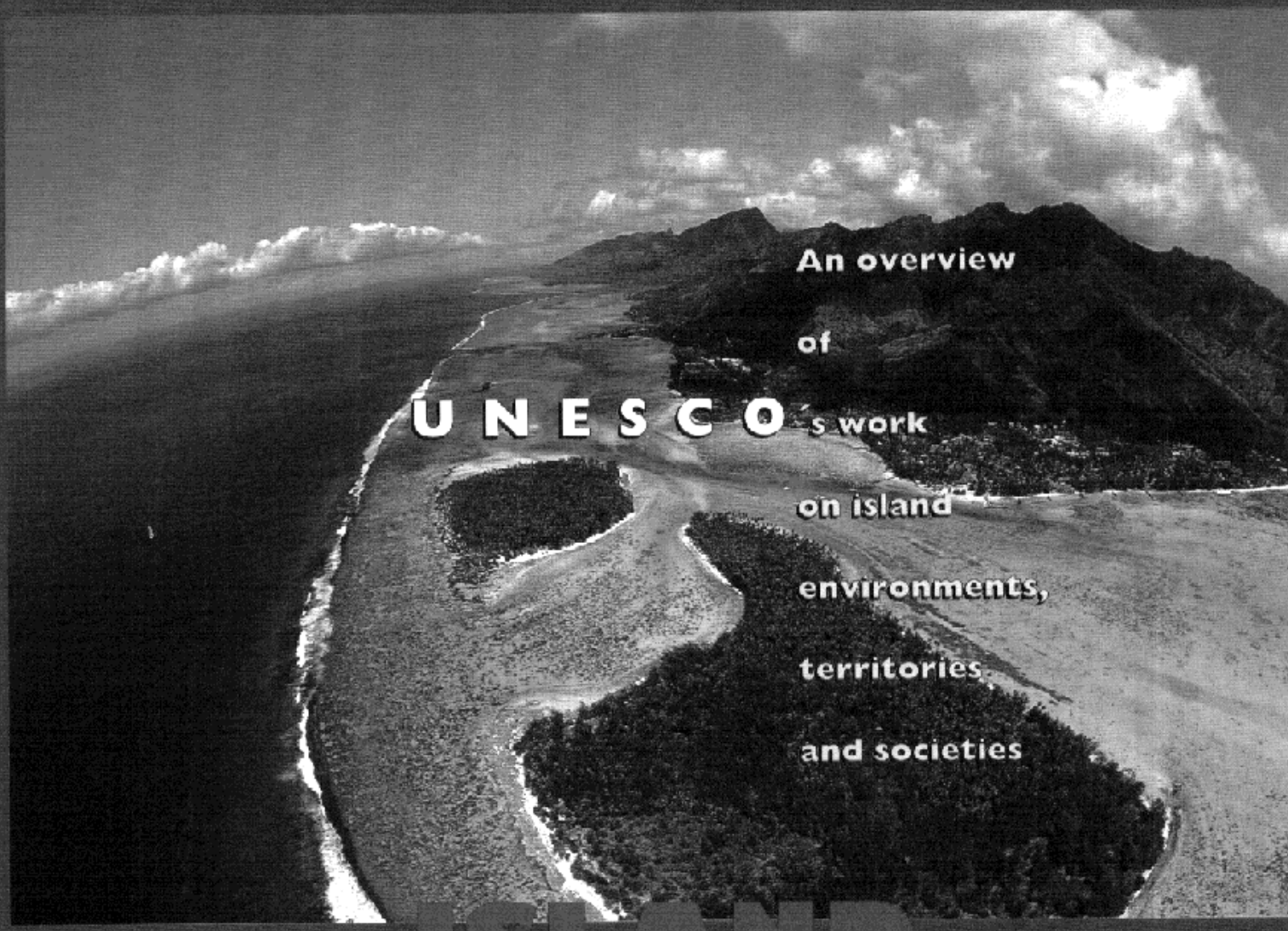


UNESCO



An overview of UNESCO's work on island environments, territories and societies

ISLAND AGENDA

This report was based
on the contributions of many specialists
and staff members of UNESCO
(see Annex 1)
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Preface

The last few years have seen a flurry of interest on small islands. Studies, meetings, projects and bodies focused on islands have proliferated, and were given a spectacular push forward at the UN Conference on Environment and Development at Rio in June 1992 and in the process associated with the Global Conference on the Sustainable Development of Small Island Developing States (Barbados, April 1994).

Perhaps not too pretentiously, UNESCO might claim to have had projects specifically focused on small islands for some twenty years. Studies and actions in many areas of education, environment and resource use, natural and social sciences, culture and communication, have reflected UNESCO's mandate and mission within the firmament of international organizations.

> *To contribute to peace and security by promoting collaboration among the nations through education, science and culture in order to further universal respect for justice, for the rule of law and for the human rights and fundamental freedoms which are affirmed for the peoples of the world, without distinction of race, sex, language or religion, by the Charter of the United Nations.*

The present report represents an overview of past, ongoing and planned activities of UNESCO related to small islands. Several of UNESCO's programmes on small islands include archipelago states and small islands associated with large countries, as well as small island developing states. The scope of this overview reflects that range of small island situations. The review is wide-ranging, but clearly does not pretend to be comprehensive. It provides insights, not a balance sheet.

The report aims to provide source material on UNESCO activities on small islands over the last couple of decades, and thus contribute to the planning of future work as well as to making better use of available information and experience. It is hoped that the overview may be useful to those involved in emerging regional and international activities, such as the 'Vake Moana' initiative in the Pacific and the Global Conference on the Sustainable Development of Small Island Developing States and its follow-up. More generally, it is hoped that this review might contain ideas and information useful to those who shape, move and implement policies which affect the sustainable development and well-being of small island economies and societies.

UNESCO-sponsored activities on small islands

A chronology of selected activities and events

1969. UNDP-UNESCO Curriculum Development Project located at University of South Pacific (Suva) from 1969-1975.

1973. MAB expert panel on ecology and rational use of island ecosystems.

1974-76. Field work phase (MAB Project Area 7) of pilot project on population/environment relations in eastern islands of Fiji, a joint effort of UNESCO, UNFPA and Fiji.

1975. Start of study in the Samoan islands, sponsored by US-MAB, on the effects of migration on the health and well-being of migrants and the costs and benefits for recipient areas. Setting-up of Advisory Committee for the Study of Oceanic Cultures.

1976. World Bank/UNESCO seminar on social and cultural effects of tourism in developing countries.

1977. Establishment of Asia-Pacific Institute for Broadcasting Development, to train broadcasters.

1978. Multidisciplinary studies on human habitat in small Mediterranean islands, with launching seminar in Skiathos, Greece. Meetings of researchers, planners and policy-makers in four eastern Caribbean islands, at start of a second-stage UNESCO/UNFPA project on population/environment/development interactions.

1979. Conference on environmental management and economic growth in the smaller Caribbean islands (Barbados). Seminar on MAB island studies during the Pacific Science Congress at Khabarovsk.

1980. Workshop in Rarotonga, Cook Islands, on the contribution of research to development and planning of tourism in the South Pacific.

1981. Synthesis of field projects in Fiji, Samoa and eastern islands of the Caribbean presented at symposium to mark tenth anniversary of the MAB Programme. Setting-up of working group to study the preparation of a General History of the Caribbean.

1982. Opening of UNESCO Regional Office in Kingston (Jamaica), with staff officers in education, communication and more recently culture.

1983. Publication by ORSTOM of a report, in French and English, on the study of the natural environment, its use and man's influence on its evolution in the eastern islands of Fiji. Report on community participation in tourist activities on the island of Bali. Launch of IGCP project on Sea Level Correlation and Applications (1983-88).

1984. Opening of UNESCO Office for Pacific States in Apia (Western Samoa), appointment of Cultural Adviser for the Pacific region. Commencement of IHP-III Project 4.6 on Hydrology of Small Islands.

1985. UNDRO-UNESCO Handbook on Volcanic Emergency Management. Caribbean Coastal Marine Productivity (CARICOMP) programme launched at workshop in Jamaica.

1986. International workshop in Puerto Rico, sponsored by UNESCO, UNEP, UNCTAD and the US and Canadian MAB Committees, around the theme of sustainable development and environmental management in small islands. First workshop on the Hydrogeological Atlas of the Caribbean islands (Santo Domingo). Launch of UNDP-UNESCO project on Pacific Educational Management.

1987. In the Mediterranean, exchange of small-island experience and collaborative research planning through workshops in Catania, Halki and Mali Losinj.

1988. Publication of *Islands, Islanders and the World: the Colonial and Post-colonial Experience of Eastern Fiji*, a post-audit of the Fiji pilot project. Caracas workshop on the Hydrogeological Atlas of the Caribbean. Nanjing regional workshop on hydrology and water balances of small islands.

1989. Enquiry on challenges in training and education in marine sciences worldwide, with a focus on the year 2000. International Scientific Council for Island Development (INSULA) formally created at MAB island meeting in Brest, with the aim of promoting the sustainable development of small islands in all regions of the world. Mauritius seminar on islands' culture and development.

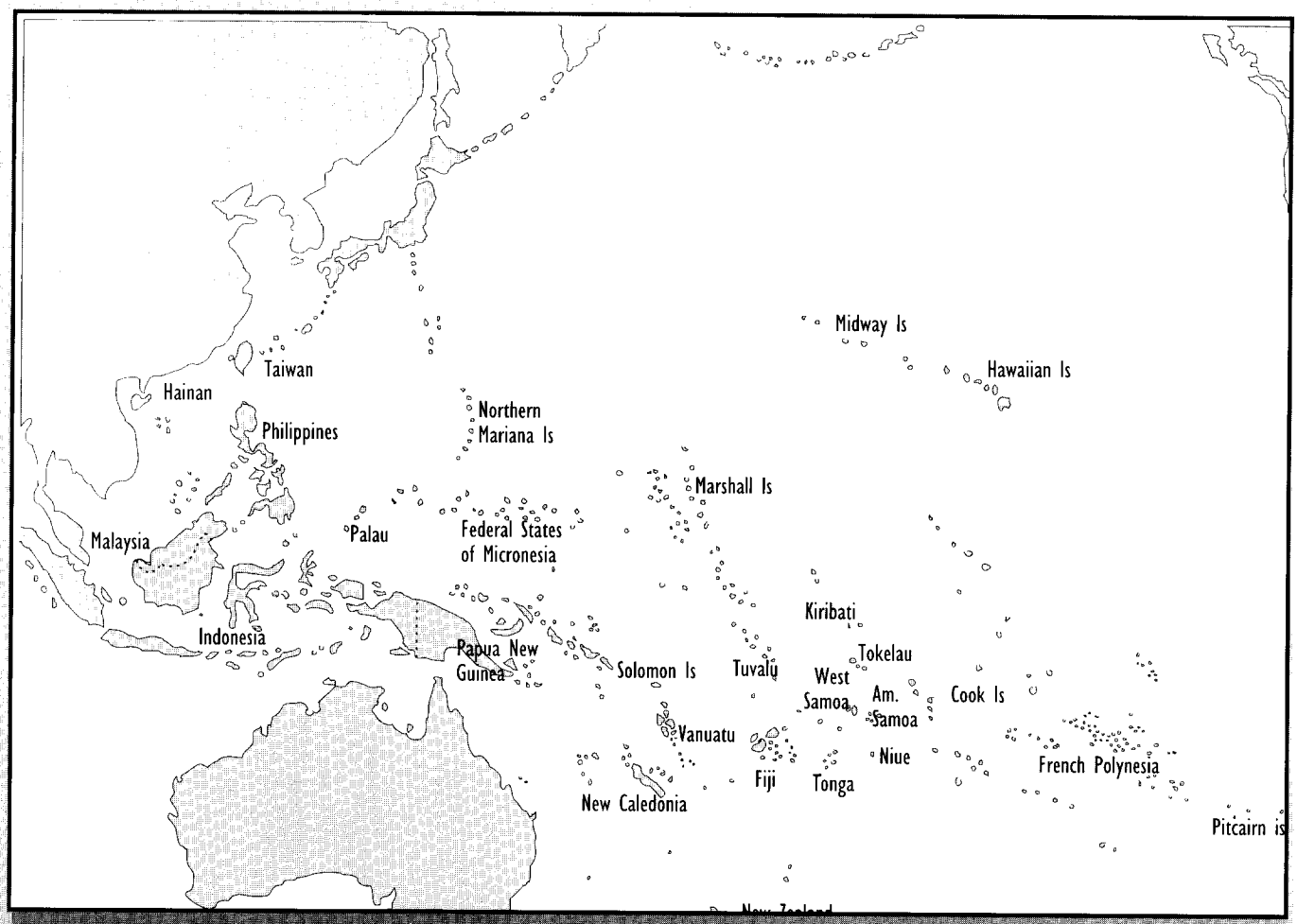
1990. Darwin High Level Consultation of Pacific Heads of Education identified educational development priorities, leading to formulation of Basic Education and Life Skills (BELS) project. Round table discussion on educational planning and management in small states as part of international congress in Mexico City. Issue of quarterly review *Museum* focused on museums in the Pacific.

1991. Publication of practical guide to the hydrology and water resources of small islands. Open file on education in small states in UNESCO's quarterly education journal *Prospects*.

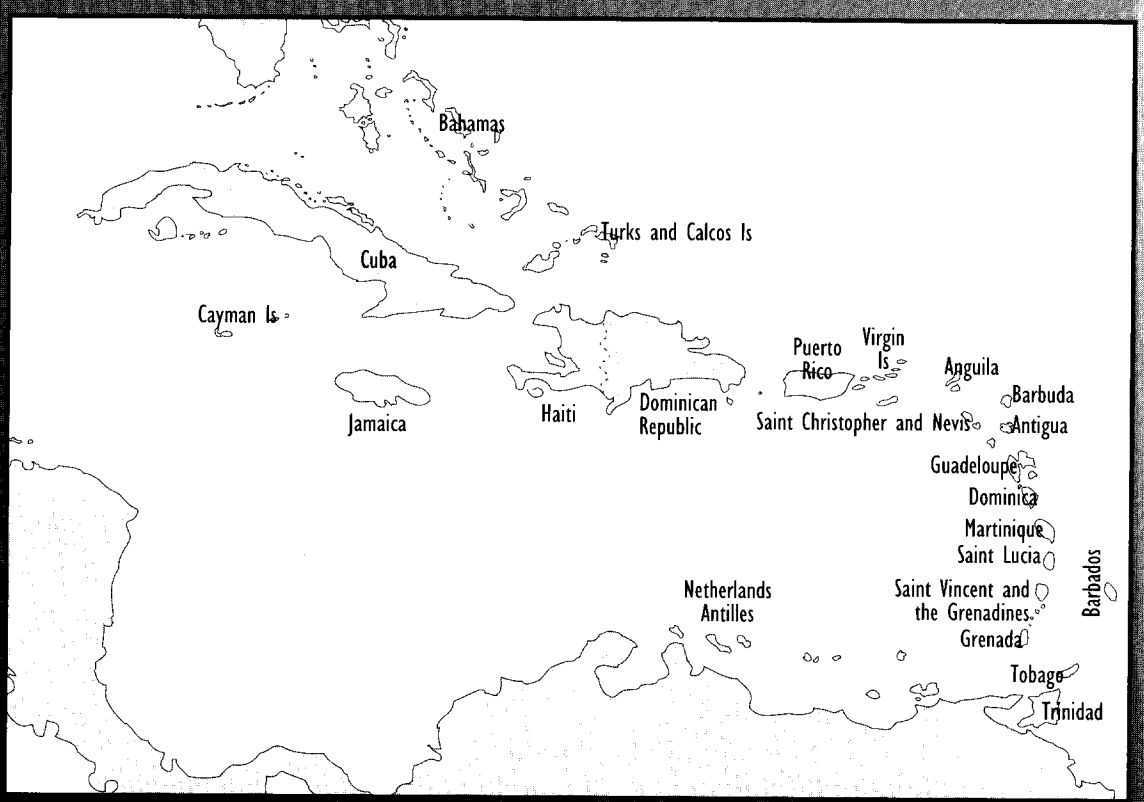
1992. UNESCO inputs to UNCED and Agenda 21 process. Monograph on education planning in small countries. INSULA's 'Island 2000' meeting in Sicily and inaugural issue of the *International Journal of Island Affairs*. Diffusion of illustrated non-technical report on water resources of small tropical islands, within IHP Humid Tropics Programme Series. Sub regional seminar on education for cultural development in Rarotonga (Cook Islands). *Sources* issue on 'The fragile world of islands'.

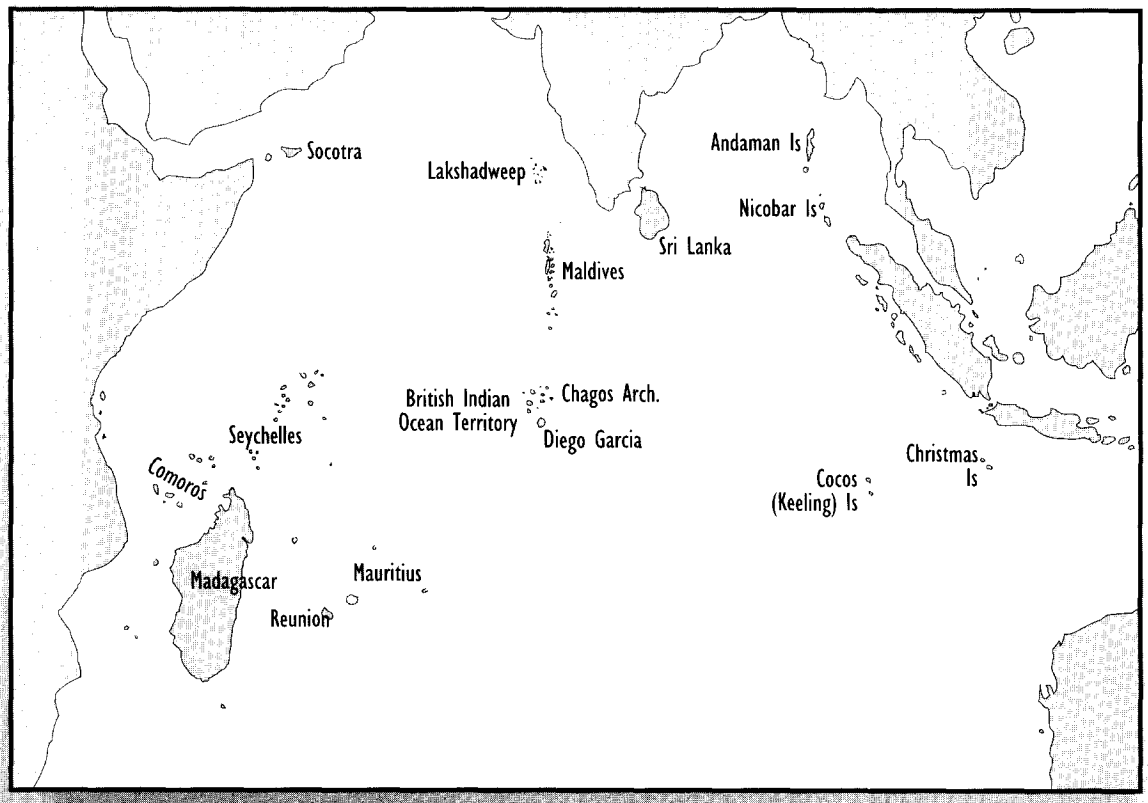
1993. Planning for *Vaka Moana* ('Ocean Roads') project in the Pacific, with regional meeting in Apia in May. Regional workshops in Ouessant (France) and Menorca (Spain) for planning collaborative work on island biosphere reserves. South East Asia regional workshop on hydrology of small islands (Batam Island). Launch by UNDP-UNESCO of programme in the Pacific on Basic Education and Life Skills (BELS). IOC small island oceanography workshop in Martinique. IIEP report on educational strategies for small island states.

1994. Participation in Global Conference on Sustainable Development of Small Island Developing States (Barbados, April). UNESCO expert meetings on such topics as higher education in small island states (Cape Verde, March) and strategies for developing Pacific water resources research and training (Solomon Islands, June). IOC report on sea level monitoring in small island developing states. Second International Conference of the International Scientific Council for Island Development (Okinawa, June).

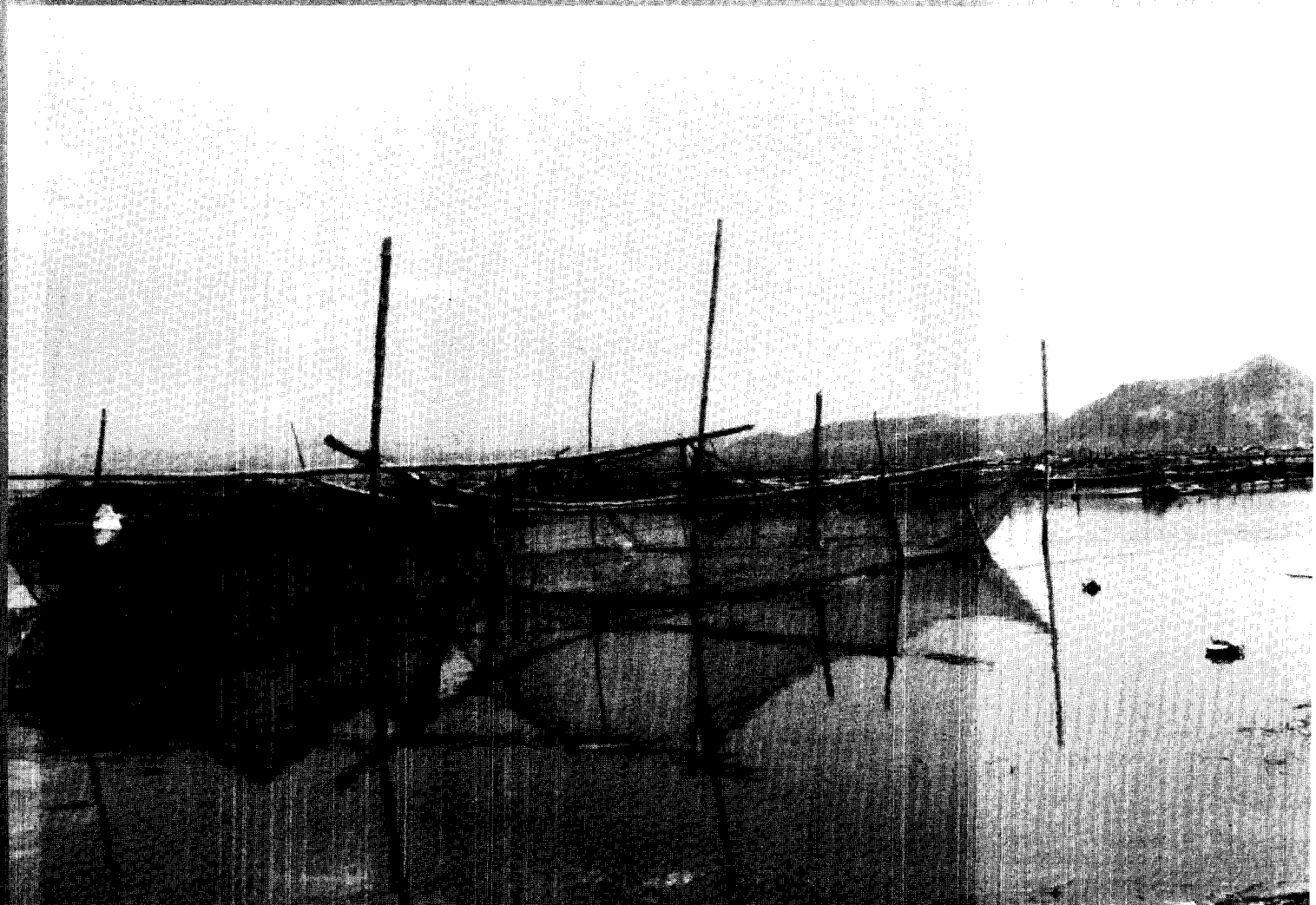


Three island regions of the world, adapted from maps in *Sustainable*





Development and Environmental Management of Small Islands **(Beller *et al.* 1990).**



Carlos Arnaldo

Islands the world over

are suffering grave problems of health

and even more, of self-identity.

For islands, being islands,

are more fragile,

more sensitive to disorder,

more vulnerable to outrages of every kind.

But man must come to his senses.

Inconsequential as he is, man can also be wise!

René Carmen, *Iles* (February 1993, No. 26).

No man is an island, entire of itself,

every man is a piece of the continent, a part of the main.

John Donne, *Devotions upon Emergent Occasions*

Island

Is Paradise an island? The ancient Greeks believed that the spirits of their dead heroes inhabited the Elysian Fields in the Isles of the Blest, far away to the west beyond Calpe and Abyla, the Pillars of Hercules.

Centuries later, searching for Paradise, the Irish monk Saint Brendan (484-578) sailed far into the Atlantic Ocean, where he came upon an island of unsurpassed beauty and fertility which he believed to be the 'Promised Land of the Saints'. Saint Brendan's sacred island remained clearly marked upon most maps for over a thousand years. Even today most travel agents have at least one 'island paradise' on their books with which to tempt clients anxious 'to get away from it all'.

Is Hell an island? For millions of Africans sold into slavery, the Island of Gorée, off the coast of Senegal, near Dakar, where they were held before being transported across the Atlantic, was the gateway to Hell, and few names evoke so readily the notion of Hell on earth as that of Devil's Island.

Is desperate hope an island? Hundreds of thousands of ragged immigrants trembled on Ellis Island at the entrance to New York Harbour where, as they had their first glimpse of the hoped-for land of promise, they waited to have their immigration applications processed.

Paradise or Purgatory, Heaven or Hell, islands leave no one indifferent - and least of all the world's poets and writers, scholars and scientists.

Michel Tcherre

At the end of this sentence, rain will begin.

At the rain's edge, a sail.

Slowly the sail will lose sight of islands;

into a mist will go the belief in harbors of an entire race.

Derek Walcott, *Archipelagoes.*

... dawn came back and they were still in cities;

No marvellous creature rose up from the water;

There was still gold and silver in the mountains

But hunger was a more immediate sorrow,

Although to moping villages in valleys

Some waving pilgrims were describing islands.

W.H. Auden, *Paysage Moralisé*

It is time to plant

feet in our earth.

The heart's metronome

insists on this arc of islands

as home.

Dennis Scott, *Homecoming*

challenges

But islands are much more than a writer's inspiration, a scientist's laboratory. They are home to... islanders, who are both the same... yet different to everyone else, with special problems and opportunities in terms of economies of scale, subsistence, the mixed blessings of tourism, external cultural influences, exploitation of natural resources, vulnerability to the hostilities of nature.

The following paragraphs explore aspects of these challenges as they have impinged on the history and evolution of actual islands around the world. In varying degrees, these situations are applicable to most small islands. While the analysis of the challenges evokes some obvious solutions, it is not always possible to count on the reactions, attitudes, or willingness of people, nor is it possible to activate many solutions without help from other sources. Islanders alone will make the final decisions on what is needed, even if, in many cases, they cannot always solve these problems alone.

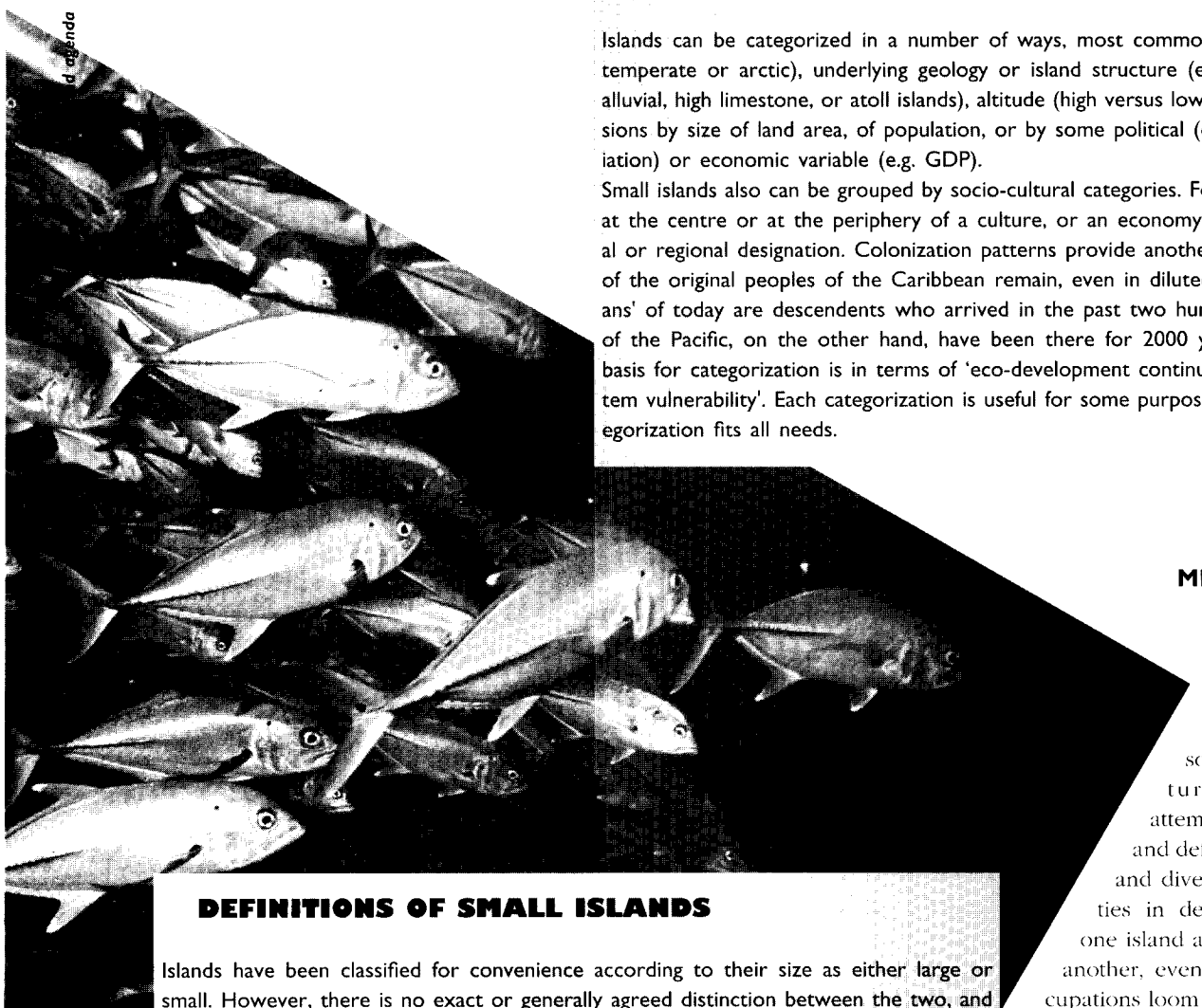
Islands in some parts of the world have grouped together in multi-functional regional associations to pool personnel and resources for greater economic advantage. Such groupings are also helpful in presenting a united front in the world of international trade and politics, as well as in forging a shared cultural identity against domination from extra-regional sources. To face these challenges and turn them effectively to conquests, a more co-operative, synergized response is needed, both from the islands themselves and from external sources.

If there is a lesson to be drawn from the above citations it surely is that the inherent wisdom of islanders will be the driving force in the creation of new relations both among islanders and between them and the others that occupy our biosphere, Earth. That is certainly the spirit in which this review has been prepared.

CATEGORIZING ISLANDS

Islands can be categorized in a number of ways, most commonly by latitude (tropical, temperate or arctic), underlying geology or island structure (e.g. continental, volcanic, alluvial, high limestone, or atoll islands), altitude (high versus low islands), or varying divisions by size of land area, of population, or by some political (e.g. former colonial affiliation) or economic variable (e.g. GDP).

Small islands also can be grouped by socio-cultural categories. For some, they are either at the centre or at the periphery of a culture, or an economy, or some other national or regional designation. Colonization patterns provide another distinction. Few if any of the original peoples of the Caribbean remain, even in diluted form. The 'West Indians' of today are descendents who arrived in the past two hundred years. The people of the Pacific, on the other hand, have been there for 2000 years or more. Another basis for categorization is in terms of 'eco-development continua' or 'indices of ecosystem vulnerability'. Each categorization is useful for some purposes, though no single categorization fits all needs.



Christophe Lepetit

DEFINITIONS OF SMALL ISLANDS

Islands have been classified for convenience according to their size as either large or small. However, there is no exact or generally agreed distinction between the two, and indeed 'small islands' are defined in various ways. Within the Man and the Biosphere (MAB) Programme, 'small islands' are generally taken to be those with approximately 10.000 km^2 or less in surface area and approximately 500.000 or fewer residents (Hess 1990). Thus, islands of interest include independent island states, archipelagic states and islands associated with large countries.

In hydrology, a somewhat different yet variable definition. One workshop on small island hydrology (Commonwealth Science Council, 1984) selected an area of 5000 km^2 as the upper limit for a small island, while a smaller area of 2000 km^2 was selected as an appropriate upper limit in the course of a current UNESCO project on the hydrology of small islands (Project 4.6 of Phase III of UNESCO's International Hydrological Programme (Falkland 1991). A 'very small islands' category exists as well, namely islands not greater in area than 100 km^2 (see Falkland 1991: 1).

From the perspective of the human sciences, one perception of small islands are those islands whose inhabitants consider themselves as islanders. The German definition of islands (In: Brockhaus, cited from Moles 1994) includes not only the conventional idea of a piece of land which is surrounded by water on all sides, but also the idea that water, and especially the sea, permeates the whole of the island - physically and culturally - that the island is submitted to some kind of marine condition.

The recent upsurge in interest in education planning and management in small islands has generally been subsumed under the challenge of articulating education to the development of small states, most of which are 'small island states'. Three principal criteria have been used in defining the notion of small - surface area, GNP and population, with 'small', 'very small' and 'micro' being one proposed taxonomy of small systems in the Pacific based upon size of population (Lillis 1993). A threshold of 1.5 million people is one defining figure for 'smallness' used by the Commonwealth Secretariat and accepted by UNESCO, as discussed in the editorial of an issue of UNESCO's quarterly review of education, *Prospects* (No. 81), devoted to education in small states (Morsy 1991).

MICRO-ECONOMIES OF SCALE

Small islands cover an array of climatic, geographic, economic, social, political and cultural conditions and attempts at characterization and definition reflect that array and diversity. Issues and priorities in development differ from one island and one island group to another, even though several preoccupations loom large in all small-island regions. Thus, for many islands, development is retarded by their own micro-economies that hinder the launching of a production machinery that can sell beyond its borders, and in quantities that make investments pay off. Constraining factors include populations which, being small, have serious limitations in terms of trained and skilled personnel; limited exploitable land; often amorphous exclusive economic zones (e.g. Kiribati) but little or no capacity to prevent poaching by foreign fishing and mineral exploration interests; an often weak infrastructure (transport, energy, communications and the basic service sectors, health and education); and distance from foreign markets. As a result, islands and sustainable development are almost inherently contradictory terms. Tuvalu, a Polynesian Central Pacific archipelago with a population of 8000 and composed of eight major islands, is too small, too far even from its neighbours let alone the world market, to entertain more than modest ambitions of industry or trade. On the other hand, when one considers the proportions of

Twenty Key Issues in Island Development*

Source: Man Belongs to the Earth (UNESCO 1988a, page 63), based on UNESCO-MAB interoceanic workshop on small islands held in Puerto Rico in November 1986, at which twenty key issues were determined and discussed.

Sustainable Development. Islands are less able to absorb environmental impacts than larger areas. Understanding and implementing strategies of sustainable development is a major challenge for island communities.

Diversity of Islands. Islands vary from quite large populous areas to tiny sand cays. With their small size, limited resource base, susceptibility to storm damage and drought, atolls exhibit many of the problems of small islands in their most extreme form.

Open, Specialized Economies. Openness and specialization are the hall-marks of island economies. Often dependent for foreign exchange on the export of one or two specialist crops, small islands may be obliged to import many consumer goods, including food.

Private Sector Involvement. The private sector has much to contribute to development policy. Transnational and local companies have a major responsibility with regard to waste management, toxic materials control and energy conservation.

Distortions in Island Economies. Island economies are subject to distortions due to socially or politically motivated transfer payments of various kinds. The significance and effects of these distortions have not always been fully recognized.

Transport. Many small islands have serious external transportation problems. For island groups there is often a problem of maintaining an adequate outer-island transport service.

Demographic issues. Small islands are subject to cycles of rapid demographic change that go far beyond those related to natural birth and death rate balances.

Employment. Small population size and migration mean that the fine balance between supply and demand of human resources is easily upset.

Decision-making. Integration of scientific concepts into managing island environments is often given low political priority. This stems partly from a lack of information available to decision-makers.

Natural Resources. Natural resources, on which sustainable development ultimately depends, are among the most vulnerable sectors of an island's assets.

Forestry. Conservation of forest cover is vital for small islands for watershed protection and as a guard against soil erosion.

Land Management. Land-use problems on islands largely result from the conflict between change and development and traditional systems. In many cases, loss of traditional forms of land ownership is causing an increase in the fragmentation of landholdings.

Water. Only the largest and wettest high islands have ample resources of water, and even on some of these there are seasonal shortages.

Energy. Many islands depend almost totally on imported fossil fuels, although use of wood and charcoal continues. Solar energy is already important on some islands and biogas digesters are in use in a few areas.

Conservation. Small islands are often the site of rare but fragile ecosystems, many of which are in danger of disappearing through lack of conservation policies. The introduction of exotic species represents an additional threat to native wildlife species.

Coastal and Marine Ecosystems. An island's coastline is often its most valuable region, but unregulated industrial and tourist development projects can cause permanent damage. Pollution from mining and forestry activities is causing extensive damage to coastal areas and marine life in some western Pacific high islands, and agrochemical runoff is polluting waters off some Caribbean islands.

Fisheries. Island fisheries in the tropics and the Mediterranean are mainly small-scale and conducted on artisanal lines. In tropical islands, fishing for export is often hampered by problems of storage, marketing, poor fishing gear and, in much of the Caribbean, by insufficient stocks of commercial fish.

Agriculture. Island agriculture systems range from subsistence farming to the production of export cash crops. The fall in demand for sugar-cane and copra has been a serious blow to certain island economies.

Industry. The smallness of islands is a severe constraint on industrial development. There is, however, some scope for value-adding semi-manufacture.

Tourism and Allied Services. Climate and beaches are island's main tourist attractions, but tourism means heavy investment in infrastructure.

Malcolm Hadley

development funding, financing a $250,000 project to, say, upgrade and expand the Marine Training Centre, reinforce local fish breeding woud represent an investment of more than $30 per capita. A comprehensive development programme could easily exceed the national budget for this archipelago. And yet, would it lead to sustainable development, to a take-off point? Are its 8000 people locked into an essentially subsistence economy?

Grappling with this question is not simple. It is certainly true that Tuvaluans have come to crave things - even basic things like health and education not to mention fridges and videos - which exceed by far their capacity to pay for them. Yet there should be no mistaking one fundamental point. Tuvaluans are proud to be Tuvaluans and wish to remain so. What is more, there is not a Pacific Islander who wishes them ill or covets their territory. They belong to the Pacific family, and they honour it. There is great strength in that fact.

On small islands and archipelagoes, there are few incentives to invest in larger sea-going fishing boats, because the catch cannot be sold quickly enough before the cargo rots. Even with refrigerated boats it would take several days to reach suitable markets, and then the catch would no longer be fresh. Japanese trawlers, however, ply these same seas, but their catch is transferred to larger ships with freezer containers and taken to Japan within days. Combatting this kind of competition is not possible with the limited resources of small island people.

Also there is a question of scale. Big boats hold more and can thus cover the cost of extra fuel and maintenance. Small boats are intentionally small (and go slowly) because of the economic base of their owners and the market in which they operate.

Small islands can produce a great many agricultural products - sugar, bananas, copra, vegetables, oil from various extracts, rice, chili peppers - but they cannot always produce in quantities sufficient for the creation of cost-effective infrastructures. Many are too distant from potential markets. Thailand can airfreight fresh banana heart and leaves to Europe daily for a minority market and still sell at buyable prices. Large cargo planes cannot land on many of these islands, and freight/distance costs for small quantities would raise the prices too high to be competitive.

A more realistic formulation of sustainable development may have to be elaborated, a development that can target at least self-sufficiency in basic food items (and not necessarily for exportation), availability of textiles for local design and sewing (instead of solely importation of finished clothing), more innovative use of local building materials for homes.

Carlos Arnaldo

Island societies offer a cultural cross roads. You don't find the 'fortress mentality' that often exists in big metropolises. Islanders are more open to outside influences that are absorbed and regurgitated as something entirely new ... Island peoples have an incredible interest in 'elsewhere', possibly the result of a need to escape a sense of physical confinement. Consequently they have an extraordinary capacity for change and adaptation.

Rex Nettleford, UNESCO Sources, 1992.

SUBSISTENCE FOR SURVIVAL

Small islands micro-economies are predictably closed: they are essentially limited to feeding and supplying the island population. Many are essentially 'subsistence' in character. Unfortunately, exposure to the outside world through radio and, increasingly, television inevitably brings with it the aspiration for things that cannot be easily had, or if obtained, can be meaningless in the island culture.

In Kiribati, fishermen sail daily to bring home what industrialized country citizens would call prize catches of snapper, yellow-fin tuna, barracuda, and exotic sea bass. But the market to sell these fish is limited because other families also sail the same seas and lagoons to catch their own fish. Foreigners occasionally buy but are not sufficiently numerous or sustained to constitute a viable market. Fish are therefore not a marketable item in typical atoll economies like Kiribati. In volcanic islands like Samoa and Viti Levu in Fiji, a substantial local market for fish exists since much of their respective populations, living inland, have nothing to do with fishing. Some claim that consumer habits have evolved and that the availability of tinned fish has had a deleterious effect on the fishing industry. While this thesis is possible, it seems improbable when one considers the facts.

Many reef fish stocks have been seri-

ously depleted, requiring expensive blue water craft to go after deep water fish. Few people have such craft or even the money to pay for fuel. There are surely very few islanders who prefer tinned fish over fresh. But if it is increasingly consumed, it is because it is cheaper than buying fresh-caught fish in the market. Moreover, no cooking is required (i.e. so no wood or kerosene need be procured), it 'keeps', etc. It is important to look for the logic of their behaviour which, in clothes, may be whimsical but not something as fundamental and culture-bound as eating.

THE MIXED BLESSINGS OF TOURISM

The untouched nature of many islands lures tourism developers and travel agencies to develop holiday playgrounds for the rich on unspoiled exotic islands. Island economists and business people are not indifferent to tourist dollars, either. Yet these fragile 'shangri-la' are rapidly polluted by the invading tourists with their alien cultural baggage and environmental garbage. For tourism interests and practices often override not only national and local laws but elementary good sense that protect the environment, that seek to preserve forests and seas, that aim to maintain a minimum of agriculturally productive lands, that control the architecture of buildings and structures to maintain some semblance of cultural ambiance. Tourism has the potential to provide the convertible currency necessary for survival, but tourism can also contravene the laws that underpin that survival.

Boracay, in the Philippines, today is an island for foreign tourists and holiday seekers. A little more than fifteen years ago, it was uninhabited, being used mainly as a resting point for fishermen. Today, the sale of stamps for postcards, 10,000 per week, is one of the largest enterprises, more sure and more stable than any occupation before Boracay became the paradise for foreigners. Restaurants and vacation bungalows abound along the shores and even inland, with the dwellings of the local people right behind them. Although the local law prescribes that bungalows and vacation structures be built from wood and bamboo, to preserve the local spirit, engage local craftsmen, and keep prices down, the illegal construction of cement apartments has caused real estate to rise 200% in two years, more than tripling the rents for vacationists. Were these profits not at the expense of the environment and if they remained to benefit the people of Boracay, one might walk away from this turn of events. But profits made in this manner rarely benefit the locals.

Many vacation islands today are facing threats from overcrowded dwellings, fire hazards, insufficient fresh water supply and sewerage, decreasing of farm land to make way for vacation houses, drunkenness and drugs, as the push gathers pace for more vacation houses, restaurants and scuba clubs. In the context of sustainable development, tourism is certainly a resource for convertible currency earning, and yet it is also a Trojan horse: the dollars paid by tourists may create an environment they no longer want to see. A more comprehensive and structured strategy is needed to make tourism profitable in more than simply economic growth. Borrowing metaphors, yielding to the lure of the siren song, while navigating safely between the Scylla and Charybdis of human and environmental pollution.

SIZE AND COMPETITIVENESS

A small island,

but a large nation - if the water area is included.

It is often said that, due to their size, small island economies can never be competitive on the world markets. Transportation costs are high and they stand little chance of getting any advantages of economies of scale through mass production. However, being small may in itself provide an asset of marketable value. It may in some instances also contribute to situations of socio-cultural solidarity and stability.

It may be quite misleading, however, to equal a small island with a small nation: an island with an Exclusive Economic Zone (EEZ)[1] covers a sea area of 431,000 km^2. This is large compared with the total area of many other nations, such as for example, the land-locked countries of Austria (82,700 km^2), Nepal (13,700 km^2) or Paraguay (39,700 km^2). Measured per capita, most small island islanders are therefore enormously rich in terms of marine resources. It might seem more appropriate therefore to shift perceptions away from seeing islands states only as nation with a tiny land mass, and more as nations with important coastal and marine territories and resources. In the words of Agenda 21,'For small island developing States the ocean and coastal environment is of strategic importance and constitutes a valuable development resource' (Ch. 17 §125, p. 317).

Several factors explains why many islands underutilize their marine resources: difficulties in enforcing delimitation of maritime boundaries, lack of finances, technology and skilled labour force (Warioba & Mrema, 1993). Boundary disputes have become more frequent as new technologies have made it technically and economically feasible today to explore offshore sea and seabeds. Indeed, claims to maritime zones based on offshore islands are among the more frequent conflicts requiring negotiation or arbitration.

Two issues make the EEZs particularly challenging: the fact that many marine living resources are highly migratory and move without any respect to EEZ borders; and Article 121 in the 1982 United Nations Convention on the Law of the Sea, which makes a distinction between islands and 'rocks which cannot sustain human habitation or economic life of their own'. This becomes important as such rocks 'shall have no exclusive economic zone'. However many island states as in the Pacific, draw their EEZs with little distinction between islands and rocks (Shannon & Morgan, 1993). Which have lead to conflicting interpretations regarding whether or not an island actually is a rock. As the international fishing industry in many parts of the world is undergoing important changes away from subsistence fishing in nearshore waters to export oriented commercial industrial fishing in offshore areas, the EEZ becomes all the more important.

1. Article 56 of the 1982 United Nations Convention on the Law of the Sea gives coastal states the right to exploit the resources of both the water column and seabed out to 200 nautical miles measured from the coastal state's Territorial Sea baseline.
2. Article 56 of the 1982 United Nations Convention on the Law of the Sea gives coastal states the right to exploit the resources of both the water column and seabed out to 200 nautical miles measured from the coastal state's Territorial Sea baseline.x

CULTURE - AN INVASION, A MÉLANGE, A GHETTO

Most islands have, over the years, experienced an influx of external cultures. Highly vulnerable to external cultures, they own cultures and transitions have been enriched but more frequently eroded. In many cases the destruction of indigenous cultures has been part of clear policy. Many island cultures are so overshadowed by modern media that they all but disappear. Others, however, are a mix of several origins, sometimes leading to a rich and healthy mélange, sometimes creating fiercely guarded ghettoes peopled by citizens with a fortress mentality, sometimes a combination of both.

Easter Island, known for its large stone idols and petroglyphs, is not untypical. The indigenous people living there can trace their history back more than 1500 years. The jury is still out debating on the question of whether their origins are Polynesian or Mayan (the Polynesian connection is the preferred one). Easter Island, like most of the Pacific, was colonized at the end of the 19th century. Chile's annexation brought with it an overlay of Latin culture, fluency in Spanish and frequent trips to the South American continent, particularly for education and vacations. Nonetheless, cultural traits, ceremonies, festivals, songs, and the like remain rooted in Polynesia. Will they succumb one day to the more powerful influence of their administrations on the South American mainland?

Mauritius is an example of an unusually rich admixture: 750,000 Indians, 300,000 Creoles (descendants of white colonists and slaves from Madagascar, East Africa and Asia), 30,000 Chinese and 20,000 whites. Even the Creole population has several varying strains. All religious holidays are respected, Hindu, Buddhist, Christian. African strains in music remain vibrant, particularly in the calypso-like *séga* with drums, flutes and guitars. Its modern gaiety tells little of its history as songs of protest against slavery. '*Séga* is not just our music,' said one government official, 'it is our African culture. But we are losing our true music, and this is a sad thing. A people's culture is its soul, and without a soul, how can people go forward? For a country to be great, it must keep its culture'.

Similarly, the twin-island country of Trinidad and Tobago is comprised of 47% East Indians and 46% of African descent, with the remaining 7% a combination of Lebanese, Chinese, descendants of the Amerindian indigenous peoples, French, English, Spanish and Portuguese Creoles. The result is a 'free jazz' of cultures, where the strongly individualistic strains of *segué* are reflected in the all-embodying airs of calypso. Once the carnival season is over, however, the calypso beat is drowned out by the pop music of North America borne on the airwaves of local radio and the ubiquity of affordable foreign satellite TV programmes. At the regional level, all Caribbean islands, with their proximity to the colossus of satellite television production a few hundred kilometres to the north, have long been menaced by the cultural and social values of a continent that has little relation to their island milieu.

The people of Cape Verde, on the other hand, who claim to be among the originators of the Brazilian samba, are from several West African cultures and many families have intermarried with the Portuguese. Nonetheless, they are fiercely proud of being African and have no complex about their varied origins, about being *métis*. Although there has been strong pressure in the educational system to learn and speak Portuguese correctly, Creole in many forms is still used in most aspects of daily life and in traditional and modern songs. While this musical tradition is strong in the hearts and souls of the people, the lack of a solid music industry (recording, marketing, live performances) may confine this art form to memory. Similarly, poets and writers lack the publication outlets for their texts in Creole to find widespread and more permanent expression.

In the Pacific, the culture of the islands is a living art. While there is, as yet, little TV, it is significant that for those countries which have a degree of influence over programming, television viewers who are given a choice between a representation of their own culture and a foreign imported one, vastly prefer the former, especially if they recognize any of the performers on the screen.

It is overly simplistic to suggest that more local production is the solution. Productions are generally enormously expensive to make and must therefore be marketed and sold. Sooner or later, the viewer must pay. But with what? Large TV audiences bring the cost down but work against the preservation of local culture. Since it is recognized that culture is a dimension of socio-economic development, one may well wonder how to proceed at a price people can afford to pay. No one questions, however, that at issue is more than simply saving monuments: at stake is the maintenance and nourishing of a more ephemeral monument, that of the culture of one's soul.

TRADING OFF RESOURCES

Many islands have rich untapped resources, but few means to exploit them; often, these are sold off to foreign exploiters in return for 'survival goods': food, refrigerators, television, consumer luxuries. These indigenous resources could be fish-rich seas or rare coral sought by international jewelers and decorators; fresh spring mineral waters that await bottling and marketing; rare flowers, birds, animals sought by perfumists, zoos and pet salesmen; harbours and refilling stations (conventional or nuclear) negotiated by super-powers or would-be regional powers; strategic presence and position on major sea routes; its own people who, as migrant workers in foreign countries, earn most of the family revenue and contribute to their national currency reserves.

'Now that he (Derek Walcott) has been awarded the Nobel Prize for Literature, without in any way belittling the genius of this immense poet, his native St Lucia - and

Cape Verde, 600 kilometres off the coast of Senegal, was once a green and rich paradise. It served as the first stopping point for slave ships leaving Africa for the new world, and was important as a hospital for those who did not make even the first few days' journey. Today Cape Verde comprises ten sand- and wind-swept islands, whose bare, volcanic terrain resembles the cratered landscape of the moon. While the mountains are rich in minerals and the sea in fish, it has been impossible to date to exploit these resources. But the islands are rich in people. 'We have no industries, no major trade. Our main resource is our people and our main task is to educate them', declared Carlos Tolentino, Minister of Education. Tolentino could have been speaking on behalf of any number of islands - Saint Vincent, Dominica, Fiji, Maldives. Only 300,000 Capeverdians live on the islands, another 700,000 live in Boston, Rome, Dakar and Lisbon. The savings they send home regularly has made the National Bank one of the most liquid in Africa. Almost any major convertible currency can be exchanged with minimum formality and the local currency has maintained fair value despite inflation.

There are other uncounted or badly counted resources. Kiribati is among the smaller island republics in the world with less than 60,000 population and less than 6000 km^2 of land. But it is one of the largest countries in the world in terms of its EEZ which includes some 6,000,000 km^2 of sea between the cluster of islands to the north of Tuvalu where the capital Tarawa is located and the the Northern Line Islands nearly 5000 kilometres to the east which includes the world-renowned bird sanctuary, Christmas Island, the largest atoll on the planet. In Kiribati, classic measures and models are of little use in describing its economy. While it has enormous potential wealth in the sea, there are few ways of exploiting this resource cost-effectively. Moreover the risk is real that the islands' birthright will be traded off for modernization: Kiribati was once offered a full national television service, in return for the rights to dump nuclear wastes in its territorial waters. The offer was rejected and there still is no television. But it would be a great mistake to underestimate the power of boredom had the opposite decision been taken. Where Europeans see coconut palms, the fringing reef and crashing surf, islanders know only an eternity of sameness. The highest per capita suicide rates in the world are to be found in some islands of the Pacific. Boredom and frustration are known causes.

Maldives, an archipelago of 120 atolls and 200,000 inhabitants, received the donation of a national television service, but there is no indication that this was traded for fishing rights, or facility in registering international vessels or for other trade rights.

Many islands constitute strategic landing points between two or more other major countries, hence the undiminished importance of practically abandoned islands such as the Paraclete Islands, Freedom Island (the Spratleys), or Chin Men off the coast of Taiwan. Easter Island is a principal relay station of the British Broadcasting Corporation and a NASA tracking station and emergency landing strip for space shuttles. The significance of the Pacific Islands became more obvious during World War Two when they served as Eastward sea routes for the Japanese flotilla attacking Pearl Harbour, and in the other direction as refueling stations for the US Air Force bombers heading for Hiroshima. Of more recent concern, especially to islanders in the South Pacific, has been the transport and testing of nuclear devices in the region. Many small islands have been successful in developing a variety of offshore services. Some islands earn income from their isolation and location by offering tax havens or facilities for offshore banking as well as for the international transit of goods, passengers and information. Such use of a strategic location by island countries may generate significant revenues but there may be costs associated with these activities, such as adverse environmental impacts, e.g. from vessel discharges, which some islands do not effectively regulate.

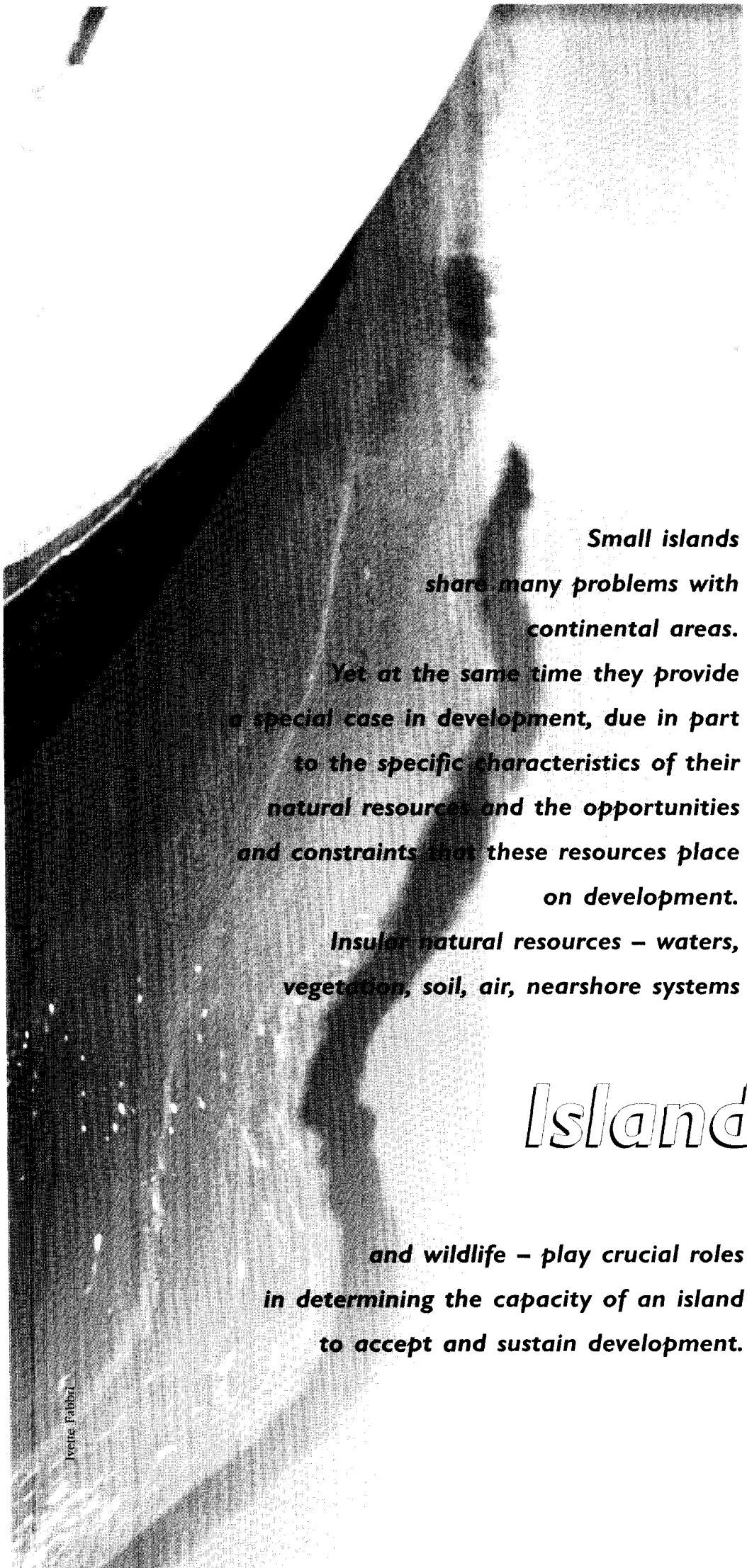
VULNERABILITY AGAINST THE HOSTILITIES OF NATURE

While many islands boast rich forests and calm scenic beaches, they are vulnerable to natural catastrophes: earth tremors, cyclones (which are especially devastating in island contexts because there are no other land masses to reduce the force of the winds) and sand storms or 'hammartan', a phenomenon which has effectively denuded most of the Sahel and Cape Verde and dried up precious water resources. Distance from emergency relief sources aggravates post-catastrophe assistance and rehabilitation efforts; and distance within islands in a given island state complicates the management of disaster relief. Wastage and prolonged suffering are the most visible penalties. Others, unfortunately, include the wilfull misuse of disaster relief funds.

Ironically, meteorological, volcanic and seismic stations exist in strategic parts of the world. The mud quake in Mexico, for example, was known hours before it happened. Cyclone Ofa in the Pacific was tracked by the Fiji Weather Service from Tuvalu to Tokelau before it struck Samoa with incredible ferocity. Seismic stations can tell with fair confidence of coming earthquakes, and of consequent tsunamis. Notwithstanding, for many islands, there is still no systematic programme of assistance for mass media to follow in case of disaster, even though the situation is improving in many fields (e.g. better detection, cyclone-resistance construction, sea walls, refined post-cyclone emergency procedures).

I am happy for him and for poetry, but also for the islands. By honouring Derek Walcott, the jury salutes him for sailing to his own compass, of braving winds and tides, and bringing with her the islands of all the seas in the world - safely to port'.

Edouard J. Maunick, UNESCO Courier, December 1992



Jyette Fabbri

Small islands share many problems with continental areas. Yet at the same time they provide a special case in development, due in part to the specific characteristics of their natural resources and the opportunities and constraints that these resources place on development. Insular natural resources – waters, vegetation, soil, air, nearshore systems and wildlife – play crucial roles in determining the capacity of an island to accept and sustain development.

Island natural

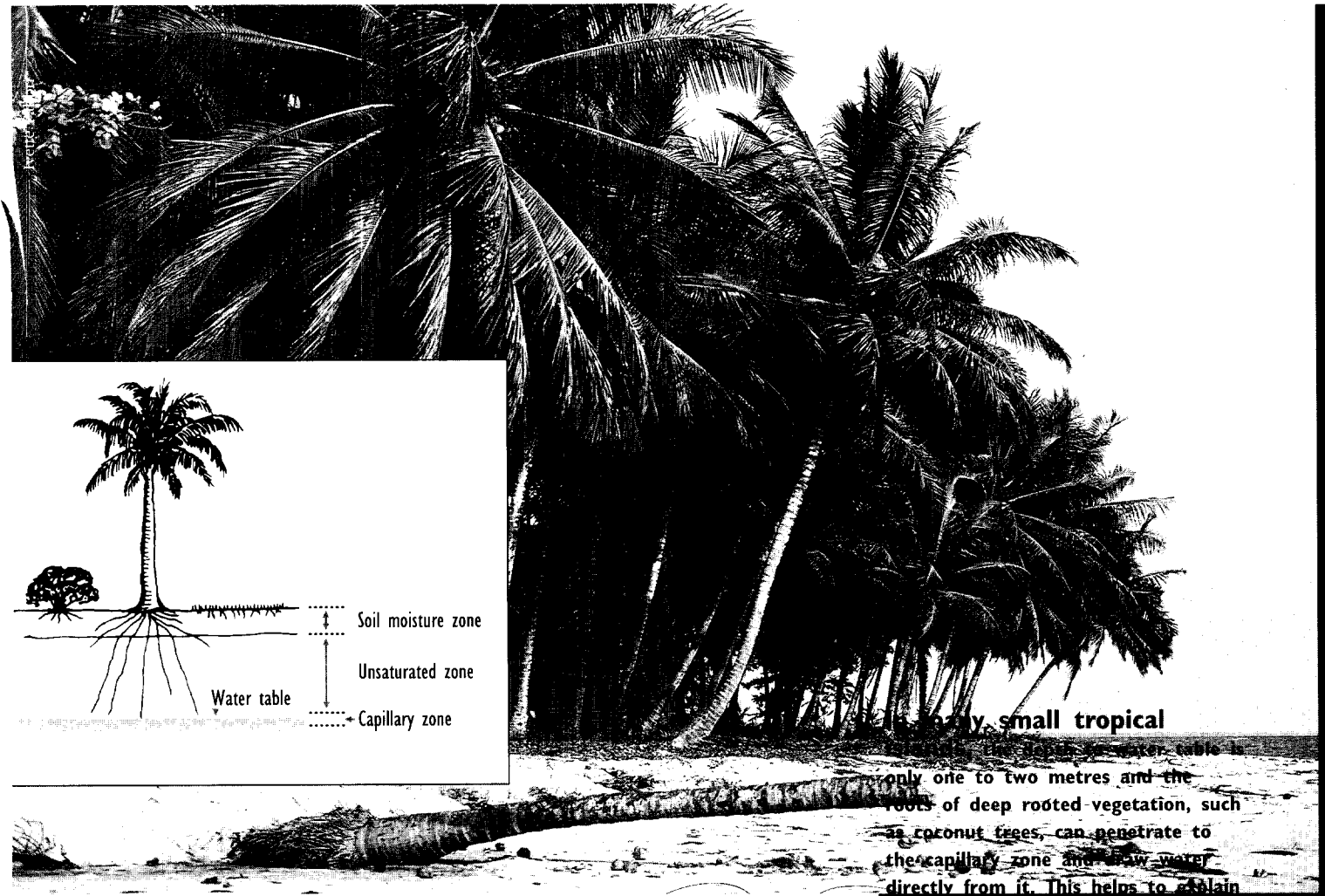
WATER AS AN ISSUE IN ISLAND DEVELOPMENT

The limited size of islands restricts freshwater resources to their wedges of groundwater 'floating' on top of saline water which provide the main source of water supply. Many small islands have few or no permanent streams or lakes. Consequently freshwater resources are limited which makes them extremely vulnerable to environmental mismanagement in response to socio-economic pressures for development.

A primary focus for sustainable management of small island environments must inevitably centre on resolving the conflicting demands made on the limited freshwater supply. This natural resource is the ultimate recipient of pollution from various socio-economic activities associated with urbanization, agriculture, mining and clearing of native vegetation. Faecal pollution of groundwater, and in some instances surface water, from sanitation facilities located too close to water sources is a particular problem which is making water supply and health a critical issue. The increasing use of pesticides, herbicides and fertilizers is an additional pollution hazard for surface water and groundwater in many small islands.

Paradoxically, the demands for potable water are increasing in response to expansion of tourism facilities (one of the major sources of income in islands) and the stress emanating from the escalation of population, especially in many of the humid tropical islands. Overpumping of groundwater, beyond the safe yield, is therefore causing degradation of many water supply aquifers through salinization.

Thus the limited areas of small islands concertina the competing demands on their limited freshwater resources which are further aggravated by the socio-economic pressures for development to support their fragile economies.



In many small tropical islands, the depth to water table is only one to two metres and the roots of deep rooted vegetation, such as coconut trees, can penetrate to the capillary zone and draw water directly from it. This helps to explain why on some drier atolls, coconut trees can survive extensive droughts, while shallow rooted vegetation, which draws its moisture from the soil zone, dies off.
However, the relations of coconut trees to an island's water balance is far from straightforward. Empirical data from some low-island groups such as Cocos (Keeling) and Kirabati, with varying coverages of coconut trees, suggests that annual recharge to groundwater decreases with increasing density of coconut trees. There is therefore a fair amount of controversy on the role of trees such as coconuts in the hydrological cycle of small tropical islands. This is just one of many practical issues related to hydrology and water resources of small islands drawn together in UNESCO Studies and Reports in Hydrology 49 (Falkland 1991), and in a chapter on hydrology in humid tropical islands by A.C. Falkland and J.P. Brunel in a wide ranging UNESCO review of hydrology and water management in the humid tropics (Bonell et al. 1993).

Freshwater resources and the physical characteristics of small islands

In geological terms, small islands are volcanic, bedrock, unconsolidated, or mixed in nature, supplemented by coral atolls in the tropics. Their geological history influences their physiographic characteristics, and, in turn, the occurrence of freshwater. In the case of volcanic islands (the 'high' island group) for example, groundwater is supplemented by some surface water resources. Whereas in some of the limestone islands and coral atolls of low elevation (of the 'low' island group), the occurrence of freshwater is restricted to mostly groundwater.

Short-, medium- and long- term cycles in rainfall have a significant impact on island freshwater supplies. The El Niño-Southern Oscillation (ENSO) and anti-ENSO (La Liña) events within the Pacific basin, for example, can have a profound effect on island economies, especially concerning the 'low' island group where the ability for orographic rainfall is absent. Therefore any interests in island water resource management need to take into account activities within the World Climate Research Programme (e.g. WCRP-Water).

Vegetation can have diametrical effects on the quantity and quality of an island's water resources. Whilst vegetation protects the water quality through soil conservation, the transpirational demands from deeper-rooted vegetation cause additional depletion of

resources

groundwater resources, especially in the tropics where solar radiation is higher.

Occurrence of freshwater on islands

Surface water, springs and groundwater aquifers are the main sources of freshwater on small islands. Conditions for the occurrence of surface water are considerably more favourable on the 'high' volcanic group than on those of limestone or coral. Low-lying or raised flat islands rarely have surface water, except as lakes or ponds where the permeability of the surface is sufficiently low.

Effective management of water resources is dependant on the availability of a good hydrometric database to address the conflicting demands. In many of the small islands of the developing world, such databases are either inadequate or non-existent.

The nature of the streamflow regime is dependant on the rainfall amounts, and the hydrogeology and surface soil hydraulic properties. Perennial streamflow occurs where high altitude springs supplement higher rainfalls over the highest topography. Where surface permeability is low and springs are absent, surface runoff often occurs rapidly after rainfall and may diminish to little or no flow within several minutes.

The occurrence and distribution of springs are controlled by the hydrogeological properties of the geological formations. Springs commonly occur at the base of islands in the form of either diffused (very permeable formations) or concentrated discharges (e.g. older limestone islands).

Groundwater in high islands can occur both in the form of elevated (high-level) and basal (low-level) aquifers. For selected islands such as the Hawaiian group, these elevated aquifers are utilized as a supplementary source of potable water. For most small islands, it is the basal aquifers which are the most important, and often they are the only freshwater source (as in the case of 'low' islands). Basal aquifers generally take the form of a freshwater lens underlying part or the whole of islands. It is important to recognize that estimates of freshwater volumes available, using available theoretical scientific relationships for continental coastal aquifers, are in serious error when applied to small islands. In reality, the boundary between fresh/saline water is not abrupt (as assumed in theory) due to substantial mixing which results in an intervening transitional zone. Consequently freshwater volumes are overestimated using traditional, groundwater models.

In terms of other sources of freshwater on small islands, the economic capacity of most small islands is not sufficient to allow use of a number of successful desalinization systems now available based on either distillation or membrane techniques. The alternative options remain the importation of freshwater by ship, or by pipeline if close to a continental area.

Assessment of small island water resources

Effective management of water resources is dependant on the availability of a good hydrometric database to address the conflicting demands. In many of the small islands of the developing world, such databases are either inadequate or non-existent. Obviously the development of a comprehensive water management strategy becomes an extremely difficult task in the absence of accurate estimates of the hydrological water balance.

Examining the water balance components in detail, there is a lack of information on the spatial variability of rainfall over the steeper topography of high islands. Evapotranspiration is the least known water component despite its importance, especially on small, low-lying tropical islands where there is a land management conflict between the soil conservation advantages of using coconut trees on the one hand, and the negative effects of their transpiring more groundwater than shallow rooted grasses and shrubs. Where surface runoff frequently occurs, there is a dearth of stream gauging stations which can cope with the erosive nature of flash floods. One of the main problems of many small islands is the lack of accurate knowledge of the extent and sustainable yield of their fresh water lenses. Too often, groundwater development schemes have been designed for small islands without any knowledge of the extent or yield of their groundwater resource. In the absence of detailed computer modelling for a particular island, an empirical rule of thumb is to restrain groundwater abstraction to between 6 and 12% of annual rainfall.

In general, this lack of baseline information on the water balance of small islands is a major problem, because the alternative of transposing concepts and criteria appropriate to large islands and continents is not a viable option. Small islands require either island-specific, or, in favourable cases, regional studies to properly identify their water resources and to implement their own effective development and management programmes. A number of island-specific hydrological investigations have been carried out within the framework of the International Hydrological Programme and other related UNESCO initiatives. Examples in South East Asia include studies on the hydrological balances of the islands of Marinduque and Cuyo (Philippines) Baranglompo (Indonesia) and Zhousan (China). Regional balance sheets have also been drawn-up, as in the hydrogeological atlas of the Caribbean (UNESCO 1986, 1988b), and interregional comparisons attempted.

WATER AND WASTE MANAGEMENT IN SMALL ISLANDS

The first issue in 1993 of INSULA's *International Journal of Island Affairs* was largely devoted to water and waste management in small islands with contributions based on Mediterranean small islands (Italy, Greece), Pacific islands, Saipan (Japan), Koster islands (Sweden), and small-island states. The issue also included an article on the implications to small-island states of UNCED's Agenda 21.

Regional Balance Sheets for Water

Problems of natural resource management vary considerably from one region to another and from one island or island group to another. In November 1986, the Puerto Rico Inter-oceanic Workshop on Small Islands drew up a series of tabular balance sheets concerning natural resource management in different island regions which summarized the situation at the time, possible alternative scenarios and suggestions for research and development. Balances were drawn up for the South Pacific, Mediterranean and North Atlantic islands, the Caribbean, and islands in the Arctic and northern Canada. Sectors that were covered in these tables included: water, evergy, fisheries, traditional agriculture, coastal/marine management, forestry, waste disposal, protected areas, and wildlife management. The table below, produced by participants at the workshop, summarizes some of the issues in water resources management in three main island regions.
Source: Beller et al. (1990).

REGION	SITUATION	ALTERNATIVE	RECOMMENDATIONS
South Pacific (High Islands)	**M**ost islands rely for drinking water on running waters supplemented by water tanks **P**roblems include pollution of water resources as a result of forest clearing in high areas, unregulated use of herbicides and use of rivers and streams for waste disposal	**R**ecycle water **U**ndertake further drilling to tap potential water lens	**E**stablish and protect catchment areas necessary to sustain water supply **P**ass legislation for the protection of water catchment areas **I**naugurate measures to conserve water
(Low Islands)	**L**argely dependent on water tanks which provide an inadequate supply **D**anger of contamination and over-use	**D**rilling for potential water sources	**F**ocus on desalination measures to improve water quality
Caribbean (High Islands)	**G**eographic and seasonal shortages **M**ostly surface waters **F**looding in lowlands **H**igh rainfall areas limit human activity	**I**nter-basin transfer **R**eservoirs **W**ater control structures **W**ater export	**I**nventory water resources **W**ater management should include natural systems, especially estuaries and freshwater systems **A**void structural remedies and favour land/watershed management practices
(Low Islands)	**S**hortages (low rainfall) **N**o surface water **G**round-water (aquifer) **W**ater importation **D**esalination	**R**ecycling water **R**igorous conservation **M**ore cisterns **I**ntensive water management in small watersheds (lining ponds)	**A**void waste injection into aquifers **P**rotect recharge areas **I**nventory water resources **U**nderstand water-use efficiency of alternative technologies
Mediterranean and North Atlantic Islands	**S**easonal contrast: winter is humid, summer is dry **C**isterns used in past and now **I**ncreased demand due to summer tourism **T**ransportation of water from island to island or from mainland to island	**N**ew technology for rainwater collection **E**conomize on water in peak use season **E**ducation of tourists **N**ew water sources **E**fficient use of water for agriculture, industry, domestic use	**D**o research on traditional water procurement methods **M**ake comparative studies of water consumption/use **U**se storage tanks and water-limiting devices **C**harge water fees **E**xplore desalination, recycling, solar ponds

Water resource management issues: quantity and quality problems

In some islands all 'conventional' water sources (rainwater catchments, surface water and groundwater) have been fully exploited and other methods such as importation or the more expensive option of desalinization are required. The replacement of shallow-rooted vegetation by deeper-rooted vegetation, such as coconut trees, is also assisting the depletion of freshwater groundwater systems in the humid tropics.

The degradation of water quality from a wide range of socio-economic activities makes this the most critical management issue. In response to increased demands for water from residents, tourism, industries and agriculture; over-abstraction from freshwater groundwater lenses is causing saline intrusion and contamination of many island groundwater aquifers. The escalation in island population densities is causing an acceleration in chemical, biological and microbiological pollution associated with the development of urban and some rural communities. Of particular concern are the various types of sewage disposal systems which are located too close to groundwater sources used for drinking water. It is this conflict of people living too close to their main source of potable water which encapsulates the small island water problem. The groundwater resources of coral atolls and low-lying limestone islands are particularly susceptible to pollution owing to their relatively thin and highly permeable soil. As a result, the normally accepted minimum distances between sewage disposal facilities to groundwater abstraction points are inadequate to prevent contamination. There is even the need for additional research to refine such guidelines of acceptable minimum distances, e.g. South Pacific islands.

Other pollution sources include solid waste disposal areas and leakage of fuels from pipelines and storage tanks. Location of solid waste disposal sites over or even excavated below the water table poses an especially acute problem. Fuel leaks are commonly associated with aircraft runways or land adjacent to sea ports used for fuel importation and storage. The increasing use of fertilizers, pesticides and herbicides in agriculture is also a pollution source for both groundwater and surface water.

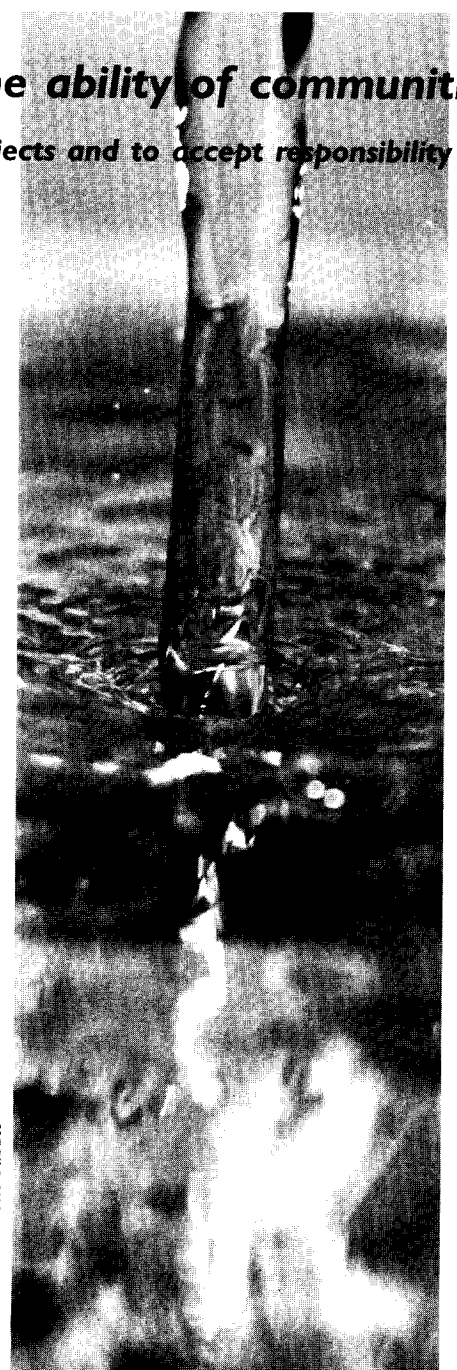
Poor land management, such as clearance of native vegetation, is causing increased turbidity levels in storm runoff which makes stream water temporarily non-potable. The turbidity can also produce problems for the supply networks through the clogging of water supply intakes and pumping systems, and increased siltation in reservoirs.

Problems are also encountered with water-supply systems. Inferior roofing materials can lead to contamination of even simple rainwater systems. Faulty joints or defective pipes in more sophisticated distribution systems can introduce contamination, even though the surface or groundwater sources are unpolluted.

Water policy issues

There is a need to develop or refine appropriate policy for water allocation to address the increasing conflicting demands on this resource. The local social, economic and political factors need to be taken into account in this process. Presently many islands have no water legislation because of non-recognition of the problem whereas in other cases, legislation is in place but is either inadequate, or too complex. Successful enforcement of legislation requires, and can only occur, through good communication and support at the small community level. This point emphasizes the need for interfacing the science/technology understanding of the occurrence and movement of water with the social and cultural aspects of the manipulation of this resource.

Inadequate institutional arrangements at a government level can also introduce barriers to effective water management, whereby water interests are fragmented amongst several government departments. This problem is further aggravated by inadequate trained personnel to administer the many-faceted functions associated with water supply.



Ivette Fabbri

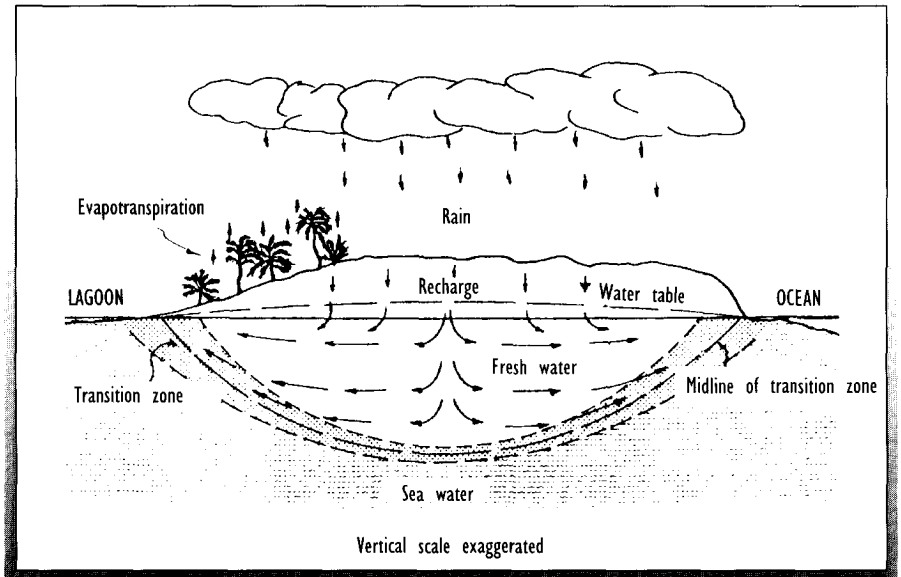
The ability of communities to participate in implementing the water development projects and to accept responsibility for their on-going operation and maintenance are vital factors

Planning needs in water resource management

Selection of a water source is important, and where alternative sources of fresh water resources are available, an effective planning process needs to be encouraged taking into account engineering, economic, social, environmental, legal and administrative factors. As part of the selection process, the conjunctive use of different classes of water needs to be encouraged based on the appropriate water quality levels for different uses. The ability of communities to participate in implementing the water development projects and to accept responsibility for their on-going operation and maintenance are vital factors. Such comments are particularly relevant to 'rural' communities within the framework of Village-Level Operation and Maintenance

(VLOM) principles based on the World Health Organization (WHO).

Appropriate protection and management policies for water catchments are essential for a safe water supply. It is desirable through legislation to subdivide selected areas of islands into watershed management 'protection' zones which can also fulfill the role of biodiversity protection. Examples where such zonings have taken place include Barbados and Guam. It is, however, the low-lying limestone islands and coral atolls, with their associated highly permeable soils and geology, which need the implementation of such protection zones.



An idealized cross-section through a typical small limestone or coral island, showing the main features of a freshwater lens. In most cases the thickest part of the freshwater lens is not in the centre as shown but is displaced towards the lagoon side. This is due to the lower permeability sediments on the lagoon side slowing down the mixing of the freshwater and sea-water, thus enabling a thicker freshwater zone to develop.

The graphic features in Small Tropical Islands: Water Resources of Paradise Lost (Falkland 1992), one of a series of illustrated non-technical IHP reports on water-related issues of the humid tropics and other warm humid regions.

COASTAL AND MARINE SYSTEMS

Small island nations have a large coastal area to land mass ratio. Their coastal environment is therefore particularly important, both socio-economically and culturally, and there is typically a high level of conflict of use of their coastal space and resources. This conflict is often accentuated by increasing population densities on the coast and by tourism development.

Small island nations usually have large marine exclusive economic zones for the size of their land mass and population. This conveys benefits, but it also implies important responsibilities for the management of these zones, this usually not being proportionally reflected in the existing means and allocation of funds in national budgets. Many island nations do not have the infrastructure and technical capability, nor the financial resources, to address the issue. Moreover, given the population size of many small island nations, it may be impractical to attempt to develop the technical capability (marine-related in particular) individually for each nation.

Major areas of concern

Deterioration of coastal marine habitats

Islands are faced with an increasing problem of coastal and beach erosion, due to the use of coral material and beach sand as building material, and by inappropriate forms of coastline engineering and tourism development.

Coastal problems are aggravated by the vulnerability to environmental change of many of the coastal habitats, such as coral reefs, seagrass beds and mangroves. Deterioration in coral reefs, for example, is caused by sewage discharge, often aggravated by tourism, and by land run-off in the form of erosion products and chemical fertilizers and pesticides. Run-off is aggravated by vegetation clearance for housing and hotels and by inappropriate agricultural techniques. Studies are needed to determine which organisms are sensitive to what components of the discharge/run-off and at what concentration, and to determine the pathways and residence times of these contaminants in the environment. In particular, the role of agricultural pesticides in coastal deterioration is poorly known.

Pollution of coastal zones

Islands are faced with increasing problems of coastal pollution of land origin, and of pollution threats of external origin. In addition to pollution from internal origin, the external pollutants include hydrocarbon pollution, originating from local and international shipping and offshore activities, and the fast growing threat of disposal of the toxic wastes of industrial nations in the exclusive economic zones of island nations and at land sites from which coastal waters can become contaminated.

Sustainability of coastal living resources

Coastal resources are easily accessible and therefore vulnerable to overexploitation. Most island nations have free-access fisheries, and their coastal resources are already overexploited. In relation to fisheries and marine resource management, two primary questions that must be answered are:

- For any particular marine resource, what is the appropriate level of exploitation?
- Is the stock/resource island-specific or is it shared with other islands or nations?

The characteristics of marine resources relevant to their exploitation differ greatly. Therefore, marine management must be resource-specific. Oceanic resources further offshore may offer a limited, but often poorly known, potential for increased exploitation. There is often considerable variation in abundance of these oceanic resources due to the influence of large-scale climatic processes. Understanding these effects will improve the predictive capability of those concerned with the oceanic fisheries.

For some island nations there is no scope for increased exploitation of living oceanic resources; for others, an expansion of fisheries is constrained by the past and present activities of foreign fishing fleets. Even where there is scope for increased sustainable exploitation, the information necessary to quantify and determine appropriate levels of exploitation may be lacking. There are opportunities for increasing fisheries production in small island states through mariculture and artificial reef systems, yet awareness of these opportunities is limited and training opportunities are few.

Some islands have maintained long traditions of marine and coastal systems management. In most cases, this knowledge is not recognized, and is deteriorating through neglect and replacement by new forms of technology and administration.

Non-living resources

The non-living oceanic resources of many island nations are under-utilized because of limited exploitation capacity coupled with inadequate information about the nature and extent of these resources. In some other cases, offshore non-living resources are extensively used for civil engineering purposes, leading to rapid degradation of the coastal marine environment. Excavation of such offshore zones may produce 'marine deserts' that often do not recover for a long time after excavation is stopped.

TWO DECADES OF COASTAL MARINE RESEARCH AND TRAINING EFFORTS

Since the 1970s, UNESCO's Coastal Marine (COMAR) Programme has fostered research and management programmes on coral reefs, mangroves, coastal lagoons, estuaries, seagrasses, beaches - practically all coastal marine systems - with a view toward their rational use and management. Such coastal zone studies and the associated capacity-building take on added importance in the case of small islands when one considers that a higher percentage of their territory is coastal zone - where a significant proportion of their populations live - and that the main source of protein comes from coastal resources.
In co-operation with other bodies (e.g. UNDP and the USA's National Science Foundation and John D. and Catherine T. MacArthur Foundation), a number of regional co-operative networks on coastal zones have been set-up within the framework of COMAR. In Asia and the Pacific, it has pooled specialists from 22 countries to help in research, management and training on mangroves and was instrumental in the creation of the International Society for Mangrove Ecosystems. Seventeen countries of West, East and Central Africa established a working structure for scientists, managers and students involved or interested in the coastal zone problems.
In the Caribbean, more than fifteen countries (which include about twenty laboratories and a data centre in Jamaica) share and compare data for improved assessment through a project called Caribbean Coastal Marine Productivity. In the Antilles, some ten island countries have worked through a COMAR project and with the technical support of the University of Puerto Rico in order to create a coastal monitoring programme to help combat erosion of their beaches.
Training and education form an essential part of UNESCO's co-operative activities in the coastal area in general and in small island nations in particular. Examples are described elsewhere in this report (e.g. see page 86).

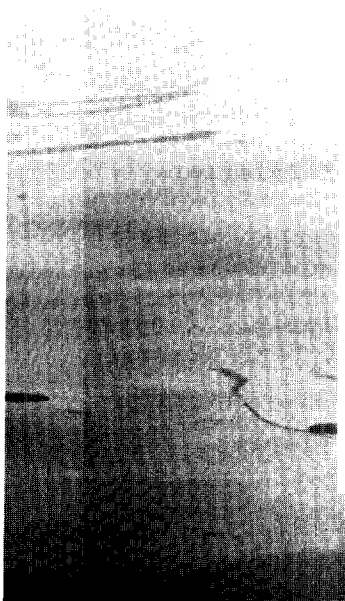
Needs for co-operative programmes

Management and monitoring

Both fisheries management and coastal zone management require comprehensive monitoring programmes to quantify the current state of the coastal resources and environment, to assess the rate of change and the recovery capacity, and to evaluate the impact of changes introduced by man. Two points should be stressed:

- An appropriate policy and administrative infrastructure dealing with national marine and coastal resources must exist and be able to negotiate and co-ordinate with foreign nations the exploitation of resources and measures for environmental conservation.
- The enforcement of management policy is enhanced by co-operation between the resource users and the public. Environmental awareness programmes for public and policy-makers are required. Resource users should be encouraged to be partners in management. Traditional knowledge of marine and coastal environment should be taken into account in modern management schemes, and traditional approaches to management should be considered whenever appropriate.

Some islands have maintained long traditions of marine and coastal systems management. In most cases, this knowledge is not recognized, and is deteriorating through neglect and

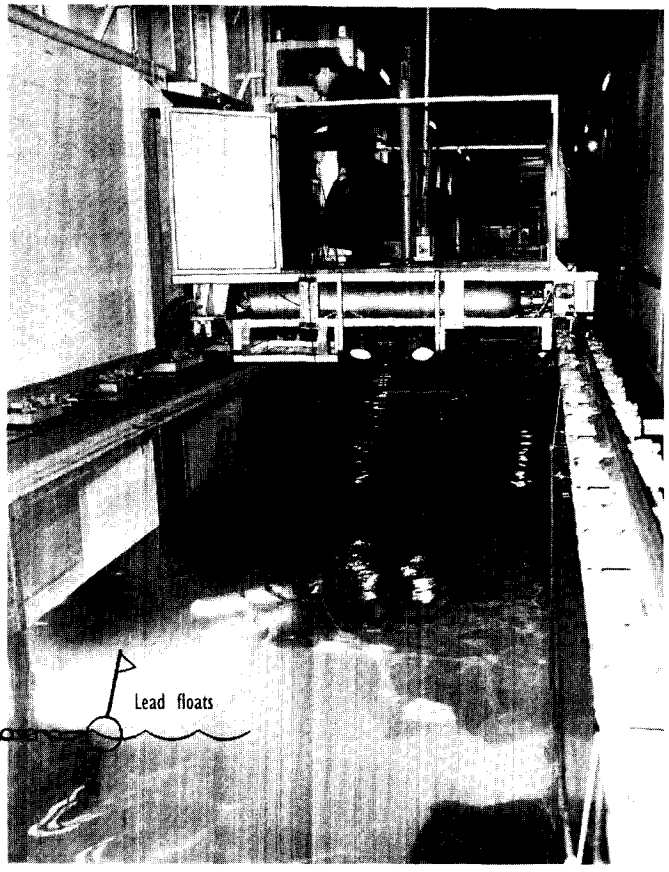


UNESCO ENVIRONMENT AND DEVELOPMENT BRIEF ON COASTS

'Coastal zones in small-island settings' is among the boxes in Coasts: Managing Complex Systems. Published in October 1993 as UNESCO Environment and Development Brief 6, the 16-page pamphlet aims to provide decision-makers with an authoritative and readable overview of key issues in integrated approaches to coastal zone management and the need for action (for further information, see page 127 of this review).

SCIENTIFIC DIVING: A GENERAL CODE OF PRACTICE

From the very beginning of research in the sea, scientists have made efforts to observe personally the marine environment below the surface. Marine biologists, in studying coral reefs and other fauna and flora in shallow water, made some progress through free diving. Others ventured deeper by using cumbersome diving suits which were dependent on life support from the surface. Later, submarines and tethered manned devices were to enter the scene as useful tools for *in situ* observations. However, the real breakthrough came in the mid-1940s with the development of the 'Self-Contained Underwater Breathing Apparatus', commonly known as the scuba or aqualung.

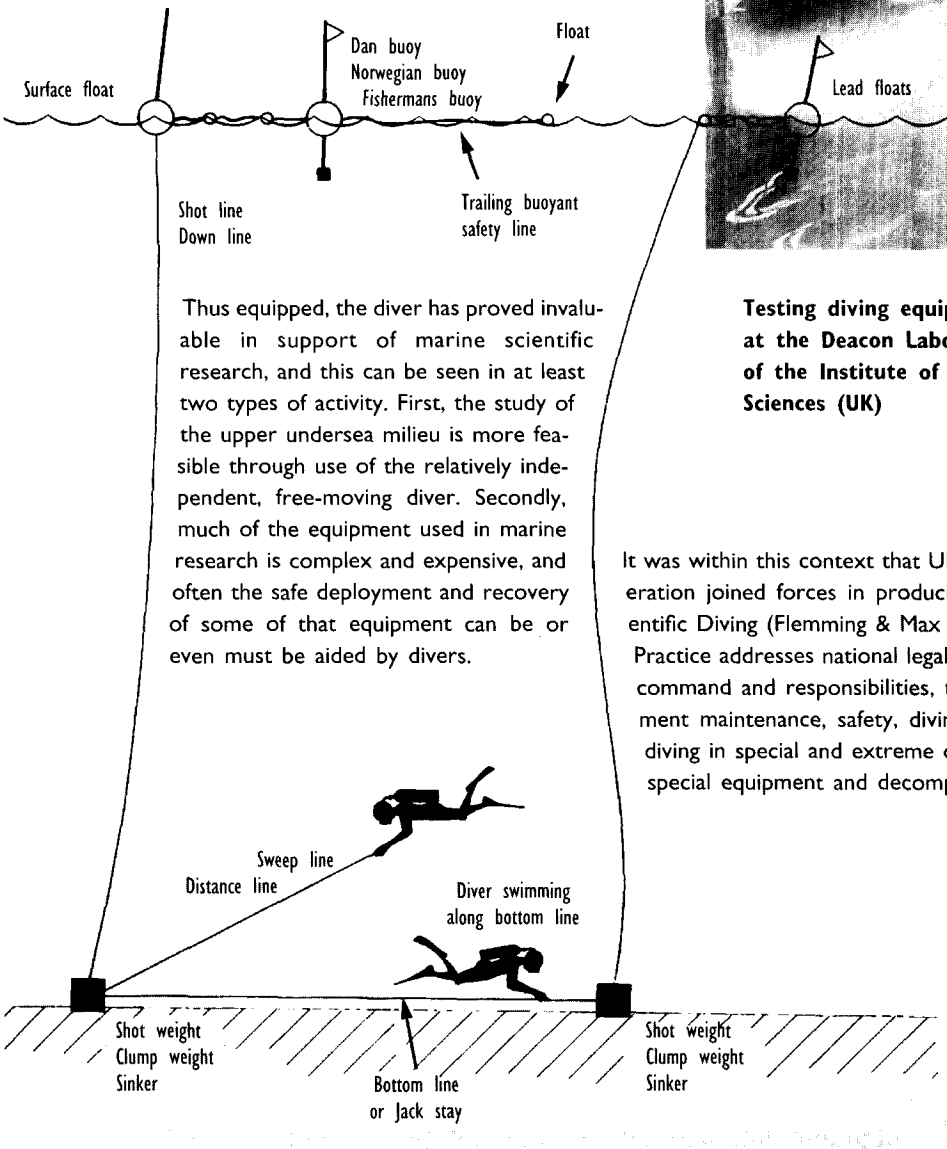


NERC-IOSDL

Testing diving equipment at the Deacon Laboratory of the Institute of Oceanographic Sciences (UK)

Thus equipped, the diver has proved invaluable in support of marine scientific research, and this can be seen in at least two types of activity. First, the study of the upper undersea milieu is more feasible through use of the relatively independent, free-moving diver. Secondly, much of the equipment used in marine research is complex and expensive, and often the safe deployment and recovery of some of that equipment can be or even must be aided by divers.

It was within this context that UNESCO and the World Underwater Federation joined forces in producing A General Code of Practice for Scientific Diving (Flemming & Max 1990). Among other topics, the Code of Practice addresses national legal aspects and organization, organization of command and responsibilities, training and medical examinations, equipment maintenance, safety, diving systems other than self-contained air, diving in special and extreme conditions, boats and support equipment, special equipment and decompression.



Ropes and lines that allow divers to work on and from the sea bottom

replacement by new forms of technology and administration.

Education and research

In many island nations, particularly those with no or limited higher education programmes, there is inadequate emphasis on basic marine science education and the relevance of research. Education and research in basic marine science should be emphasized, while recognizing that the needs of island states in marine science teaching and training are not distinct from those of other developing coastal states. A regional sharing of teaching and training resources and of infrastructure should be considered: for reasons of scale, it will not be possible for each and every island nation to develop the infrastructure and technical capability necessary to address the critical issues and problems of coastal and marine resource management.

A central constraint on the quality of marine science education and research is the funding required to attract and retain high quality staff, to underpin research programmes and to support research students within the programmes. Students will become increasingly computer literate, computer-assisted learning will increase, but this must not replace direct interaction between student and lecturer. Developed countries can best assist others by offering short-term training in the context of clearly defined specialist skills. The higher degree programmes for M.Sc. and Ph.D. should typically be conducted in the ecological and social circumstances in which the student will subsequently function.

Regional marine centres are a possible solution, if there is a strategy to provide for long-term continuity of funding, together with an agreement for regional cooperation. Islands are often ideal locations for oceanographic research and, because of their biotic diversity, for scientists interested in marine biotechnology and biodiversity. This may facilitate the development of regional marine centres.

Although many problems are, or will become, common to all islands, several factors vary considerably between islands: the current urgency of the problems; the capacity to address them; the environmental and resource characteristics of the islands, including their land area, population size and population growth. Consequently, the appropriate approach to assisting with the development and application of marine science on islands will necessarily be site-specific.

Communication and marine science

Through modern telecommunications, strong links are developing between the capitals of island nations and the rest of the world. However, communication systems within those island nations remain weak, which severely affects the use of a number of important warning systems vital for island nations (e.g. tsunami, hurricanes, cyclones).

Sustainability issues related to the marine coastal zone in island nations

In 1988, UNESCO undertook an enquiry among marine science specialists, to gauge opinions on challenges in training and education in marine science worldwide, with a focus on the year 2000. The results were diffused as Number 52 in the series of UNESCO Reports in Marine Science (UNESCO 1989a), with recommendations addressed to Island national governments (ING), Marine science educational and training institutions (MSET), UNESCO and Other international organizations (OIO):

- Identify and support the development of existing national and regional institutions to facilitate their roles in marine teaching, training, monitoring and research on both national and regional levels, and in providing advisory services to island governments (UNESCO, OIO).
- In situations where island nations have a marine science institute, but limited resources restrict development of full marine science capability, it is recommended that those institutes consider developing complementary programmes, each with a specific focus, in such a way that a regional sharing of expertise and research effort is possible (ING, MSET, UNESCO).
- For island nations concerned about their limited capacity to develop a marine science capability, it is recommended that they be given the necessary guidance and support to establish a basic level of infrastructure and expertise sufficient for monitoring resource and environmental trends, while for more complex and expensive research relying on appropriate arrangements with regional and other institutions (ING, UNESCO, OIO).
- Support the development of regional and interregional networks which facilitate the exchange of information and experience. An essential corollary of this is support for the necessary effort to improve the telecommunications infrastructure within island nations (ING, UNESCO, OIO).
- Conduct training programmes in the management of marine science information i.e. the collection, processing, storage and dissemination of data (OIO, MSET, UNESCO).
- Facilitate short-term training for island-nation scientists in clearly defined specialist skills in countries with a demonstrated competence in marine sciences. In this connection, it is strongly recommended that the field studies of students in research degree programmes be conducted in their own

STATUS AND RECENT HISTORY OF CORAL REEFS IN THE CARIBBEAN

Coral reefs of the world are in decline worldwide, from the impact of expanding human populations and pressures in the tropical coastal zone. The reefs of the Caribbean Sea and adjacent waters, about 12% of the global total area, are perhaps under the greatest threat given the small size of the Caribbean and its regional interconnection by ocean currents. Deforestation, leading to increased runoff and sedimentation, increased nutrients from sewage, over-fishing, and coastal construction and mining, have all been frequently cited as contributing causes.

Human impacts on reefs are superimposed on long-term changes brought about by natural factors including storms and hurricanes, white- and black-band diseases, and coral bleaching and other suspected manifestations of global climate change. Reef herbivore populations have also declined in the Caribbean, primarily through the die-off of the long-spined sea urchin *Diadema antillarum* in 1983-84 and over-fishing. The reduction in grazing by herbivores at some locations has resulted in increased algal abundance that inhibits coral growth and recruitment. Clearly, the structure of a coral reef in any particular location will be the result of the long-term interplay between human-induced and natural factors. There is a growing conviction that interdisciplinary studies conducted over the full range of regional development of coral reefs will provide the best opportunity to discriminate between these two factors so that the success of management of human impact may be evaluated.

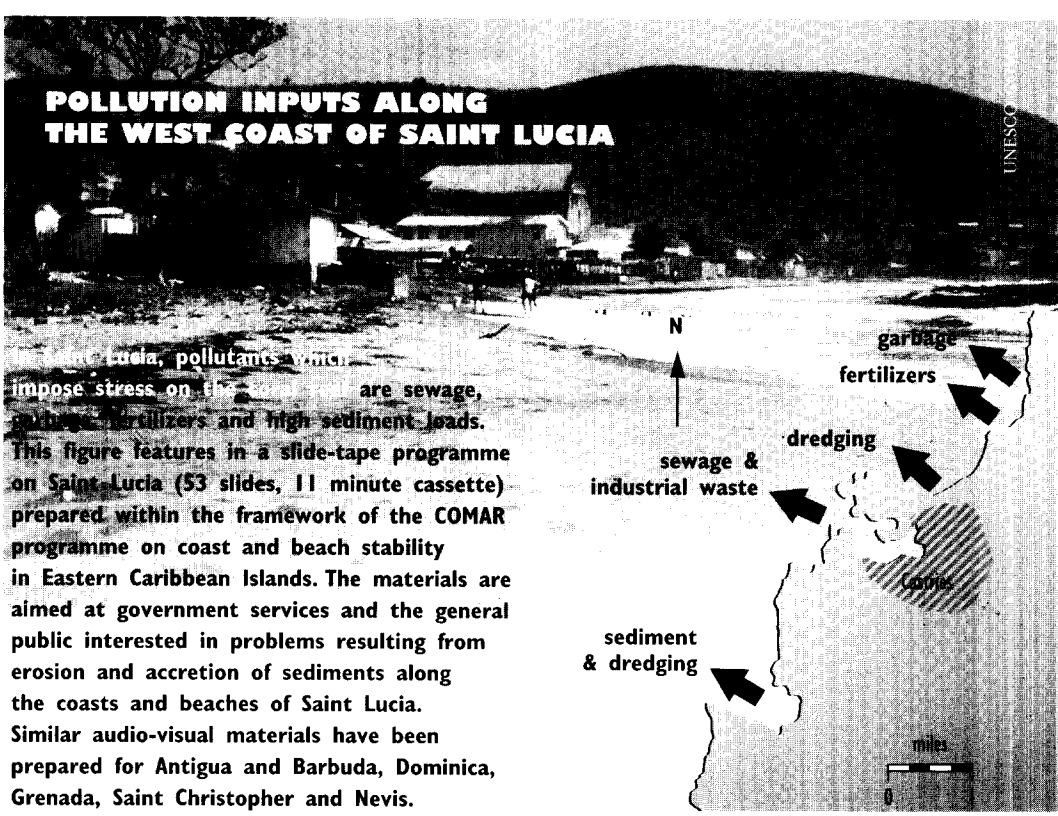
As part of long-term, region-wide comparative studies of the biodiversity and productivity of Caribbean coastal ecosystems, the Caribbean Coastal Marine Productivity (CARICOMP) network has gathered and compiled information on the recent history and status of coral reefs in the region. Results from a questionnaire completed by 14 marine laboratory members of CARICOMP indicate that coral cover has recently declined in eight of the 14 sites (Smith, Ogden *et al.* 1993). While much of the loss was attributed to natural events, nutrient-loading, sedimentation, and over-fishing were also implicated. Six sites reported algal cover as medium to high (10 - > 30%), the suspected result of reduced herbivory by over-fish-

over-fishing, *Diadema* mortality, and nutrient-loading. Nine of the sites reporting are located in marine parks, preserves, or areas of restricted access. Generally, coral cover has remained stable at these sites, except where threatened or damaged by direct tourist impact or distant forest clearing causing coastal sedimentation. This observation should encourage grass roots educational efforts as well as legislation to mitigate human impact on reefs. The long-term observations on these reefs sites which began in late 1992 under the CARICOMP programme will help to discriminate between natural variability and human impact and assist in sustained regional coral reef management.

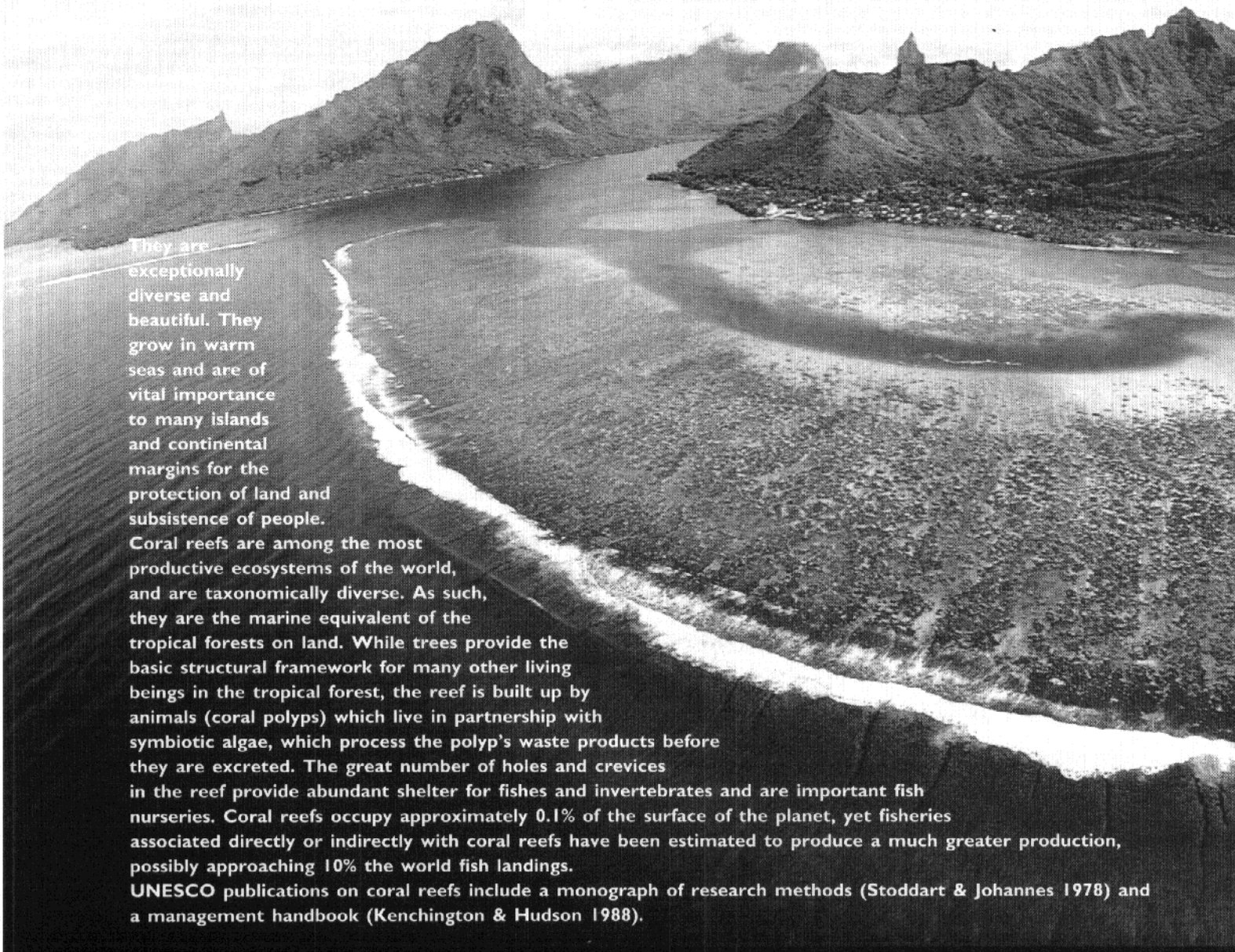
Status and history of changes on coral reef sites studied within the Caribbean Coastal Marine Productivity (CARICOMP) Network. After Smith, Ogden et al. (1993)

Location	Depth (m)	Exp.[1]	Coral Community[2] (Dominant spp.)	Coral Cover	Disturbance Events[3]	Algal Cover[4]	Diadema Abund.	Fish Community[5]	Fishing Pressure[6]	Other spp.[7]	Status[8]
Barbados	1-10	L	Ss, Pa, Aa, Ma, Mc	↓	H, S, P	L	↑	?	↑, ↓	?	↓?
Belize	11-15	W	Pp, Ma, Aa, Ac, Mm	↔	H, D	M	↓	Ac, Po, Sc	↓, ↑	G, Sp, Z	↔
Bermuda	7-8	W	Ds, Dl, Ma, Pa, Mc	↔	B	L	↓	Sc, Ac, Ky	↑, ↓	G	↔
Cayman	10	W	Ma, Mc, Ds, Dl, Ss	↔	H, B	L-M	↓	Sc, Ac, La	↓, ↓	G	↔
Colombia	3-7	W	Ac, Ap, Mm, Ss, At	↓	D, Dy, B, S	M, ↑	↓	?	↑, ↑	Sp, G	↓
Costa Rica	7-10	W	Ss, Aa, Pp, Ds, Mcp	↓	B, H, S, P	H	↓	?	↓, ↓	?	↓
Cuba	10-13	W	.....	.....	H	.....	↓	.....	↓, ↓	.....	↔
Jamaica	10-12	W	Ma, Aa, Pp, Dl, Mc	↓	H, B, D	H	↓	Po, Sc, Ac, Sr	↑, ↑	Sp, G	↓
Mexico	0-20	W	Mal, Mcp, Mc, Dc	↓	H	H	↓	La, Ac, Sc	↑, ↑	G, Sp, ?	↓
Nicaragua	14	W	Ma, Pa, At, Ap, Aa	↓ ?	P, Bl, H	M-H	↓	?	↑, ↑	G	↓
Saba	10	L	Ma, Ap, Ac, Mc, Ds	↔	B, H	M	↑	Sc, Sr, Bl, Lt	↓, ↓	Sp, G	↔
Saint Lucia	10	L	Ma, Cn, Mm, Dl, Mal	↔	B	L	↓	Po, My	↑, ↓	Z, Sp, Cr	↔
Tobago	9	L	Ma, Dc, Ss, Aa, Dl, Mal	↓	D, B, H, P, S	L	↓	Ac, Bl, Sc, La	↓, ↓	Sp	↓
Venezuela	3-13	L	Ma, Mcp, Cn, Mc, Ap	↓	D, Bl	L	↓	?	↓, ↓	Z, G, Sp	↔

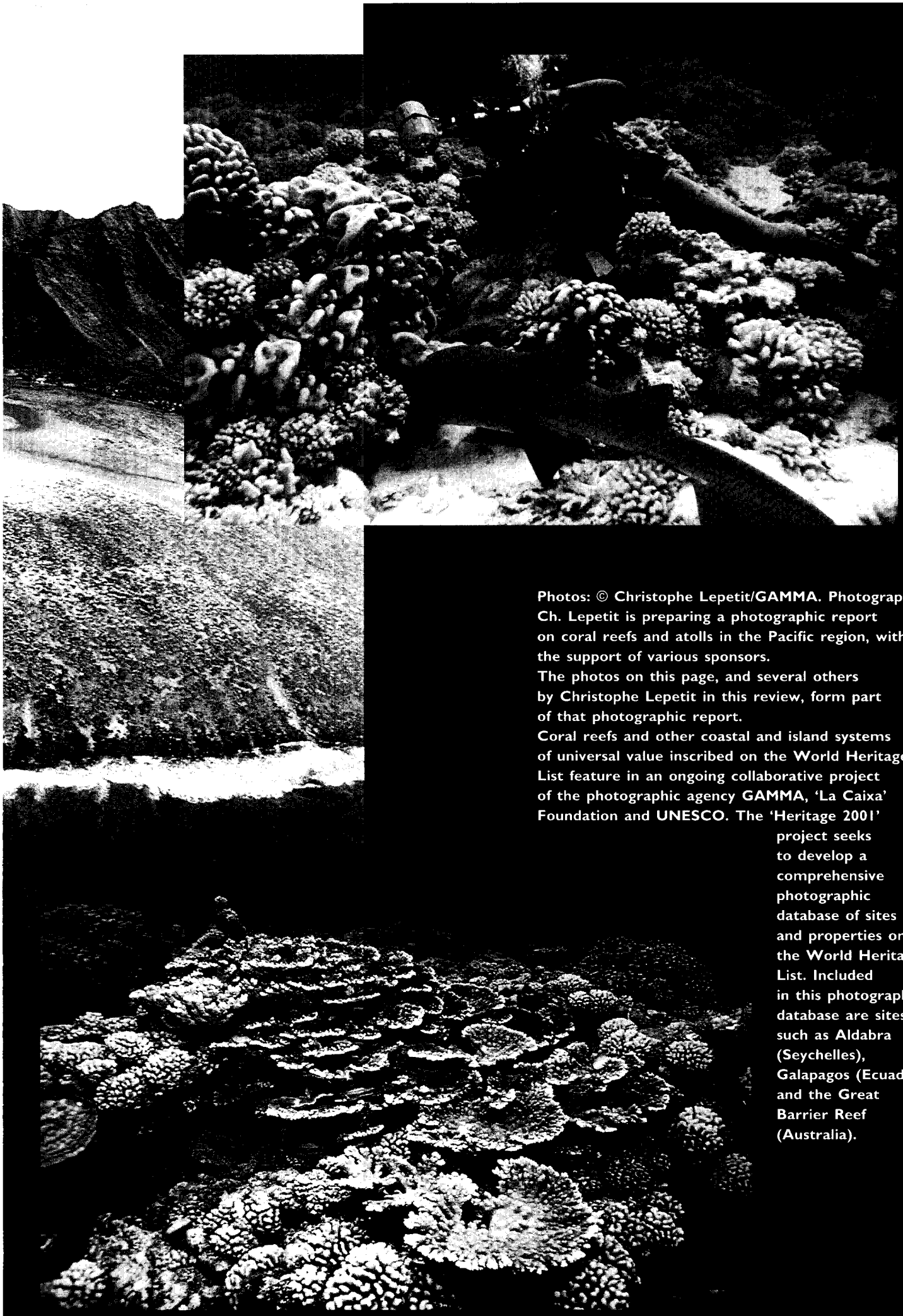
1. Exposure: W = windward, L = leeward
2. Corals: Ma = *M. annularis*, Mc = *M. cavernosa*, Mal = *M. alcicornis*, Mcp = *M. complanata*, Mm = *M. mirabilis*, Ac = *A. cervicornis*, Ap = *A. palmata*, Aa = *A. agaricites*, At = *A. tenuifolia*, Ds = *D. strigosa*, Dl = *D. labyrinthiformis*, Dc = *D. clivosa*, Ss = *S. siderea*, Cn = *C. natans*, Pa = *P. astreoides*, Pp = *P. porites*
3. Disturbances: B = bleaching, H = hurricane, D = disease, Dy = dynamite, S = sedimentation, P = pollution
4. Macro-algal coverage: L = low (< 10%), M = medium (10-30%), H = high (> 30%)
5. Fish families: Sc = Scaridae, Ac = Acanthuridae, Po = Pomacentridae, Sr = Serranidae, Ky = Kyphosidae, La = Labridae, Bl = Balistidae, Lt = Lutjanidae
6. Fishing Pressure: first arrow = historical, second = present status
7. Dominant invertebrate taxa: G = gorgonians, Sp = sponges, Z = zooanthids, Cr = crinoids, ? = unknown or unreported data
8. Status of reefs since mid 1980s. Arrows: ↔ = unchanged, ↓ = low or decreasing, ↑ = high or increasing



Saint Lucia, pollutants which impose stress on the coastal zone are sewage, garbage, fertilizers and high sediment loads. This figure features in a slide-tape programme on Saint Lucia (53 slides, 11 minute cassette) prepared within the framework of the COMAR programme on coast and beach stability in Eastern Caribbean Islands. The materials are aimed at government services and the general public interested in problems resulting from erosion and accretion of sediments along the coasts and beaches of Saint Lucia. Similar audio-visual materials have been prepared for Antigua and Barbuda, Dominica, Grenada, Saint Christopher and Nevis.



They are exceptionally diverse and beautiful. They grow in warm seas and are of vital importance to many islands and continental margins for the protection of land and subsistence of people.
Coral reefs are among the most productive ecosystems of the world, and are taxonomically diverse. As such, they are the marine equivalent of the tropical forests on land. While trees provide the basic structural framework for many other living beings in the tropical forest, the reef is built up by animals (coral polyps) which live in partnership with symbiotic algae, which process the polyp's waste products before they are excreted. The great number of holes and crevices in the reef provide abundant shelter for fishes and invertebrates and are important fish nurseries. Coral reefs occupy approximately 0.1% of the surface of the planet, yet fisheries associated directly or indirectly with coral reefs have been estimated to produce a much greater production, possibly approaching 10% the world fish landings.
UNESCO publications on coral reefs include a monograph of research methods (Stoddart & Johannes 1978) and a management handbook (Kenchington & Hudson 1988).



Photos: © Christophe Lepetit/GAMMA. Photographer Ch. Lepetit is preparing a photographic report on coral reefs and atolls in the Pacific region, with the support of various sponsors.
The photos on this page, and several others by Christophe Lepetit in this review, form part of that photographic report.
Coral reefs and other coastal and island systems of universal value inscribed on the World Heritage List feature in an ongoing collaborative project of the photographic agency GAMMA, 'La Caixa' Foundation and UNESCO. The 'Heritage 2001' project seeks to develop a comprehensive photographic database of sites and properties on the World Heritage List. Included in this photographic database are sites such as Aldabra (Seychelles), Galapagos (Ecuador) and the Great Barrier Reef (Australia).

country or region wherever possible. This accustoms the student to performing in the prevailing social and environmental circumstances, adds to the information, on local marine organisms and environment, and serves to assist the development of regional research centres (ING, MSET, UNESCO, OIO).

- Encourage dialogue among marine scientists, economic planners and political decision-makers with a view to greater recognition of the role of the marine sciences in island-nation development and to improving the administrative infrastructure necessary for coastal zone and fishery management. Support this with appropriate training programmes (ING, MSET, UNESCO, OIO).
- Encourage the incorporation of marine science teaching into primary and secondary school curricula, and support the development of marine environmental awareness programmes (ING, UNESCO).
- Support the development of distance teaching for marine sciences as a means of making the best use of scarce teaching and training resources in small and scattered island populations (ING, UNESCO).
- In those island nations where long-established coastal communities retain a store of traditional knowledge about the marine environment and resources, encourage and support efforts to document, interpret and apply that knowledge in the marine sciences and in marine resource management (ING, MSET, UNESCO).
- Through teaching and training, seek to impart a capacity to recognize and understand the nature and relevance of traditional community-based systems of island marine resource management, and to draw from them ideas and information for teaching and training (ING, UNESCO, OIO).
- Support training aimed at improving the capability of island nations in surveillance of their exclusive economic zones and in foreign-access negotiations on research and on exploitation of their living and non-living resources (OIO such as FAO, UNESCO).
- Support the development of the marine sciences necessary for mariculture, and support training in mariculture techniques appropriate to island nations (OIO such as FAO, UNESCO).

CONSERVATION OF THE NATURAL HERITAGE AND BIOLOGICAL DIVERSITY

UNESCO's involvement in conservation issues dates back more than forty years, to the early days of the organization in the late 1940s - when biologist Julian Huxley was the first Director-General and the small secretariat for its fledgling science programmes included tropical botanist E.G.J. Corner.

Among UNESCO's first important actions in those early years was joining forces in 1948 with the French government to organize a conference at Fontainebleau which gave birth to the International Union for the Protection of Nature and Natural Resources (IUCN), now the World Conservation Union. The following year saw the publication of the results of a wide-ranging survey of conservation education in twenty-five centres. This survey provided one oftthe key inputs to a UN conference on the conservation of natural resources held at Lake Success.

Since the late 1940s, many new organizations and programmes devoted specifically to nature conservation have been set up and UNESCO has developed cooperative links and activities with many of these institutions. UNESCO's own continued involvement in conservation includes the servicing of two international instruments for the conservation of the natural heritage - the international network of biosphere reserves and the World Heritage Convention. Many of the sites recognized within these two instruments represent privileged areas for the conservation and study of biological diversity. More recently, UNESCO has been involved in technical studies related to the Convention on Biological Diversity, signed at Rio in 1992.

Protecting biological diversity and the natural heritage

The topic of biological diversity is receiving widespread interest in both the scientific and the popular press. Biological diversity is perceived from many angles: ethical and religious, aesthetic and emotive, economic and utilitarian, legal and mandatory, scientific and technological. UNESCO's actions include the establishment and servicing of two international instruments for the *in situ* conservation of biological diversity and the natural heritage.

Biosphere reserves are protected areas of representative ecosystems that have been recognized within the MAB Programme for their importance in providing the scientific knowledge, skills and human values needed to support sustainable development (UNESCO 1984a). Biosphere reserves constitute the only international framework of protected areas at the intergovernmental level that combines conservation with development, research with demonstration and education with training. In early 1994, there were 324 biosphere reserves in 82 countries, a number in island settings. Their size ranges from the 500 ha of North Bull Island (Jeffrey *et. al.* 1977) to the 70 million ha of the Northeast Greenland reserve.

The Convention concerning the Protection of the World Cultural and Natural Heritage was adopted by the UNESCO General Conference in 1972. Twenty-two years later, in early 1994, the Convention had been ratified by 136 States

The World Heritage site of the Vallée de Mai on Praslin Island (Seychelles) is noted for the extraordinary palm, the coco de mer, and also has the endemic black parrot. The size of the site is small (18 hectares), and its expansion is being considered by the national authorities.

Examples of Small-Island Biosphere Reserves and World Heritage Sites.

COUNTRY	SITE	DATE OF APPROVAL	
Australia	Macquerie Island[1]	1977	
	Lord Howe Island[2]	1982	
	Fraser Island[2]	1992	
Canada	Anthony Island[2]	1981	
Chile	Juan Fernandez[1]	1977	
Ecuador	Galapagos[1,2]	1984	1978
Estonia	West Estonian Archipelago Biosphere Reserve[1]	1990	
Finland	Archipelago Sea Area	1993	
France	Réserve de biosphère d'Iroise[1]	1988	
	Guadeloupe Archipelago[1]	1992	
Greece	Gorge of Samaria (Crète)[1]	1981	
Indonesia	Komodo National Park[1,2]	1977	1991
	Siberut[1]	1981	
Ireland	North Bull Island[1]	1981	
Japan	Yakushima Island[1,2]	1980	1993
Mauritius	Macchabee/Bel Ombre Nature Reserve[1]	1977	
Philippines	Puerto Galera Biosphere Reserve[1]	1977	
	Palawan Biosphere Reserve[1]	1990	
Seychelles	Aldabra Atoll[2]	1982	
	Vallée de Mai[2]	1983	
Spain	Canal y los Tiles (Canary Islands)[1]	1983	
	Garajonay (Canary Islands)[2]	1986	
	Reserva de la Biosfera de Lanzarote[1]	1993	
	Reserva de la Biosfera de Menorca[1]	1993	
Tunisia	Parc national des Iles Zembra et Zembretta[1]	1977	
United Kingdom	Isle of Rhum National Nature Reserve[1]	1976	
	St. Kilda National Nature Reserve[1,2]	1976	1986
USA	Aleutian Islands National Wildlife Refuge[1]	1976	
	Channel Islands[1]	1976	
	Luquillo Experimental Forest (Caribbean NF)[1]	1976	
	Virgin Islands National Park & Biosphere Reserve[1]	1976	
	Isle Royale (Great Lakes)[1]	1980	
	Hawaii Island Biosphere Reserve[1]	1980	
	Hawaii Volcanoes National Park[2]	1987	

1. Biosphere Reserves
2. World Heritage Sites

Parties, and as such constitutes the most universal international legal instrument in the field of conservation. At the heart of the strategy adopted for the World Heritage Convention (Thorsell 1992) are the goals of establishing a credible and universally representative World Heritage List, of protecting, conserving and managing effectively these irreplaceable sites, and of building public awareness and mobilizing skills and resources for preventive and curative World Heritage work. As of early 1994, 411 sites of outstanding and universal value are included on the World Heritage List. Of these sites, 305 are cultural, 90 are natural and 16 are mixed, combining both natural and cultural properties. They are located in 95 State Parties.

Among the sites contributing to the international network of biosphere reserves and the World Heritage List are a number of small islands and archipelagoes. Conservation in areas such as these is promoted through such means as the exchange of information and experience among insular protected areas, the provision of technical assistance and training opportunities, and the development of comparative studies among groups of islands. Examples of actions within the World Heritage Convention have included support to international efforts to assess and mitigate fire damage that affected more than 30,000 hectares of Isabel Island in the Galapagos in 1985.

A number of the small islands figuring on the biosphere reserve and World Heritage lists feature in a special dossier on protected areas in the

December 1993 issue of INSULA's *International Journal of Island Affairs*. Articles address such topics as: biosphere reserves, islands, archipelagoes and coastal areas (Robertson 1993), the World Heritage Convention and the protection of the outstanding cultural and natural heritage of islands (von Droste and Rössler 1993), islands meriting World Heritage status (Thorsell 1993); and protected areas and sustainable development in small islands (Ishwaran 1993). Other articles are focussed on protected areas and conservation in particular regions and island settings, including Menorca (Rita *et al.* 1993), Lanzarote (Marin 1993), Hiiumaa (Kokovkin 1993), the Baltic Sea Region (Dogsé 1993), Corsica-Sardinia transboundary co-operation and the development of international parks (Merler 1993). Actions to conserve biodiversity through international instruments such as biosphere reserves and World Heritage sites are complemented by advisory visits and extra-budgetary projects of various kinds. One recent example, in 1993, was an inter-agency mission (UNDP-FAO-UNESCO) to Socotra to outline a programme of sustainable development, and to advise the government of Yemen on the possible development of Socotra as a biosphere reserve. Another recent initiative concerns a UNDP-UNESCO-IUCN project to underpin national environmental planning in Islamic Federal Republic of Comoros, which has included a diagnosis of the marine and coastal environment (see page 101).

Conservation as part of sustainable development

For many people, conservation means not just the preservation of genetic materials, species, ecosystems and but rather the wise management of natural resources. Within such a perspective, recent trends in the evolution of the biosphere reserve concept within UNESCO's Man and the Biosphere (MAB) Programme have included its use as a tool for testing approaches to sustainable development, with protected areas as part of a broader regional landscape and ... seascape.

Since the mid-1980s, increased emphasis has been given to the multiple functions of biosphere reserves, particularly with a view to upgrading and establishing fully-functioning biosphere reserves which perform three main roles: (a) conservation *in situ* of the diversity of natural and semi-natural ecosystems and landscapes; (b) establishment of demonstration areas for ecologically sustainable land and resource use; and (c) provision of logistic support for research, monitoring, education and training related to conservation and sustainability issues.

These functions are associated through a zonation system consisting of a core area or areas which are the most natural and are strictly protected, with minimal human disturbance. A buffer area accommodates more human activities such as research, environmental education and training, as well as tourism and recreation. A third zone, the transition area, serves as a liaison with the larger region in which the biosphere reserve lies and promotes in particular the development concern with activities such as experimental research, rehabilitation, human settlements and agriculture. Efforts are made to develop co-operative activities among research scientists, land owners, farmers, and local populations, and hence the management of this zone requires innovative co-ordination mechanisms.

Multiple functions and zoning for different uses are very much part of such regional units - what could also be called 'working models' or 'laboratory regions', for exploring approaches to

PIRRUJAAK - SHEDING LIGHT ON THE WEST ESTONIAN ARCHIPELAGO BIOSPHERE RESERVE

Pirrujaak is the name of a series of semi-popular reports produced by the Hiiumaa Centre for the West Estonian Archipelago Biosphere Reserve. It takes its name from the custom of people on the island of Hiiumaa using burning sticks (*pirrus* in Estonian) placed in a holder to provide light. On Hiiumaa (surface area 1000 km^2, the second largest island in Estonia), these holders were called *Pirrujaak* (fire-stick Jack). Sometimes while working, some clever people improvized by holding the burning sticks in their mouths. Then they became a *Pirrujaak* themselves. The *pirru*-light was not very bright and a person walking in the dark could not see the obstacles which lay in the path. However, at least he or she made themselves visible to others.

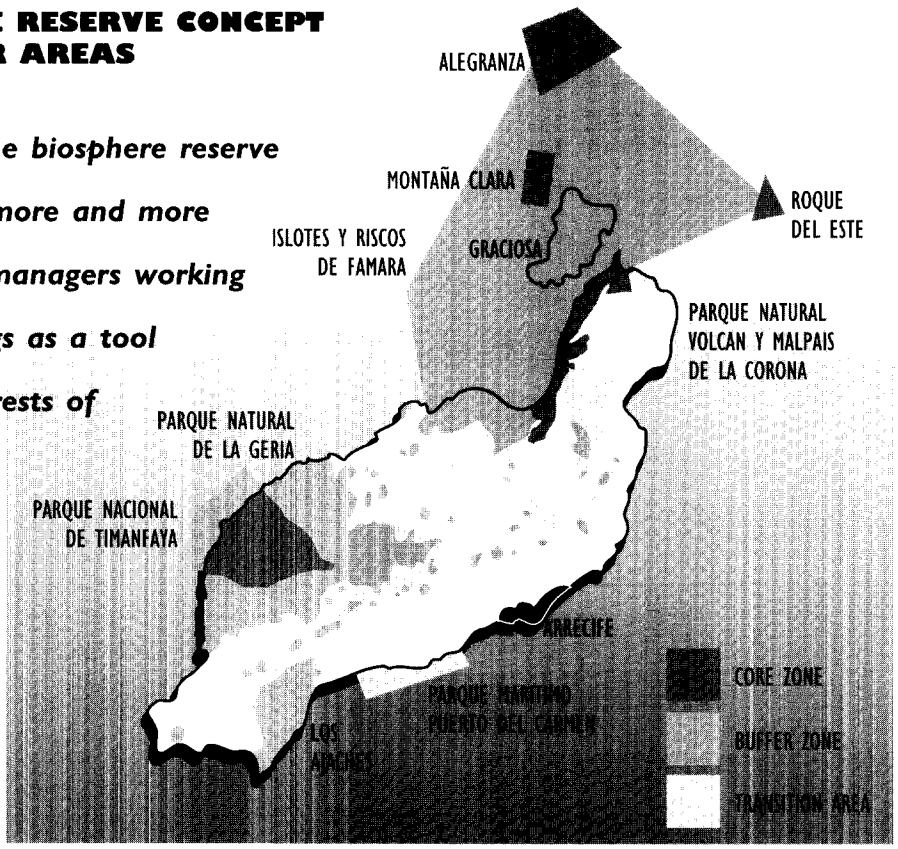
The *Pirrujaak* symbolizes the idea that you must make the best use of whatever resources you have. In the English summary of the first number of the series, authors Maie Jeeser, Toomas Kokovkin and Kai Vahtra (1993) somewhat self-deprecatingly comment that the 'series may be only a dim light not fully illuminating everything about Hiiumaa Island, but it will serve its purpose in making Hiiumaa visible to the world's community'.

The first number in the series seeks to describe the treasures of Hiiumaa. In the newly independent Estonia, the local communities have regained the power to make decisions in a number of areas that formerly were under the control of the state. One area of change is that which affects private enterprise and land ownership. These changes place nature conservation in a new position. Greater collaboration with local communities is needed and conservation needs to be placed within the broader context of regional planning.

The purpose of this booklet is to describe the nature values of Hiiumaa Island. The idea is to inform decision-makers, business people and private persons about the protected areas on the island, and to propose the alternative areas that could be used (e.g. for tourism). The booklet describes the different kinds of natural features already protected by national and local laws on Hiiumaa (there are forty core areas in the biosphere reserve where human activity is restricted), zoning of the biosphere reserve and delineation of areas under strict protection, notable flora (over 50 rare species of higher plants) and fauna (over 500 elk, 500 red deer, 700 roe deer, lynx, martens, golden eagles, avocets), glossary of ecological terms.

APPLYING THE BIOSPHERE RESERVE CONCEPT TO COASTAL AND INSULAR AREAS

During the last few years, the biosphere reserve concept has been receiving more and more interest from scientists and managers working in coastal and insular settings as a tool for reconciling different interests of conservation, research, tourism development, industry, traditional fisheries, pollution monitoring, etc.



The value of biosphere reserves, encompassing both land and sea parts and their interface, lies in integrating conservation, research, and development goals in a single, publicity-supported, management scheme. This multi-purpose management can be achieved through the use of zoning, in which core, buffer, and transition areas carry different requirements for protection and human use.

However, the principles and guidelines for biosphere reserves are not always easily adaptable to the coastal-marine area. For example, how does one adapt the zonation of the biosphere reserve - core, buffer and transition area - to the three dimensional, moving water environment of islands and coasts? Can one identify and protect core areas?

Seeking possible answers to these and other questions has led to a preliminary set of suggestions and recommendations for the application of the biosphere reserve concept in coastal marine areas, elaborated as a joint venture of the MAB and COMAR programmes of UNESCO and its IOC and the Marine Programme of IUCN (Batisse 1990, Price & Humphrey 1993).

LANZAROTE BIOSPHERE RESERVE, SPAIN

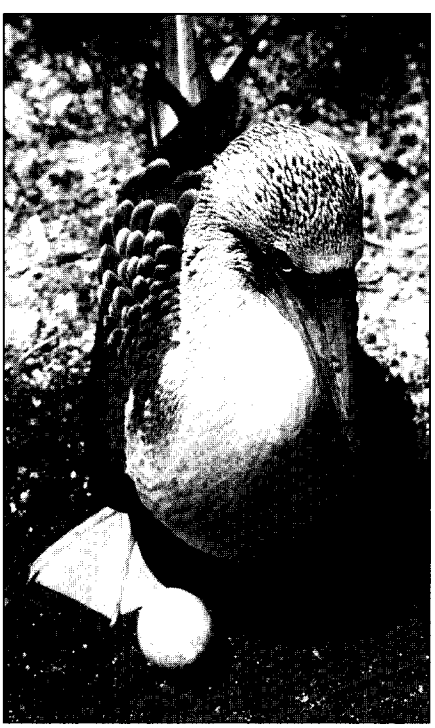
At the field level, the biosphere reserve of Lanzarote in the Canary Islands of Spain is among the sites where different sectors of the community have joined together to seek solutions to problems of conservation and development. Plans and proposals were presented at a series of inaugural events in Lanzarote in November 1993, and are described in a six-volume set of reports on the proposed strategy for the Lanzarote's future development as a biosphere reserve (Goberno de Canarias, Cabildo de Lanzarote 1993).

In terms of zonation, the core area is focused on the Parque Nacional de Timanfaya, with six nature parks in the buffer zone. The biosphere reserve also includes 38.000 hectares of contiguous marine systems.

sustainable development (UNESCO 1993b, pages 42-43). Such a role is also very much in line with current thinking on conservation areas being considered as part of a broader landscape (and seascape) matrix, and with encouraging cross sectoral and participatory approaches to sustainable development in different ecological and socio-cultural settings. Reflecting this trend, are changes in the configuration and functioning of several biosphere reserves established in the 1970s and early 1980s and the nature of many of the new areas that have been added to the international network of biosphere reserves during the last decade. On continental areas, these newly-established reserves have tended to comprise large regional complexes. Another reflection, in island situations, has been the setting up of whole-island biosphere reserves, such as those of Menorca and Lanzarote in Spain.

As part of the drive to testing approaches to sustainable development in island situations, steps have also made to develop collaborative studies among groups of biosphere reserves in particular regions. One example, building upon earlier experience in smaller Mediterranean islands (see pages 48 and 101), has entailed a planning meeting in the Brittany island of Ouessant (France) in March 1993, to develop research protocols for a four-year (1993-1996) programme of co-operation among the Molène archipelago in the Iroise Sea (France), the island of Hiumaa in the West Estonian Archipelago Biosphere Reserve, the whole-island biosphere reserve of Menorca (Spain) and the proposed biosphere reserve of the Bijagos archipelago (Guinea Bissau). Particular attention has been given to compara-

tive studies on the ecological and socio-economic relationships between people, environment and landscapes, within a perspective of sustainable development. The 25-page workshop report (Brigand & Bionet 1993) outlines the objectives of the proposed *Archipel* network and provides a summary of each of the four island groups in terms of composition of research team, ongoing or completed studies, publications, island setting (geography, history, human settlement, biota, etc.) and available maps. The proposed research programme includes the preparation of a synthetic monograph on each of the four sites, studies on indicators of economic, social and ecological change in small island situations, and integrated environmental mapping of each biosphere reserve. These provisional plans were further discussed at a follow-up workshop on the island of Menorca in November 1993.



UNESCO/ANDES, CZAP

The Galapagos Archipelago, a World Heritage Site and Biosphere Reserve, comprises 16 islands and is one of the largest marine and coastal protected areas in the world.

It is home to 229 endemic plants and five endemic birds.
The Government of Ecuador and the Charles Darwin Foundation (founded under the auspices of UNESCO) are co-sponsors of the Charles Darwin Biological Station, established to promote scientific study and protect the islands' indigenous species.
Recent developments include the proposed extension of the World Heritage site into the marine area.

Small islands and conservation science

Small islands have long played an important role in scientific studies on the genetic diversity and evolution of living beings. A century-and-a-half ago, observations on the Galapagos Islands were critical is shaping Charles Darwin's revolutionary Theory on Natural Selection. And in the latter part of the present century, topics such as island biogeography have figured prominently in the theory, concepts and practices of population biology and conservation science. A number of the islands contributing to the international networks of biosphere reserves and of World Heritage sites are important for scientific studies related to conservation biology.

One example is that of genetically effective population sizes of Darwin's Finches on the Galapagos. A central concept in conservation biology is that of the genetically effective size of a population. The smaller the population, the higher the rate of genetic loss by random processes (all other things being equal) and the more vulnerable it is to extinction through the influence of random demographic and environmental factors. In some ways, Darwin's Finches on the Galapagos Islands are ideal for developing an understanding of how small populations respond to the hazards that could ultimately lead to their extinction. Some of their populations are small, spatially restricted, and occupy habitats that have never been disturbed by humans. A complete enumeration of births and deaths is feasible for some of them. Thus they provide an opportunity for establishing how population numbers and structure change under the influence of entirely natural, fluctuating, environmental conditions. It was within such a perspective that Princeton University researchers Peter Grant and Rosemary Grant have studied the demography of two species of Darwin's Finches (*Geospiza scandens* and *G. fortis*) on Isla Daphne Major, a small (40 hectare) volcanic island in the centre of the Galapagos archipelago (Grant & Grant 1992). Average effective sizes for the two species were as low as 38 (*G. scandens*) and 60 (*G. fortis*) by one method of calculation, and slightly larger by another. The demographic features that enable the finch species to persist in the face of extreme environmental stochasticity are a high maximum life-span, a generally high adult survival under the stressful conditions of drought, a flexible period of maturity, and a high reproductive rate. Despite their relatively small effective population sizes and the likelihood of genetic impoverishment through random drift, they remain genetically variable through gene flow, principally hybridization.

The Convention on Biological Diversity and Island States

The Convention on Biological Diversity was signed by 157 Governments and the European Economic Community during the United Nations Conference on Environment and Development in Rio de Janeiro in June 1992. The objectives of the Convention are 'the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the

benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.' (UNEP 1992a).

The Convention on Biological Diversity is the outcome of several years of complex negotiations, involving a wide range of issues on which developed and developing countries had difficulties to agree. Some observers might consider that the Convention text is often rather weak in outlining in any detail what countries actually should do (it contains no lists of species or of ecosystems that should be conserved, for example). Moreover, several paragraphs are open to different interpretations. Nevertheless, the Convention is seen as an important international instrument for promoting change in the way societies interact with the natural environment. This optimism can be based on some of the more tangible commitments in the Convention, which, although frequently qualified with the terms 'as far as possible' and 'as appropriate', provides a comprehensive framework for action.

A larger number of island states (30 countries, or 20%) were among the first to sign the Convention. As of early March 1994, 51 countries had ratified the Convention, of which 15 are small island states.

There are several reasons why small island states are so interested in the Convention: Firstly, they are explicitly referred to in the Convention in relation to financial issues; secondly, many small island states have long realized the importance of the conservation and sustainable use of biological diversity, be it for direct extractions (such as

REFERENCES TO SMALL ISLAND STATES IN THE CONVENTION ON BIOLOGICAL DIVERSITY

Preamble

The Contracting Parties,

Acknowledging that the provision of new and additional financial resources and appropriate access to relevant technologies can be expected to make a substantial difference in the world's ability to address the loss of biological diversity,

Acknowledging further that special provision is required to meet the needs of developing countries, including the provision of new and additional financial resources and appropriate access to relevant technologies,

Noting in this regard the special conditions of the least developed countries and small island States.

Article 20. Financial Resources

- The Parties shall take full account of the specific needs and special situation of least developed countries in their actions with regard to funding and transfer of technology.
- The Contracting Parties shall also take into consideration the special conditions resulting from the dependence on, distribution and location of, biological diversity within developing country Parties, in particular small island States.
- Consideration shall also be given to the special situation of developing countries, including those that are most environmentally vulnerable, such as those with arid and semi-arid zones, coastal and mountainous areas.

View from Bartholomé Island, Galapagos

Jim W. Thorsell

Island States that have signed and/or ratified the Convention on Biological Diversity

Country	Date signed
Antigua and Barbuda	5 June 1992
Australia	5 June 1992(*)
Bahamas	12 June 1992(*)
Barbados	12 June 1992(*)
Cape Verde	12 June 1992
Comoros	11 June 1992
Cook Islands	12 June 1992(*)
Cuba	12 June 1992(*)
Cyprus	12 June 1992
Dominican Republic	13 June 1992
Fiji	(*)
Haiti	13 June 1992
Indonesia	5 June 1992
Jamaica	11 June 1992
Japan	13 June 1992(*)
Maldives	12 June 1992(*)
Malta	12 June 1992
Marshall Islands	12 June 1992(*)
Mauritius	10 June 1992(*)
Micronesia	12 June 1992
Nauru	5 June 1992(*)
New Zealand	12 June 1992(*)
Papua New Guinea	13 June 1992(*)
Philipines	12 June 1992(*)
Saint Nevis	12 June 1992(*)
Saint Lucia	(*)
Samoa	12 June 1992(*)
Sao Tome and Principe	12 June 1992
Seychelles	10 June 1992(*)
Solomon Islands	13 June 1992(*)
Sri Lanka	10 June 1992
Tonga	12 June 1992
Trinidad and Tobago	11 June 1992
Tuvalu	8 June 1992
Vanuatu	9 June 1992(*)

(*) Island states that have subsequently ratified the Convention on Biological Diversity (as of early March 1994).

fisheries or logging) or non-extractive use (such as eco-tourism) or indirect use (such as ecosystem services). Island states therefore feel that it is imperative to have an international convention within which their concerns and interests can be elaborated.

Many countries in the South, including many small island states, hope that the Convention will facilitate the transfer of additional financial resources to enable them to undertake investments in conservation and the sustainable use of their biodiversity. It is presently not possible, however, to estimate the impact of the Convention in terms of additional future biodiversity investments (Dogsé 1992). Articles in the Convention related to financial issues appear to be open to different interpretations and future negotiations will be necessary among its Contracting Parties before assessments can be made on its financial effects.

Most likely there will also be tough discussions on which developing countries should benefit most in financial terms from the Convention. Various groups of developing countries argued during the negotiations, that their specific characteristics should be mentioned in the Convention, in order to improve their chances for financial support. The often-used formula for identifying countries eligible for funding has been the US $4000 GNP per capita criterion (for example in the Global Environment Facility). This was not acceptable to several island states with incomes higher than $4000 per capita, which argued that income criteria must be balanced with additional criteria, such as expected biodiversity expenditures (i.e. a country may be relatively rich but contain biodiversity that will require massive investment resources while other poorer countries may have less biodiversity and therefore be in a relatively better position to fund conservation investments).

In the short-term, it seems unlikely that the Convention will result in major additional funds being made available for investment in biodiversity. In the medium- and long-term, several issues, including the question of financial mechanisms, in addition to those identified above, will have to be settled before the Convention can be expected to produce significant biodiversity financing. The Biodiversity Country Studies (see below) are important in this context because they include estimates on the benefits from conservation and therefore can help convince governments that biodiversity investments can make economic sense in many cases even without external financial support. The mentioning of incentives for conservation is also crucial (Art. 11 and Art. 20 1), because by removing fiscal incentives that encourage unsustainable biodiversity use, for example, important improvements can be achieved without massive amounts of funding.

Potentially much more 'valuable' articles in the Convention, for biodiversity rich small island states, are Article 15 on 'Access to Genetic Resources' and Article 19 on 'Handling of Biotechnology and Distribution of its Benefits'[1]. These articles provide strong support for the idea that developing countries not only have sovereign control over their biodiversity but that they should get compensation for providing access to their genetic resources and a share in the commercial revenues that may arise from the use of their resources. This view was firmly underscored by the Executive Director of UNEP in a document made available to the negotiating Parties before the Convention was concluded[2].

The possibility for developing countries to earn money by providing access to their genetic material has already been explored by Costa Rica whose National Biodiversity Institute (INBio), signed an agreement with the pharmaceutical company Merck on the exploration of potentially valuable substances from the forest. The deal gives INBio $1 million in support of its inventory and conservation programmes and royalties on any commercialized products derived from its biodiversity (Joyce 1991). Several developing countries, including small island states, are now considering the 'INBio approach'. Some developing countries still fear, however, that if the sharing of benefits is to be based on the condition of '*mutually agreed terms*', as stated in the Convention (Art. 15 7), that little sharing will actually take place.

Biodiversity Country Studies

The Biodiversity Country Studies were initiated within the framework of the negotiations of the Convention on Biological Diversity[3]. The negotiating parties recognized early-on that most of the world's biodiversity is to be found in developing countries, which are unlikely to be able to meet the additional expenditures necessary for them to achieve the goals of the emerging convention. There would thus be a need for providing these countries with additional external assistance. Information on the possible benefits, costs and unmet needs of developing countries associated with biodiversity conservation and its sustainable use was therefore perceived as beneficial to the negotiating process. By drawing on a number of detailed country studies rep-

resenting different ecosystems and socio-economic conditions, it was hoped that it would be possible to derive a global estimate, which would be somewhat more accurate than earlier very rough approximations.

A large number of countries have expressed their interest in undertaking country studies[4]. As of early 1994, 15 of them have already produced their first draft studies, including the Bahamas, Indonesia and the Solomon Islands. Each study has been carried out under the co-ordination of a National Biodiversity Unit (NBU) established for this purpose. In order to help the NBUs and to facilitate comparability of the studies, guidelines were prepared which the NBUs adopted as far as possible. An international interdisciplinary expert advisory team, with inputs from UNESCO, was also made available to the NBUs. Data reported by UNEP (1992b) indicate that the cost to implement identified priority investments is high in both developing and developed countries.

Each country has provided estimates of total annual costs for priority biodiversity conservation and sustainable use investment, compared with estimated unmet annual costs. For The Bahamas, total annual costs were estimated at US $110 million, and unmet annual costs at $84 million. The respective sums for Indonesia were $290 million (total) and $231 million (unmet).

The Bahamas Biodiversity Country Study

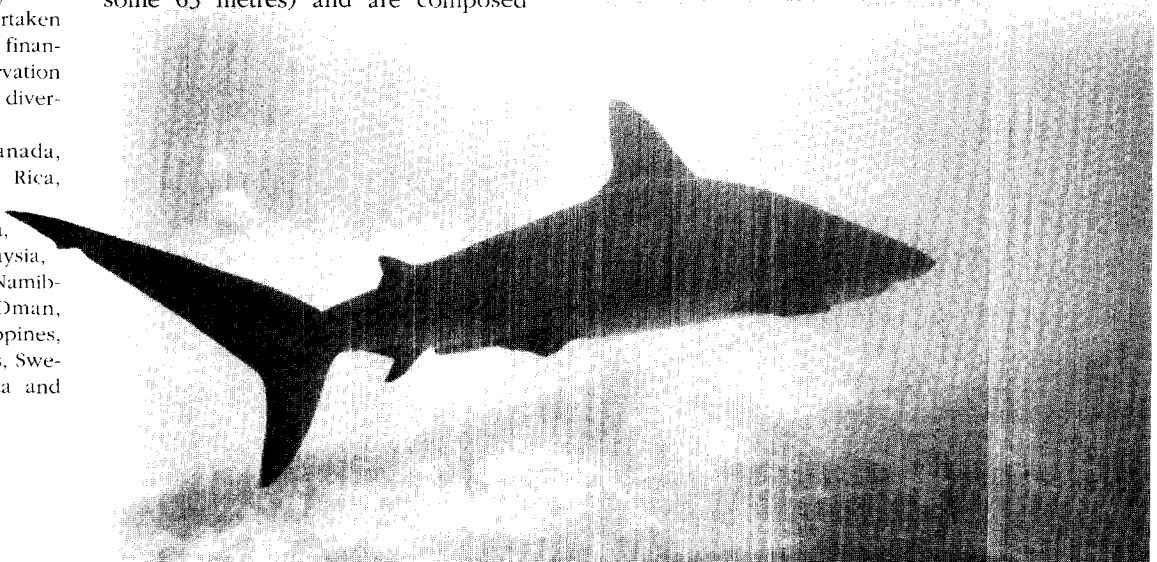
The Bahamas Biodiversity Country Study was produced by the Bahamas National Biodiversity Unit (NBU) which was commissioned in 1991 incorporating a wide range of public and private sector participation. The study was undertaken using the guidelines produced by UNEP for this purpose and with the support of an international advisory team, which included the participation of an economist from UNESCO. The objective of the study was to take stock of the present status of knowledge, conservation and sustainable use of biological diversity in the country and to try to tentatively estimate the benefits derived from, as well as the costs associated with, the conservation and sustainable use of biological diversity. The study was designed so as to focus national and international attention on the biological diversity of the Bahamas.

The Commonwealth of the Bahamas consists of 29 islands, of which 22 are inhabited, 661 cays and 2387 rocks. Andros is the largest island with its 6000 km^2. All islands are low and flat (the highest point in the Bahamas is some 63 metres) and are composed

The tourism industry is the major economic activity of the Bahamas, comprising about 50% of GDP and employment. Some 3.5 million visitors arrives annually, to a large extent attracted by the islands' climatic and environmental qualities. Large numbers of tourists do, however, also imply that fragile coastal and marine ecosystems, such as mangroves and coral reefs, are under severe pressure. The expansion of the cruising sector (in 1991 more than 50% of the tourists were cruise visitors) has also led to an increased threat to marine biodiversity.

The Coral World underwater exploratory tower outside Nassau, allows visitors to view colourful biodiversity at the bottom of the sea some 5 metres below the sea surface. Visitors can walk around in the tower's 360 degree viewing area and see coral, spiny lobsters, moray eels, sponges, angel fish, a variety of small marine life, and perhaps ... a shark.

Peter Dogse



1. It is assumed that formulations in Articles 15, 16 and 19 contributed to the United States decision not to sign the Convention in Rio de Janeiro. Subsequently, the United States became a signature to the Convention, in June 1993.
2. 'Biological resources constitute a capital asset, with great potential for yielding sustained benefits to the countries which access them and for meeting human needs in general. The draft convention being negotiated on biological diversity is the first international agreement in the field of the environment where the developing countries have something specific to offer (being generally rich in biological resources) and for which they should get fair return. Until now, in practice, access to biological resources, which are mainly found in developing countries was generally free'. In: M. Tolba. 1992. *Costs and benefits for the developing countries of becoming parties to environmental treaties*. UNEP Na. 92-7518. p. 7.
3. The Intergovernmental Negotiating Committee (INC) for a Convention on Biological Diversity, which was established by the Governing Council of UNEP with the mandate to negotiate the Convention, recommended, together with the *Ad Hoc* Working Group of Experts on Biological Diversity that country studies should be undertaken on the benefits, costs and unmet financial needs of investment in conservation and sustainable use of biological diversity.
4. Australia, Bahamas, Brazil, Canada, Chad, China, Colombia, Costa Rica, Ecuador, Egypt, Germany, Ghana, Guinea, Guyana, India, Indonesia, Jordan, Kenya, Madagascar, Malaysia, Mexico, Morocco, Mozambique, Namibia, Nepal, Nigeria, Norway, Oman, Papua New Guinea, Peru, Philippines, Poland, Rwanda, Solomon Islands, Sweden, Tanzania, Thailand, Uganda and Zaire.

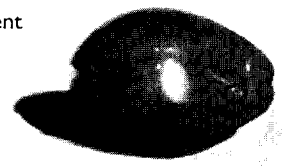
Peter Dogse

Nurse sharks are a popular attraction at Coral World, where marine biologists have managed to breed them in captivity. Public information on the marine environment is a priority investment in the Bahamas and an important tool for the protection of its rich biodiversity values.

mainly of calcareous sand, originally derived from marine shells - an indicator on the benefits a nation can derive from biological diversity! The islands stand together with large, biologically diverse coral reefs, that are important breeding grounds for fish and other forms of marine life. The coral reefs, which provide excellent scuba diving and snorkeling opportunities, are also an important factor in tourism.

MEASURES FOR CONSERVATION IDENTIFIED IN THE BAHAMAS BIODIVERSITY COUNTRY STUDY

- **To** produce a catalogue of the biodiversity available in the Bahamas
- **To** conduct a review to determine the level of conservation and the format needed to ensure the continued survival in a viable form of the biological diversity present in the Bahamas
- **To** establish *in situ* conservation sites
- **To** develop complementary *ex situ* conservation mechanisms for the preservation and restoration of biological diversity
- **To** develop sustainable terrestrial practices
- **To** develop sustainable marine practices
- **To** develop sustainable tourism practices
- **To** develop sustainable ecosystem management programmes
- **To** develop appropriate legislation for integrating sustainable development and conservation into all aspects of the management of the Bahamas
- **To** develop education and public awareness schemes for the promotion of conservation and sustainable development



Although the Bahamas no longer has any stands left of the tall hard wood rain forests, which so impressed Columbus at his first landing in the New World at the Bahamas island of San Salvador in 1492, it is a biological diverse and rich nation. The country study concluded that there are some 6206 species (1624 plants and 3675 animal species) identified to date in the Bahamas. Four species are known to have become extinct locally and seven are listed as endangered. Indeed, one of the major conclusions from the study was that only a small number of the major taxonomic groups have been studied in detail. The Bahamas has only partially documented its distribution of ecosystem diversity. The need for a more comprehensive assessment is underlined in the study, as a prerequisite for sustainable development decision-making.

The study also identified a number of measures that are seen as important for the long-term conservation and sustainable use of biological diversity in the Bahamas.

ENERGY OPTIONS FOR ISLAND COMMUNITIES

Island communities around the world, which are almost totally dependent upon a steady supply of seaborne petroleum products, were adversely affected by rising costs of imported fuel during the years following the oil crisis of 1973. In some islands, the import bill for fuel alone exceeded earnings from exports. During subsequent years, the higher cost of fuel and the threat of shortages prompted the assessment of energy needs and created an incentive to develop indigenous energy resources in island communities.

Development of alternative energy systems

Some of the problems and approaches to the development of alternative energy systems were addressed during a MAB inter-oceanic island workshop held in Puerto Rico (Takahashi & Woodruff 1990).

Because of the variety of situations that exist, from large islands with several alternative energy options to small islands with very limited resources, there is no generic solution to energy independence in island communities. Each country, and in most cases each island, must utilize the energy resources that are available in an economically, environmentally, and socially acceptable way.

Virtually every avenue that might contribute to greater self-sufficiency for island communities has been explored during the past 20 years. Efforts to reduce the dependency on imported fuels have included:

- Demonstration projects, feasibility studies, and commercial development involving indigenous resources such as hydropower, wind, geothermal energy, biomass, municipal solid waste, and ocean waves for electricity production on a commercial or utility scale.
- Small-scale installations for production of electricity using solar, wind, biogas, and coconut oil, for household, farm or community use.
- Experimental tree farms for production of wood or charcoal for cooking, and biomass for electricity generation.
- Practices for promoting the judicious usage of energy and the employment of a variety of devices, including solar water heaters, heat

pumps, insulation, wind-driven water pumps, and more efficient end-use equipment.

- Futuristic planning for the production of transportation fuels such as hydrogen and methanol from renewable resources.

In many cases, progress in alternative energy development in island settings has fallen short of expectations. Factors contributing to this situation are: inadequate resource assessments resulting in ineffective or inoperable projects; inadequate funds to implement or to complete projects properly; poorly conceived projects based on unworkable assumptions; lack of spare parts for repairs; inaction by governments on recommendations of assisting agencies; and opposition by environmental, cultural, and other groups.

Recommended steps to avoid problems preventing or delaying the commercial development or optimum utilization of indigenous energy resources include careful resource assessments, option analyses, demonstration projects and feasibility studies.

Energy engineering

Since 1954, UNESCO has been involved in helping to solve the practical problems in harnessing clean energy sources, many of which are freely available to small islands. Examples are solar, wind, tidal and wave, and ocean thermal energies.

Recently this programme has been reinforced through a 'World Solar Summit' process - a three-year (1993-95) campaign focusing on public information and education in the area of renewable energies, break-through actions on rural development, the use of solar energy to improve health and quality of life, and the enhancement of agricultural productivity. It is also seen as a means of helping to generate employment in small island nations through the promotion of small industries.

A range of learning materials in engineering sciences is being prepared in co-operation with the International Technological University (ITU) and leading industries and academic institutions. Specially designed for use by postgraduate students and engineers, the principal aim of this initiative is to train a new generation of power engineers able to face today's and tomorrow's challenges.

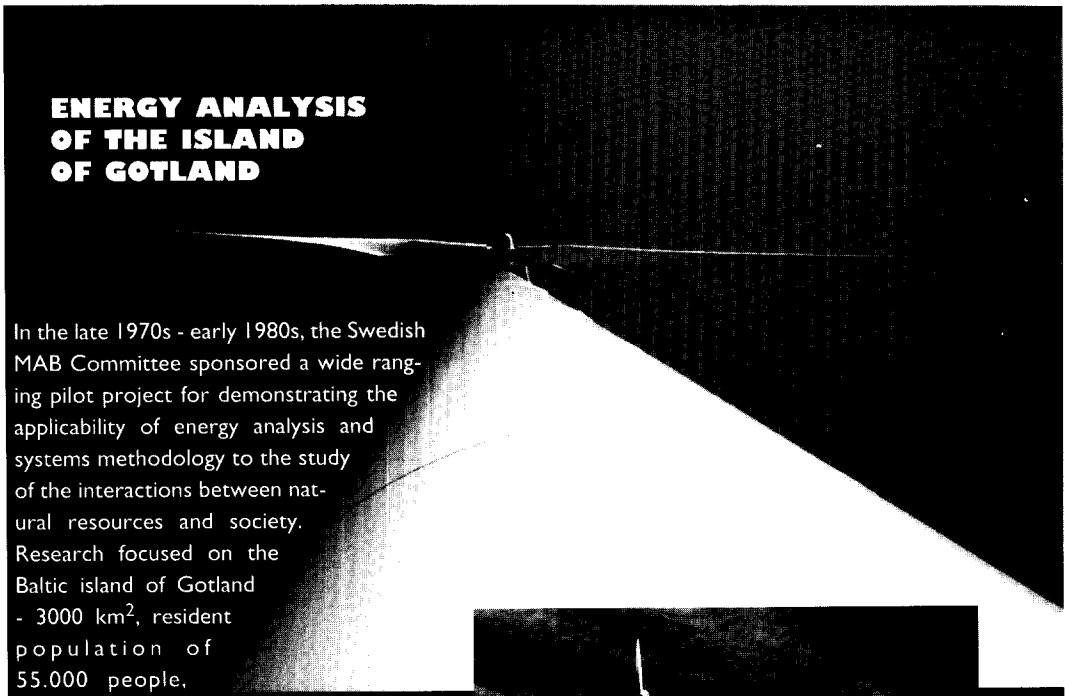
The learning packages include a module on new and renewable energy, which has been developed through a newwork of leading educationalists, industrialists and academics, with more than seventy professors from engineering schools throughout the world taking part. The planned package is divided into the following modules:

- Review of basic energy concepts
- Applications of energy engineering equipment
- Energy systems engineering
- New and renewable energy
- Energy planning and policy
- Database on new and renewable sources of energy
- Energy conservation
- Management of the energy sector
- Environmental ethics code for power engineers.

The complete package aims to develop the ethical responsibility of the energy engineer towards society. Initially the module is being produced in conventional book format with publication expected in late 1994. As the learning package evolves, future material will be published in other media including audio-visual aids and computer software.

Among other sources of information, the learning package draws on materials that have been commissioned and diffused in a UNESCO Series of Learning Materials in Engineering Sciences, such as a five-hour course on ocean energy produced by a team of researchers and engineers from the Hawaii Natural Energy Institute of the University of Hawaii and the Pacific International Center for High Technology (UNESCO 1992a). Other sources include studies prepared for the World Solar Summit, which was held in Paris in July 1993, addressing such issues as wind energy, photovoltaics, and solar energy in the South Pacific.

ENERGY ANALYSIS OF THE ISLAND OF GOTLAND



In the late 1970s - early 1980s, the Swedish MAB Committee sponsored a wide ranging pilot project for demonstrating the applicability of energy analysis and systems methodology to the study of the interactions between natural resources and society. Research focused on the Baltic island of Gotland - 3000 km^2, resident population of 55.000 people, some 80 km from the Swedish mainland, heavily dependent on external sources of energy. Among the outputs of the study were several quantitative models, including input-output models of various sectors of the island economy. Energy diversity models showed the extent to which diversifying across energy supply sources and end-use activities can diminish fluctuations of total economic output under conditions of uncertainty in energy supply. Water resources were identified as the most critical limiting factor for future regional development. Recommendations to planning authorities addressed such issues as diversifying the energy supply system, using waste heat from factories, exploring alternative ferilization regimes for agricultural crops, and developing indigenous renewable resources for meeting a large proportion of the island's energy demands (Hilding-Rydevik *et al.* 1986, pp. 35-42; Jansson & Zucchetto 1978a, 1978b; Zucchetto & Jansson 1985).

SMALL ISLANDS AND NATURAL DISASTERS

Natural hazards affecting islands are in general the same as these on continents. However, the impact of natural disasters on island societies can be far greater due to the confinement of resources (e.g. crops) and structures. Hence natural disasters are a major human and development issue in small islands. Millions of people are affected each year by various types of natural hazards of geological and hydro-meteorological origins. Small islands in the Pacific and Indian

UNESCO/Dominique Roger

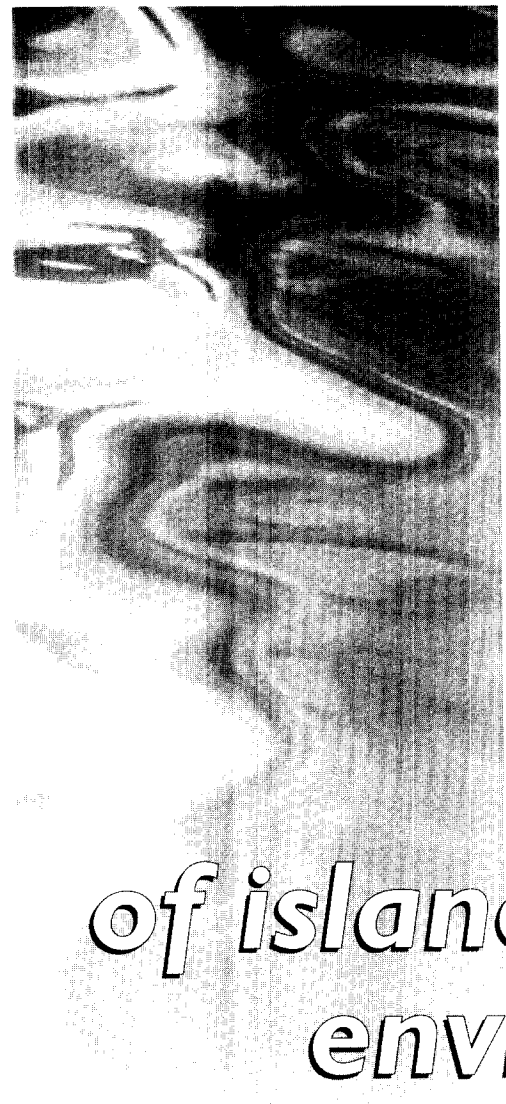
Vulnerability

Oceans, in the Caribbean and the Mediterranean, and elsewhere, rich and poor, are threatened by volcanic eruptions, earthquakes, tsunamis, landslides, floods and cyclones. These hazards may result in casualties to people and livestock, in damage to and destruction of the physical and built environment, in loss of crops and the disruption of infrastructure and social life. Moreover, vulnerability is rising with the growth in population, in concentration in hazard-prone areas, and in proliferation of critical structures.

An example of an oceanic region that is particularly vulnerable to natural hazard is the Caribbean, as reflected in the welcoming remarks by the Barbadian Minister of Health and Natural Resource at an international conference on environmental management and economic growth in the smaller Caribbean islands, held in Barbados in September 1979.

'In the Caribbean, as in all other areas in the world, there are many constraints - physical, economic, and political - on the realization of the people's goals. The environment of the Caribbean islands, while generally being accepted as a blessing, may also prove to be a bane. One has only to look at the destruction caused by Hurricane David in Dominica and neighbouring territories and La Soufriere in Saint Vincent to see evidence of this. The lush vegetation, marvellous beaches, and pleasant climate may all be lost in one hour's battering by nature. Hurricanes are, however, only one of a series of natural disasters to which the area is exposed. Volcanic eruptions, tidal waves, and earthquakes are also ever-present dangers to which the territories' governments and peoples must give urgent attention in planning any meaningful development strategy' (Miller 1979: 7).

Many islands are situated near subduction zones, for example the island states of Indonesia and the Philippines. Such islands are likely to be prone to disasters emanating from earthquakes and volcanic eruptions. Some small islands are literally a single volcano.



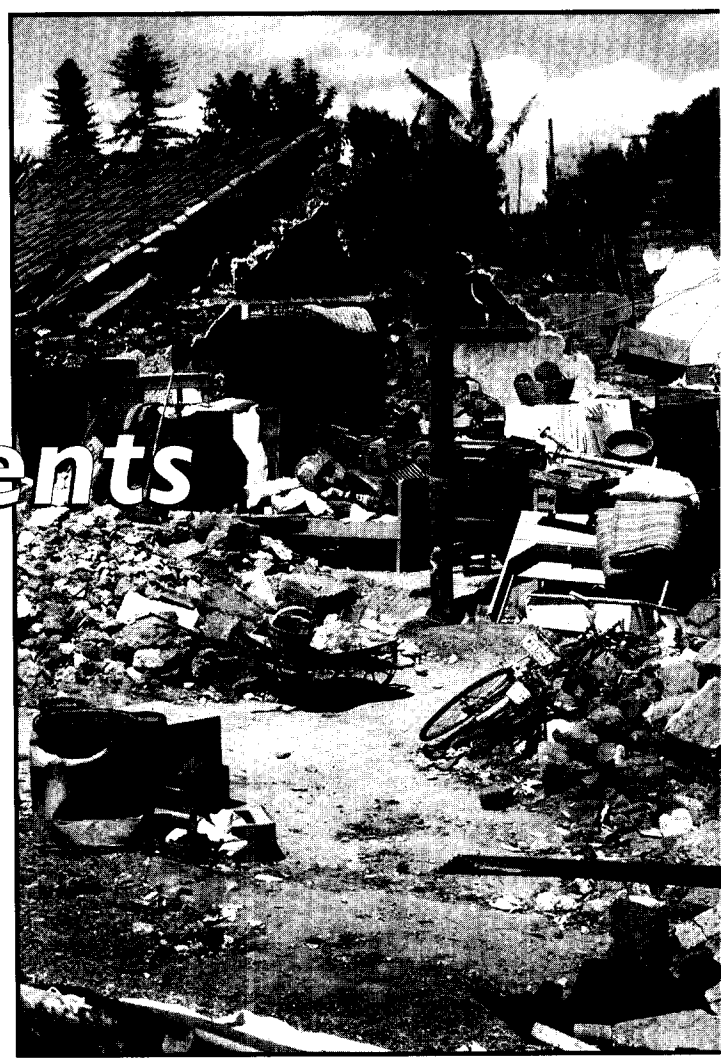
# of island environments

Small islands are very exposed to external forces. In several regions, small islands are particularly vulnerable to a cauldron of natural hazards and disasters, including cyclones, earthquakes and tsunamis. Endemic biota are notably vulnerable to the arrival of humans, rodents and introduced plants and domesticated animals. Moreover, coral atolls and sand cays, and the low-lying littoral zones of many other islands, are acutely vulnerable to a rise in sea level.

Many such islands are inhabited, rendering surveillance necessary.

With a view to addressing some of these issues, UNESCO's efforts have concentrated on training and capacity building. In South East Asia, for example, regional training courses have been organized on volcano monitoring (Legazpi, Philippines, 1984; Yogjakarta, Indonesia, 1986; Angeles, Philippines, 1992), on earthquake hazards (Kuala Lumpur, Malaysia, 1983; Manila, Philippines, 1984, 1987 and 1991) and on landslide identification and prevention (Legazpi, Philippines, 1986). Somewhat similar courses have been conducted in other risk prone areas in different parts of the world. Further, UNESCO has organized meetings and workshops with the aim of improving our scientific understanding of geological phenomena such as those mentioned above, as well as workshops on land use planning for environmentally sustainable development with emphasis on hazard prone islands. In co-operation with leading scientists, up-to-date manuals on volcanic eruptions, landslides and earthquakes have been produced, with a view to mitigating the effects of geological hazards in island states.

UNESCO/J.M. Maïer



Development in small islands should therefore be planned with natural hazards in mind. The International Decade for Natural Disaster Reduction offers a global strategy and framework for coping with natural hazards and for integrating natural disaster reduction into development processes and

TSUNAMIS. FROM SANTORINI TO KRAKATAU

'Tsunami' is a Japanese word meaning a giant ocean wave or series of waves produced by a large-scale disturbance of the ocean floor. Tsunamis are generated when an abrupt movement of the ocean floor or sea bed displaces a large mass of water, usually as the result of a submarine earthquake but occasionally as the result of crater floor collapse at a volcano close to or below sea level, or a landslide off the flanks of a volcano. The movement of the water spreads outward in all directions in the form of a wave which travels at a speed proportional to the square root of the depth of water; in the deep ocean it reaches 1,000 km/hour. In the open sea the movement is imperceptible, but when the wave reaches shallow water near a coast its speed decreases and it forms a steep front which may be as high as 30 metres. On low-lying coasts tsunamis sometimes consist of a single wave but more often of a train of waves (up to about ten) which arrive at intervals of 20-30 minutes.

It can be easily imagined that a turbulent wall of water, up to 30 metres high, advancing inland at 100 km/hour or more, has devastating effects, which are complemented when the water drains back into the sea after the forward passage of the wave. Only the strongest buildings and structures remain intact and the chances of survival of any living creature caught outdoors by a large tsunami are very small indeed.

As described in a 1985 UNDRO-UNESCO handbook on *Volcanic Energy Management*, volcanic tsunamis are fortunately rather rare phenomena but history nevertheless records some notable disasters. The collapse of the greater part of Santorini volcano in about 1400 B.C. is believed to have generated a huge tsunami which devastated the coasts of Crete and the Aegean islands, destroying the maritime power of the Minoan empire and leading to the end of this first European civilization. Many centuries later, it gave rise to the legend of Atlantis.

At the Japanese volcano Unzen in 1792, a tsunami was generated by the entry of a debris avalanche into the bay, and killed some 15,000 people.

The greatest disaster in recent times was caused by tsunamis resulting from the eruption in 1883 of Krakatau, a group of four islands in the Sunda Straits between Java and Sumatra. The force of the 1883 explosion was equivalent to two thousand Hiroshima bombs, and it was heard as far away as Sri Lanka, the Philippines and Australia. Pumice and ash shot up to 80 km above the earth and this dust darkened the sky so much that lamps had to be used during the day in Jakarta and Bandung. Enormous tidal waves claimed 36,000 lives along the Sunda Straits and were detected in Alaska, San Francisco and South Africa.

The explosion of 1883 made Krakatau very important ecologically. Not only was all the vegetation burned, but it is almost certain that the entire land surface was sterilized. Krakatau provided a natural laboratory for scientists to study the ways in which plants and animals colonize virgin land. The first botanical expedition to visit Krakatau after the explosion was in 1886 and irregular surveys of varying thoroughness continued up to 1951. It was in 1979 that the latest, major botanical survey was conducted.

The findings of these and other studies were presented at a symposium in August 1983 to mark the centenary of the eruption of Krakatau, organized by the Indonesian Institute of Sciences (LIPI), in co-operation with UNESCO and other institutions. The proceedings volume (Sastrapradja *et al.* 1985) includes 70 papers grouped in four sections: earth science (37 papers), oceanography (8), biology (18), and social sciences (7).

environmental protection. It is suggested that by the year 2000, all small islands should:

Complete National Risk Assessments:

- identify natural hazards which pose the threat of disaster;
- evaluate the geographic distribution of hazard threats and their frequency and impacts;
- assess the vulnerability of the most important concentrations of population, development and resources.•

Implement National and/or Local Prevention and Preparedness Plans:

- adopt land-use and construction practices that will reduce disaster risks;
- adopt emergency-response plans that identify hazard scenarios, essential actions and responsible organizations;
- implement awareness programmes to educate people about risks and training programmes to improve the capabilities of responsible personnel;
- implement concrete measures to mitigate damages and increase resilience to hazards.

Implement Global, Regional, National and Local Warning Systems:

- implement systems for monitoring and predicting threatening phenomena in time to reduce impacts;
- implement communication systems for disseminating warnings;
- educate decision-makers about hazards and options for reducing disaster risk.

The contribution of UNESCO in the field of natural disasters is to promote a better scientific understanding of the distribution in time and space of natural hazards and of their intensity, to set up reliable early warning and observational networks and systems, to secure the adoption of suitable building design and land-use plans, to protect educational buildings and cultural monuments, to foster disaster communication and to support post-disaster investigation and rehabilitation. Background and examples are provided in a semi-popular booklet on *Standing up to Natural Disasters*, published by UNESCO (1991a) as part of its contribution to the International Decade for Natural Disaster Reduction.

A related activity of UNESCO in the earth sciences field concerns the applicaion of remote sensing to geological hazards mapping. This work dates back to 1984, when the International Union of Geological Sciences (IUGS) and UNESCO launched a programme on Geological Applications of Remote Sensing (GARS). The aim is to demonstrate the use of advanced remote sensing techniques for the resolution of key geological questions, and to ensure the transfer of information and technology to co-operative research in the field, in combination with educational programmes of various kinds.

The first GARS project began in Africa in 1984 with the objective of developing new methods for the integration of multisensor data in order to improve structural and lithological mapping in tropical environments. A second GARS project was launched in 1988 after

several meetings with Latin American remote sensing and geological organizations. Emphasis was placed on landslide hazard mapping using remote sensing and Geographical Information System (GIS) technology. The third project is related to mapping of volcanic and associated hazards. Provisional plans were discussed at a workshop held at UNESCO Headquarters in Paris in February 1994. Among the proposed projects is one on remote sensing and volcanic-hazard assessment in islands of the Philippines, with emphasis on the identification of lahars (mudflows) and the use of radar interferometry for monitoring volcano evolution.

BIOLOGICAL INVASIONS AND ISLANDS

Human-caused invasions by exotic species are a world-wide phenomenon, but they are particularly frequent and significant on oceanic islands and archipelagoes. The effects of introductions, unplanned and planned, have often been so devastating on the native flora and fauna that some scientists now claim that alien species are the number one environmental hazard.

Perhaps the most tragic aspect of invasive species is that they are often imported purposely to do various good things (e.g. food production, biological control) but so frequently turn out to be disasters. The case of the Golden Apple Snail is a good example of what seemed to be an excellent idea, but which resulted in serious problems (Anderson 1993). The Golden Apple Snail has its origin in the Amazon and was imported to the Philippines in 1982 on the basis of its various beneficial qualities: it is easy to farm and needs very little input; it grows quickly, reaching the size of an apple after a couple of months; its meat is nutritious and has a good taste. The snail was therefore officially promoted and distributed in the Philippines as a source of income for large business, as well as for small farmers. Unfortunately, however, the Golden Apple Snail has in addition some other qualities: it loves rice (the basic food in the Philippines), it is quick to reproduce and can withstand severe environmental conditions. What was supposed to be an excellent

Ch. Lepetit/I. Fabbri

Examples of introductions of alien species to islands.
Source: The Economist, 10 April 1993. Anderson, 1993

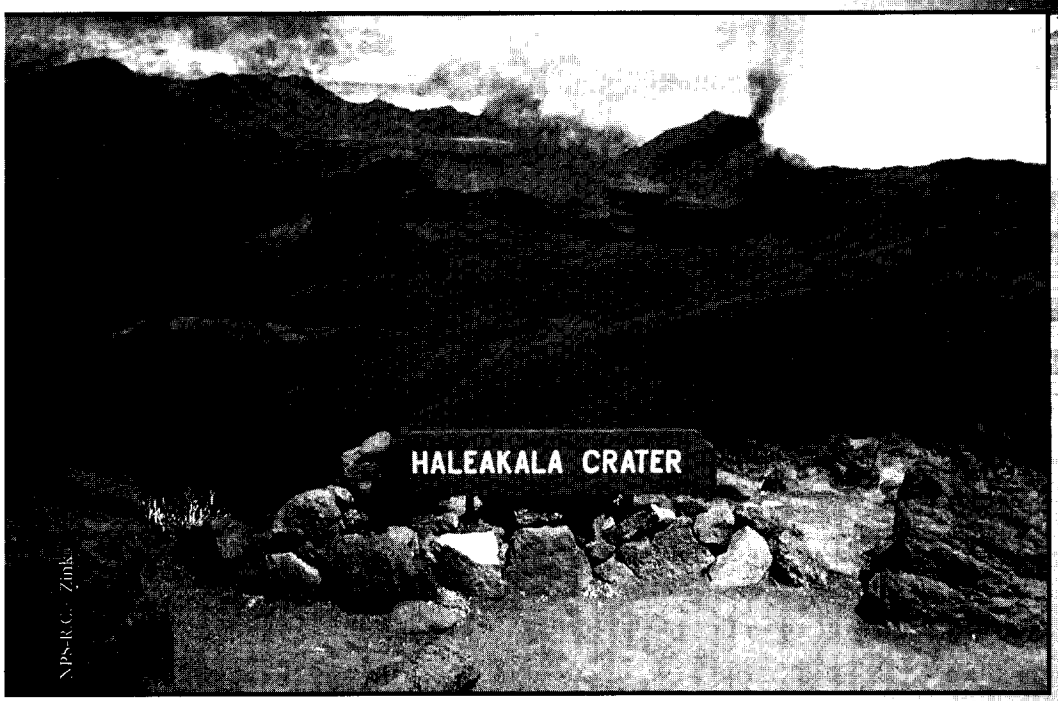
ISLANDS	SPECIES	PURPOSE OF INTRODUCTION	OUTCOME
Kauai, Hawaii	Rosey cannibal snail	To eat up the African snail, an earlier invader	Attacked 20 different types of native snails.
Hawaii	Banana Poka vine	Ornamental plant	Crowding out of native plants on a area of 500 km^2.
Philippines	Golden Apple Snail	Low cost source of protein	Infested almost 15% of all rice land. Destroyed 75% of the rice crop on some islands. Attempts to stop the snail have included the use of massive amounts of poisonous pesticides with negative health and environmental effects.

idea has turned into a major national problem, which threatens rice production and is extremely difficult to control (Anderson 1993).

Many examples of biological invaders have been documented on the Hawaiian Islands, the most isolated archipelago on Earth. Before the arrival of human beings, it is calculated that a new species arrived only every 100,000 years, while today some 20 new species of invertebrate arrive annually. The native flora of ± 1,200 species (> 90% endemic) has been swelled by ± 4,600 exotic plant species brought by Polynesian, European and Asian colonists. At least 800 of these species have established breeding populations.

Hawaii's 20 different species of flightless birds have gone extinct thanks to rats and other alien species. The effects are far from only biological - invasive species can also be economic disasters. Fruit flies, for example, cause damage estimated at $400 million per year. Some $3 million has been spent by the National Park Service to keep out pigs from Haleakala National Park, which if left free to move around, cause extensive damage to the vegetation. It is therefore scarcely surprising that penalties for bringing in alien species to the islands are high: the fine for bringing in a snake is now set at US $25,000 (*The Economist*, 10 April 1993).

For the research scientist, the biology of invasive species in island situations is a fertile area of enquiry. Again taking an example from Hawaii, *Myrica faya* is a small evergreen tree native to the Canary Islands, Azores and Madeira. Invasion of this actinorrhizal nitrogen fixer into young volcanic sites in Hawaii Volcanoes National Park (part of the Hawaii Island Biosphere Reserve) is promoted by its prolific seed production, effective dispersal by exotic birds and rapid growth rates (Vitousek & Walker 1989). Nitrogen fixed by *Myrica* becomes available to other organisms as well. The increase in overall biological availability of nitrogen in stands invaded by *Myrica* is evidence that population-level processes can control ecosystem-level properties and processes. Biological invasions such as that of *Myrica* can thereby provide for integration of the techniques and approaches of population biology and of ecosystems studies, an integration which is of some importance to research biologists.




NPS-Cecil W. Stoughton

The most important threats to Hawaii's environment according to scientists at Haleakala National Park, Maui.
Source: The Economist, 10 April 1993

1. Alien species imported to the islands
2. Alien species yet to come
3. Global climate change (because it may benefit alien species)

INTERGOVERNMENTAL OCEANOGRAPHIC COMMISSION (IOC) AND SMALL ISLANDS

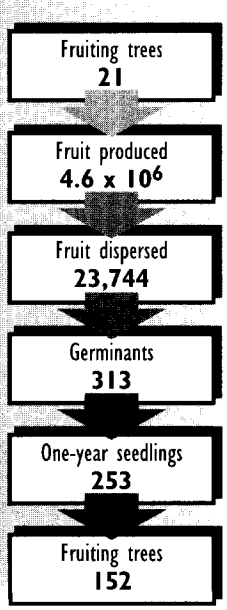
A number of IOC programmes are helping to elucidate the oceanic conditions facing islands and bring answers to some of the development problems involved, although these programmes are not officially declared as intended specifically or only for these small island regions. Some of them, undertaken jointly with other bodies (e.g. the UN, WMO, FAO, IMO, UNEP, ICSU and SCOR), bear fruit for all regions of the world. Examples are the 'Global Investigation of Pollution in the Marine Environment', programmes on 'Ocean Sciences in relation to Living or Non-Living Resources' as well as ocean services and data management. All of these provide scientifically based information and data for decision-makers in island states and other regions and involve development of methods, manuals, assessments and capacity-building.

A major current effort of the Commission is the development of the 'Global Ocean Observing System' (GOOS), which includes specific modules on the health of the oceans, marine living resources, coastal zones, meteorological and oceanographic services, and climate monitoring.

In another forward-looking effort, the IOC is addressing the basic scientific requirements for integrated coastal area management. This includes development of observation methods and connected training and formulating regional research and observation programmes, particularly through regional bodies (including the Commission's own subsidiary ones). Examples are the: (i) joint IOC-UNEP pollution monitoring programmes (e.g. in the 'Wider Caribbean') as well as the 'International Mussel Watch'; (ii) coastal sedimentary budget programme for part of the western Africa region; and (iii) regional sea-level observation programme for the Indian Ocean, including several island states.

The 'Global Sea-Level Observing System' (GLOSS, initiated in 1985) is being steadily extended in more and more parts of the world, to assist in predictions of global sea-level change due to climate and other variations. The 'Tsunami Warning System in the Pacific' - established in the 1960s and now counting 25 Member States - reduces the time needed to evaluate tsunami risks, provides a warning mechanism allowing timely decisions to reduce loss of lives and property, and creates public awareness of what to do in case of these natural disasters (see page 70).

The climate variability and atmosphere-ocean interaction studies carried out in the 'World Climate Research Programme', sponsored by WMO, IOC and ICSU, provide increasing understanding, thus enhancing the ability to forecast phenomena such as tropical cyclones and precipitation. At regional levels, IOC is also co-operating with WMO to improve warnings on storm surges, another major hazard to coastal areas (especially small islands). The Commission, in co-operation with UNEP, WMO and IUCN, has initiated a 'Pilot Activity on Monitoring Coral Reef Ecosystems', particularly with regard to the potential impact of climate change.



Flowchart for the demography of one year-class of Myrica faya in Hawaii Volcanoes National Park. This information suggests that the seeds produced during one year by twenty-one adult Myrica would give rise to more than 150 mature individuals.
Source: Vitousek and Walker 1989.

SEA-LEVEL RISE

Sea-level rise is one of the most accurately established consequences of global warming. During the last hundred years, the sea-level has risen some 10-15 cm and the Intergovernmental Pannel on Climate Change (IPCC) expects a further rise in global sea-level in the range of 35 to 110 cm between 1990 and 2100 according to the so-called 'business-as-usual' scenario. The 'best estimate' in this range results in a 66 cm rise in the year 2100. This rise in sea-level is mainly attributed to thermal expansion of the upper ocean layers and to melting of glaciers and small ice caps. There are, however, many uncertainties in identifying and assessing the causes of sea-level trends.

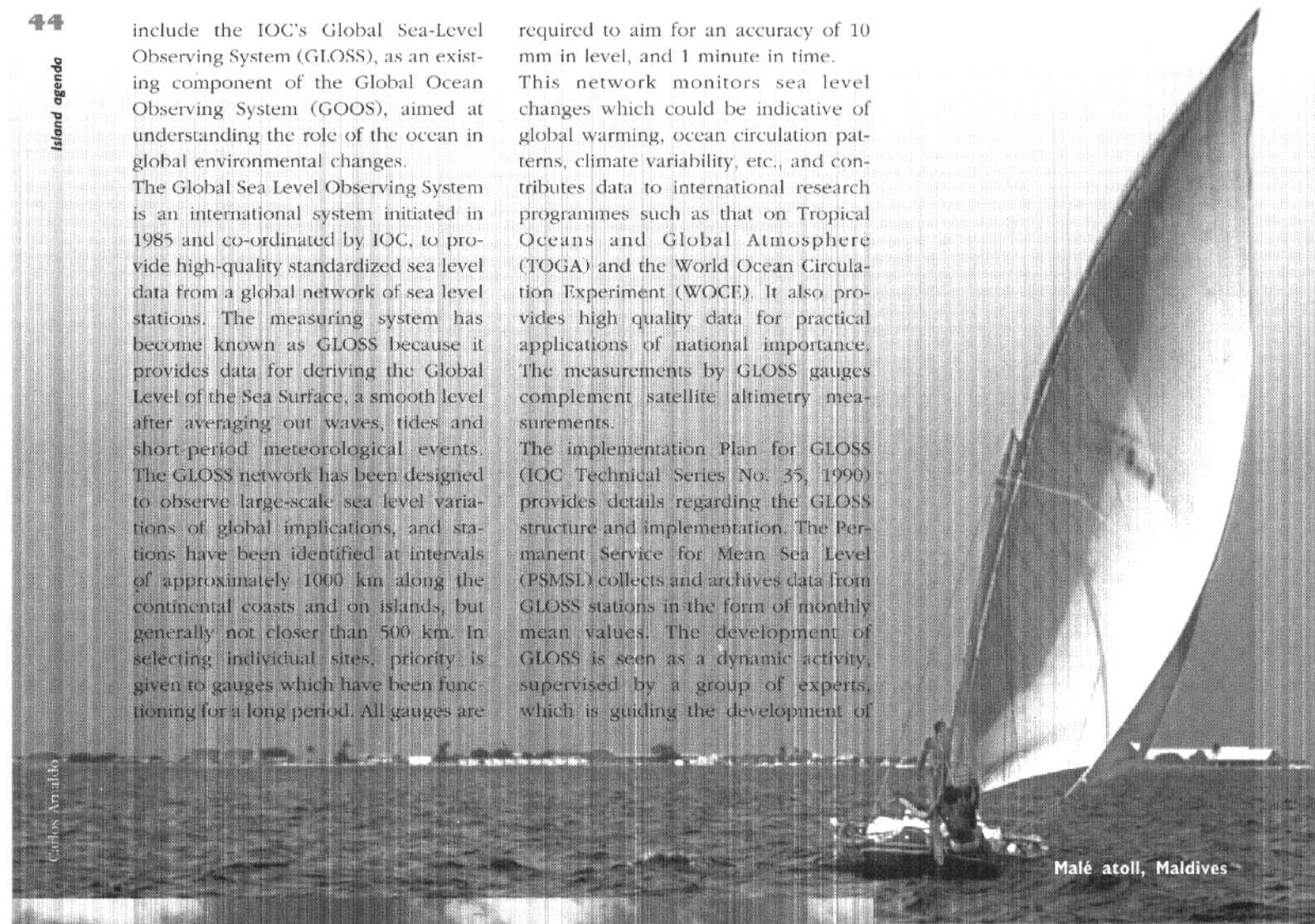
Projected sea-level change over the next century could inundate hundreds and thousands of square kilometres of coastal wetlands and lowlands (Misdorp *et al.* 1990). Some nations are particularly vulnerable. Eight to ten million people live within one metre of high tide in each of the unprotected river deltas of Bangladesh, Egypt and Vietnam. Half a million people live in archipelagoes and coral atoll nations that lie almost entirely within three metres of sea-level, such as the Maldives, the Marshall Islands, Tuvalu, Kiribati and Tokelau. Other archipelagoes in the Pacific and Indian Oceans and the Caribbean could lose much of their beaches and arable lands, which would cause immense human suffering and severe economic and social disruption. Scenarios such as these have triggered much attention within the framework of a number of regional and international contexts, including the World Climate Programme and ICSU's International Geosphere Biosphere Programme (IGBP). Substantive information and recommendations have been brought together in such publications as the proceedings of the Second World Climate Conference co-sponsored by WMO, UNEP, UNESCO and its IOC, FAO and ICSU (Jäger & Ferguson 1991; Eid & Hulsberger 1991). A critical evaluation of relative sea-level change has been prepared by the UNESCO-COMAR Working Group on Mean Sea-Level Rise and its Influence on the Coastal Zone, in collaboration with IOC, with findings and recommendations published as UNESCO Reports in Marine Science 54 (Stewart *et al.* 1990). Continuing initiatives at the technical and project level

include the IOC's Global Sea-Level Observing System (GLOSS), as an existing component of the Global Ocean Observing System (GOOS), aimed at understanding the role of the ocean in global environmental changes.

The Global Sea Level Observing System is an international system initiated in 1985 and co-ordinated by IOC, to provide high-quality standardized sea level data from a global network of sea level stations. The measuring system has become known as GLOSS because it provides data for deriving the Global Level of the Sea Surface, a smooth level after averaging out waves, tides and short-period meteorological events. The GLOSS network has been designed to observe large-scale sea level variations of global implications, and stations have been identified at intervals of approximately 1000 km along the continental coasts and on islands, but generally not closer than 500 km. In selecting individual sites, priority is given to gauges which have been functioning for a long period. All gauges are required to aim for an accuracy of 10 mm in level, and 1 minute in time.

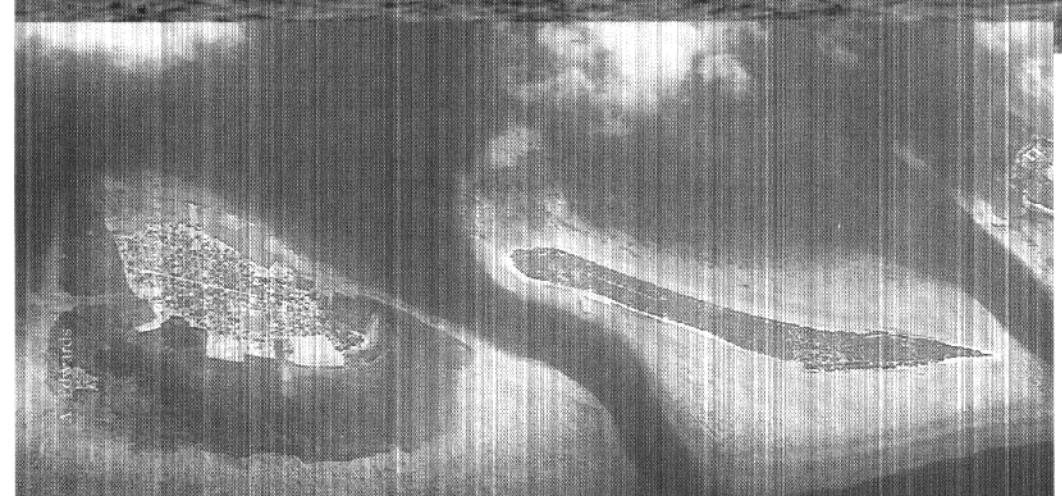
This network monitors sea level changes which could be indicative of global warming, ocean circulation patterns, climate variability, etc., and contributes data to international research programmes such as that on Tropical Oceans and Global Atmosphere (TOGA) and the World Ocean Circulation Experiment (WOCE). It also provides high quality data for practical applications of national importance. The measurements by GLOSS gauges complement satellite altimetry measurements.

The implementation Plan for GLOSS (IOC Technical Series No. 35, 1990) provides details regarding the GLOSS structure and implementation. The Permanent Service for Mean Sea Level (PSMSL) collects and archives data from GLOSS stations in the form of monthly mean values. The development of GLOSS is seen as a dynamic activity, supervised by a group of experts, which is guiding the development of GLOSS in a manner most useful to ocean science and for the analysis of global change. The proposed GLOSS network consists of 308 sea level stations which will be operated and maintained by 87 countries. As of early 1994, 210 stations provide sea level data to PSMSL and specialized sea-level centres established within IGOSS, TOGA and WOCE. A fair proportion of these stations are located on small islands, as described in a report on *Sea Level Monitoring in the Small Island Developing States* (IOC 1994), prepared as part of the GLOSS effort by the Permanent Service for Mean Sea Level and the Bidston Observatory (UK). The report includes summaries of sea level data held by the PSMSL, including plots of monthly mean values for those stations which contain data capable of being plotted as time series. Among the conclusions of the report is that islands play a particularly important role in monitoring sea level change, owing to their ability to provide relatively 'open ocean' data.



Carlos Arnaldo

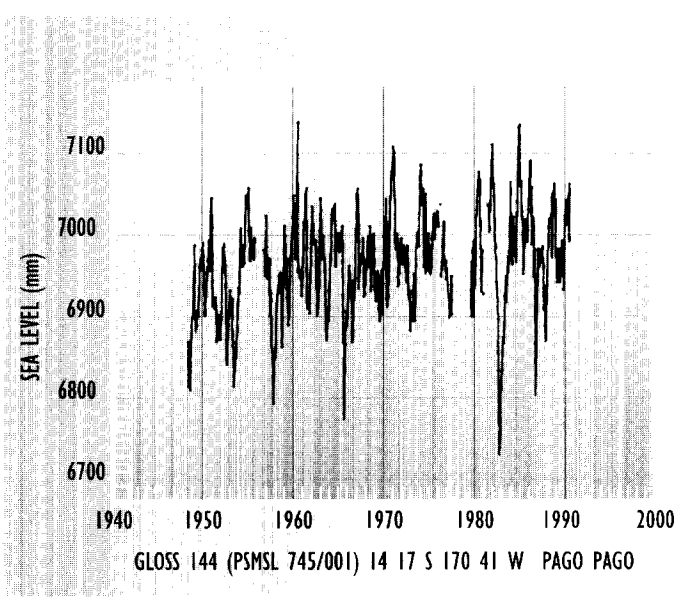
Malé atoll, Maldives



A. Alvarez

Of the stations contributing to the PSMSL (Permanent Service for Mean Sea Level), two are located in the Maldives in the Indian Ocean, at Gan and Malé. Perhaps no other country is so vulnerable to the effects of sea-level rise as the Maldives. The 1,196 islands which form the archipelago are on average only two or three metres above sea level. A quarter of its 218,000 inhabitants live on Malé, in an area barely two kilometres square, and the government is convinced that the Republic can be 'wiped off the map' by sea-level rise. Before this can possibly happen, however, the inhabitants are menaced by others dangers, notably a water shortage and destructive cyclones. The international airport on Malé, for instance, was flooded in 1988, and mango trees are perishing because of sea water inclusion. For these reasons, the Maldives took the initiative for an Alliance of Small Island States (AOSIS) which in 1989 adopted the 'Malé Declaration' proclaiming that 'Sea-level rise threatens the very survival of some island states' and pressing the international community to 'take immediate and effective measures' to reduce 'the greenhouse effect'.

The Global Sea Level Observing System (GLOSS) comprises a global network of some 300 strategic tide gauges for long-term monitoring of sea-level changes and climate change studies.
The network is over two-thirds complete.
Many of the island records on sea level change are relatively short compared to those from continental coastlines. At least 20 years of data are required for even a crude determination of a long-term change, and few island stations possess such an amount of data. This said, close inspection of time series data, in many cases shows evidence of a seasonal cycle, considerable interannual variability (particular for Pacific stations, that due to El Niño events) and long-term 'secular trends'.
The map (above) and the plot of monthly mean sea level values for the station of Pago-Pago (below) are from a report on Sea level monitoring in the small island developing states (IOC 1994), specially prepared for the Global Conference on Sustainable Development in Small Island Developing States in Barbados. The report was prepared by the Permanent Service for Mean Sea Level (PSMSL), which is the global databank for long-term sea level research. It was founded in 1933 at Bidston Observatory, Merseyside (UK) and operates under the auspices of the International Council of Scientific Unions (ICSU). Its databank contains over 35000 station-years of sea level data in the form of monthly and annual mean values from over 1500 sites worldwide.



The station of Pago-Pago in American Samoa holds the longest time-series data set of monthly mean sea level valves in the Pacific. Records dating back to 1948 show evidence of considerable seasonal and interannual variability.

OTHER DIMENSIONS OF VULNERABILITY

Impacts such as those outlined above - natural hazards, biological invasions and sea-level change - have multiple repercussions on island environments, territories and societies. In addition, islands are vulnerable to many other outside forces. Some of these repercussions and vulnerabilities are reflected elsewhere in this review, in such terms as the effects of market changes on island demographies and the impact of tourism on island cultures.

Socio-cultural dimensions of island

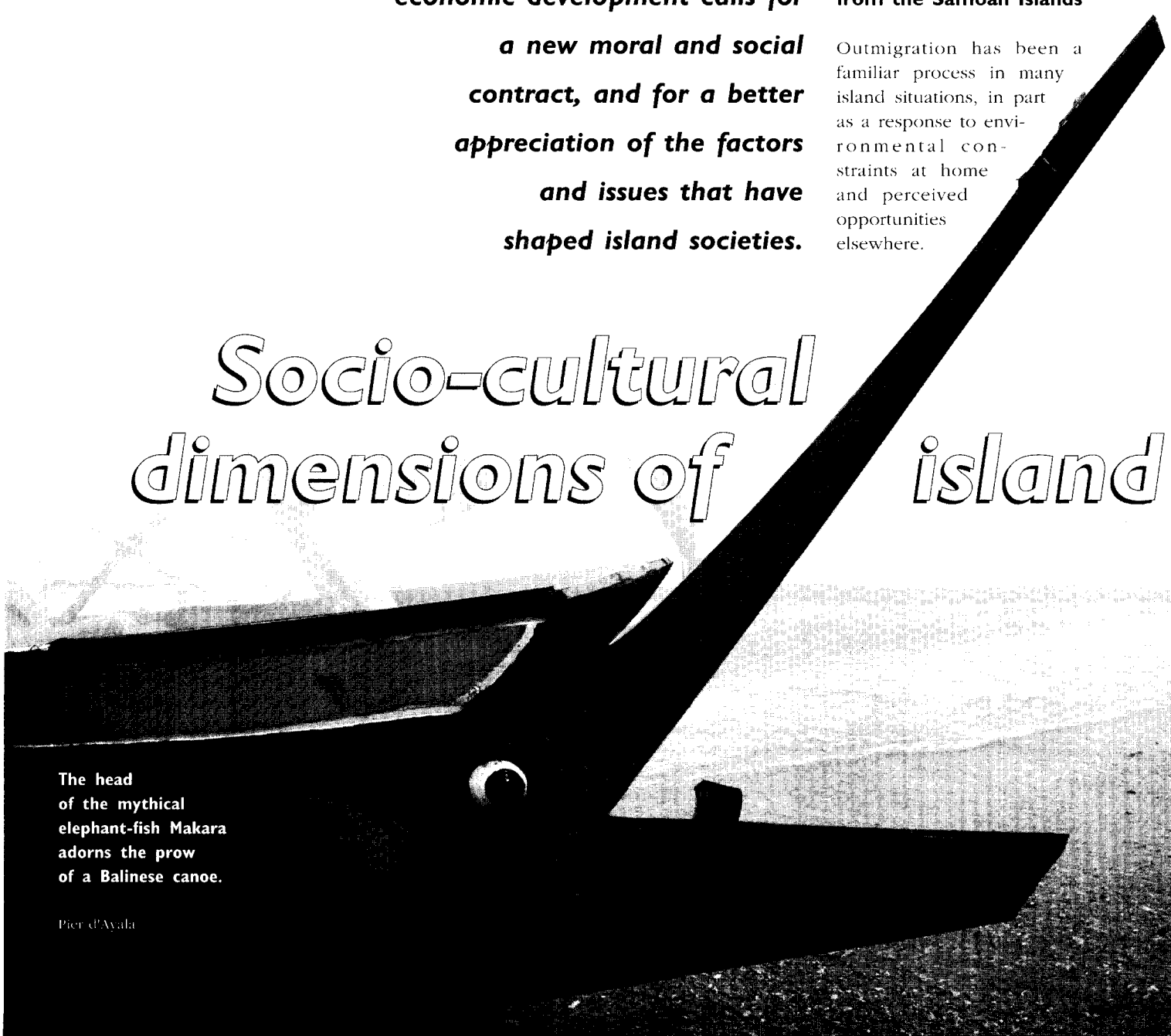
Worldwide, there is increasing recognition of the intrinsic importance of culture to all aspects of the development process. Greater emphasis on the cultural dimensions of development is confronted by the basic question: How can economic development be managed in a way that also sustains the distinctive social institutions and cultural identities of island peoples? Countering the shortcomings and failures of a certain narrow conception of economic development calls for a new moral and social contract, and for a better appreciation of the factors and issues that have shaped island societies.

ISLAND POPULATIONS AND DEMOGRAPHIES

Small islands throughout the world have experienced cycles of rapid demographic change that go far beyond those related to natural birth and death rate balances. This may be due to the impact of outside forces beyond their control or to the fact that their economies are based on a single specialized crop at the mercy of disease and the caprices of the market. Some insights to the processes and driving forces affecting island demographies are provided by several island situations which have been studied intensively within UNESCO's programmes: the Samoan islands, Salina in the Mediterranean, the eastern islands of Fiji, and islands in the eastern Caribbean.

Outmigration from the Samoan Islands

Outmigration has been a familiar process in many island situations, in part as a response to environmental constraints at home and perceived opportunities elsewhere.



The head of the mythical elephant-fish Makara adorns the prow of a Balinese canoe.

Pier d'Ayala

The benefits to the area of emigration are often manifest, but the consequences to the migrants and their areas of destination are not well known.

In the late 1970s, a US-MAB sponsored study examined migration from the Samoan islands to urban settings in the United States and New Zealand (Baker & Baker 1984). The study touched on such aspects as the effects of 'push and pull' migration on the natural and social environment of both the places of origin and destination, including the causes of the outmigration, the importance of outmigration for the rural environment, and the problems of the outmigrants and their places of destination.

It does not appear that the large Samoan outmigration (compared to residual native populations) can be explicitly related to a limited resource base in the Samoan islands. Archaeological evidence suggests that as early as 1000 Before Present, the Western Samoan islands supported a much larger population than they did at the time of contact, while other studies have shown that Samoans have not intensified their agricultural use of the environment to the extent commonly found when cash economies are introduced.

The Samoan emigrant is generally reasonably well prepared to cope with modern society. Most are well equipped to converse in the local language and have some formal education. In general, life expectancy rises with migration, primarily as a result of better control over infectious disease in the place of destination. At the same time, the comprehensive health of the migrants may in fact decline.

development

The lack of intensive land use may in part be explained by the fact that the Samoan cultural system is able to evoke a high level of remittances from outmigrants. Thus, remittances from migrants may provide an *aiga*, or extended family, more wealth than a more intensive or extensive use of the *aiga* land. It has also been suggested that this is a case of pull migration in which the migrants move because they believe economic or social alternatives in another society to be more attractive.

As an outgrowth of their studies on Samoa, and other locations such as the Peruvian altiplano, Baker & Baker (1984) proposed certain hypotheses that might be further explored in a variety of migration situations. One such hypothesis suggests that outmigration from rural regions generally tends to preserve the natural environment at the place of origin, leading not only to a

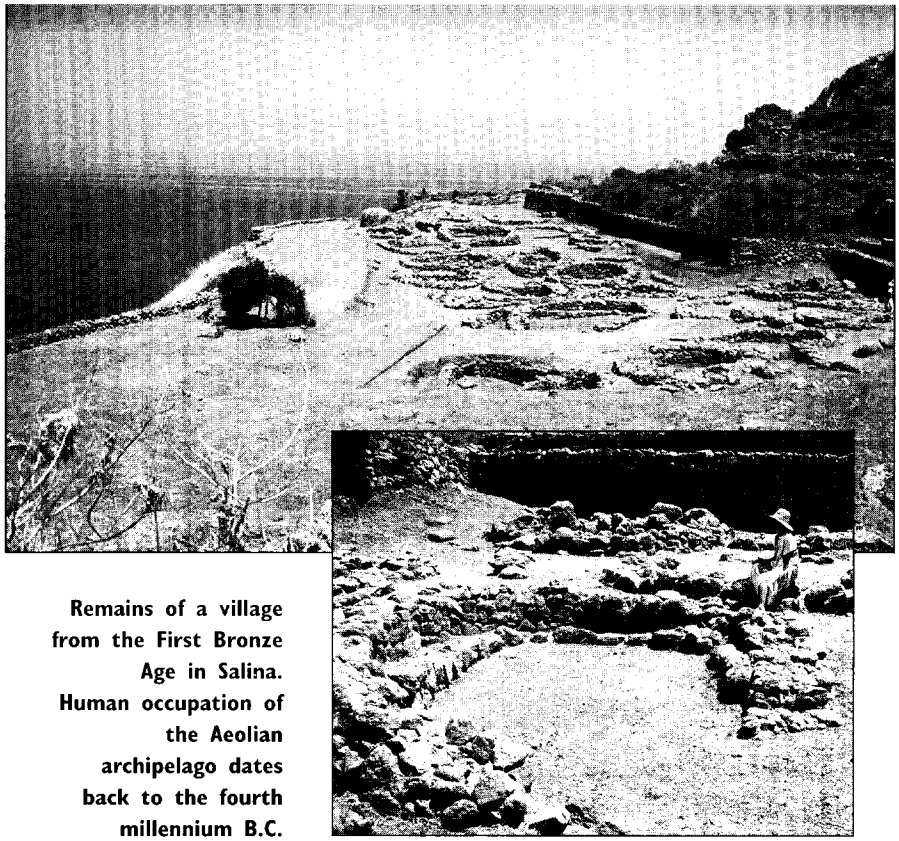
more satisfactory land use for agriculture and herding but also to a greater retention of aboriginal species diversity. A second hypothesis proposes that migrants from developing rural societies to urban modern societies generally suffer a decline in many physical and psychological aspects of health, even though life expectancy may rise.

Pirates, parasites and the Aeolian island of Salina

Pirates and parasites have been the principal causes of the vicissitudes of the volcanic island of Salina (UNESCO 1981a, d'Ayala 1992) the second largest of the seven Aeolian islands off the northern tip of Italy which have been studied within a MAB network of studies on Mediterranean small islands. For centuries, fear of pirates in the Archipelago was such that only Lipari, with its powerful fortifications, had a stable population, while Salina and the other Aeolian islands, remained virtually uninhabited. Even Lipari finally succumbed. In the Aeolian islands they still commemorate the terrible siege of July 1544, when Khayr-ad-Din, the Barbary pirate better known as Barbarossa (red-beard), seized the fortress and carried off into slavery some 9000 inhabitants, almost the entire population of the island.

From the end of the 18th century, the strategic situation changed dramatically in the Mediterranean. The thousand year-old Republic of Venice was conquered by Napoleon and delivered to Austria. Napoleon himself was defeated by the British and Nelson's fleet imposed the *pax Britannica* throughout the Mediterranean, practically eliminating pirate activities. Given these favorable circumstances, the church of Lipari, to which Salina belonged, leased the fertile soils of the island to private entrepreneurs. Immigration from Sicily and the Italian mainland was strongly encouraged.

The new people worked hard to transform the volcanic slopes of the island into highly productive vineyards, which produced Malmsey, a dessert wine that was highly appreciated by Europeans.



Pier d'Ayala

Remains of a village from the First Bronze Age in Salina. Human occupation of the Aeolian archipelago dates back to the fourth millennium B.C.

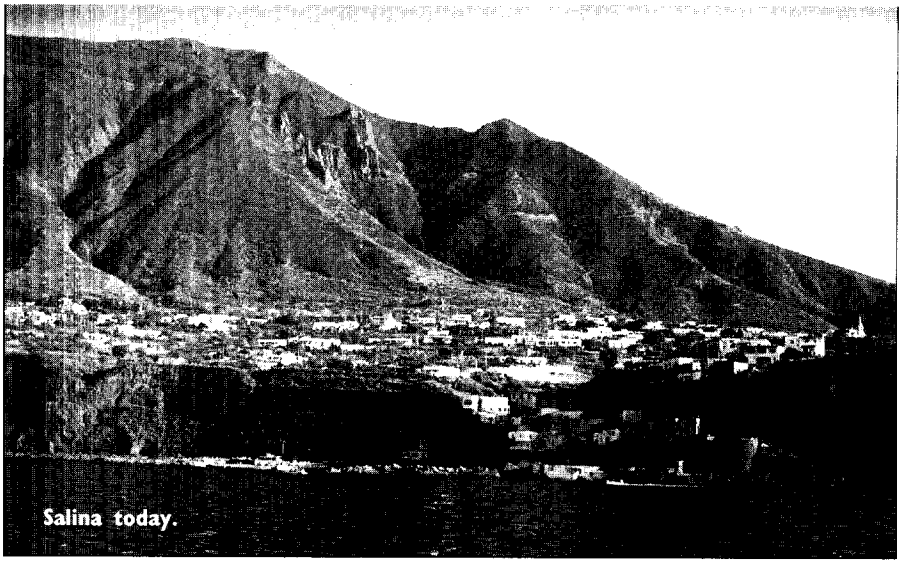
Until the Napoleonic wars the Malmsey wine produced in Greece was subject to monopoly control by Venice, which exported it to European countries. At the same time Venice lost its Greek islands, it lost its independence. New entrepreneurs from other Italian areas took the opportunity to produce the valuable wine in places like Salina, where the land happened to be cheap. Towards the middle of the last century, the population of Salina grew to about 8000 inhabitants. Its wines were exported to France and Russia by ships from the island, and the islanders prospered.

At the end of the century, however, an infestation of the Phylloxera parasite destroyed the vineyards on Salina. Earnings on the island dropped sharply and, lacking the capital to survive during the period required to restore the vineyards, local families began to emigrate in large numbers to Argentina, the United States and, later, to Australia. In a relatively short time, the population

For Salina, dependence upon a single product led first to rapid population growth and then, following a natural disaster, to rapid emigration, a clear example of the risk for a small island of basing its economy on a single specialized crop.

Pier d'Ayala

Aeolian islands


Pier d'Ayala

Salina today.

fell to under 2000. During the first half of the twentieth century, fishing and the production of capers were the main sources of revenue. Although the vineyards were rehabilitated prior to the Second World War, and although tourism became an important growth industry by the 1960s, the population has only recently risen to a total of 2300.

Salina's period of economic development lasted only about 60 years. Its rapid settlement was based on a specific opportunity to take advantage of an existing market to earn a good living. Rapid emigration followed the Phylloxera infestation. In the absence of long-term credit with which to restore their vineyards, and in view of inducements offered to emigrate to other areas where land was made available at low cost, many farmers left their native island and, in some cases, their families as well.

For Salina, dependence upon a single product led first to rapid population growth and then, following a natural disaster, to rapid emigration, a clear example of the risk for a small island of basing its economy on a single specialized crop.

Population-environment interrelations in eastern Fiji

From 1974 to 1976, a field project on the interrelationships between population and environment was undertaken as a cooperative endeavour of the Government of Fiji, UNESCO and UNFPA. The study's conceptual framework was provided by MAB Project Area 7 ('Ecology and land use of island ecosystems'), and more particularly by the thinking of the time that islands were especially appropriate sites for studying the complex systems relations among population dynamics, the availability and use of natural resources (mainly dependent on the state of agriculture), problems of the environment, and economic development in general, all under relatively controlled conditions. The Fiji study also dealt with the question of how to ensure that small isolated systems do not lose their survival capacity, or, if they become integrated into larger systems, do not lose their capacity for self-reliance and endogenous development. The project's objectives were to develop a set of researched guidelines for planning and decision-making on population/environment problems in Fiji. It aimed as well at developing research methodologies which would also be useful outside Fiji for assessing population/resource/environment relationship situations at a micro-scale rather than at the global and regional scale of other models in this field.

The project's results have been widely published and diffused, initially in seven Project Working Papers (all published in 1976) and in five UNESCO/UNFPA Island Reports (published in 1977-79 for UNESCO by the Australian National University). References are given in three general reports: a comprehensive report from the project to the Government of Fiji containing detailed information for decision-making on population, resources and development in the eastern islands of Fiji. (UNESCO/UNFPA 1977), a 227-page synthesis published by UNESCO in series of MAB Technical Notes (Brookfield 1980), and a 184-page overview in composite French and English published by ORSTOM (Latham & Brookfield 1983).

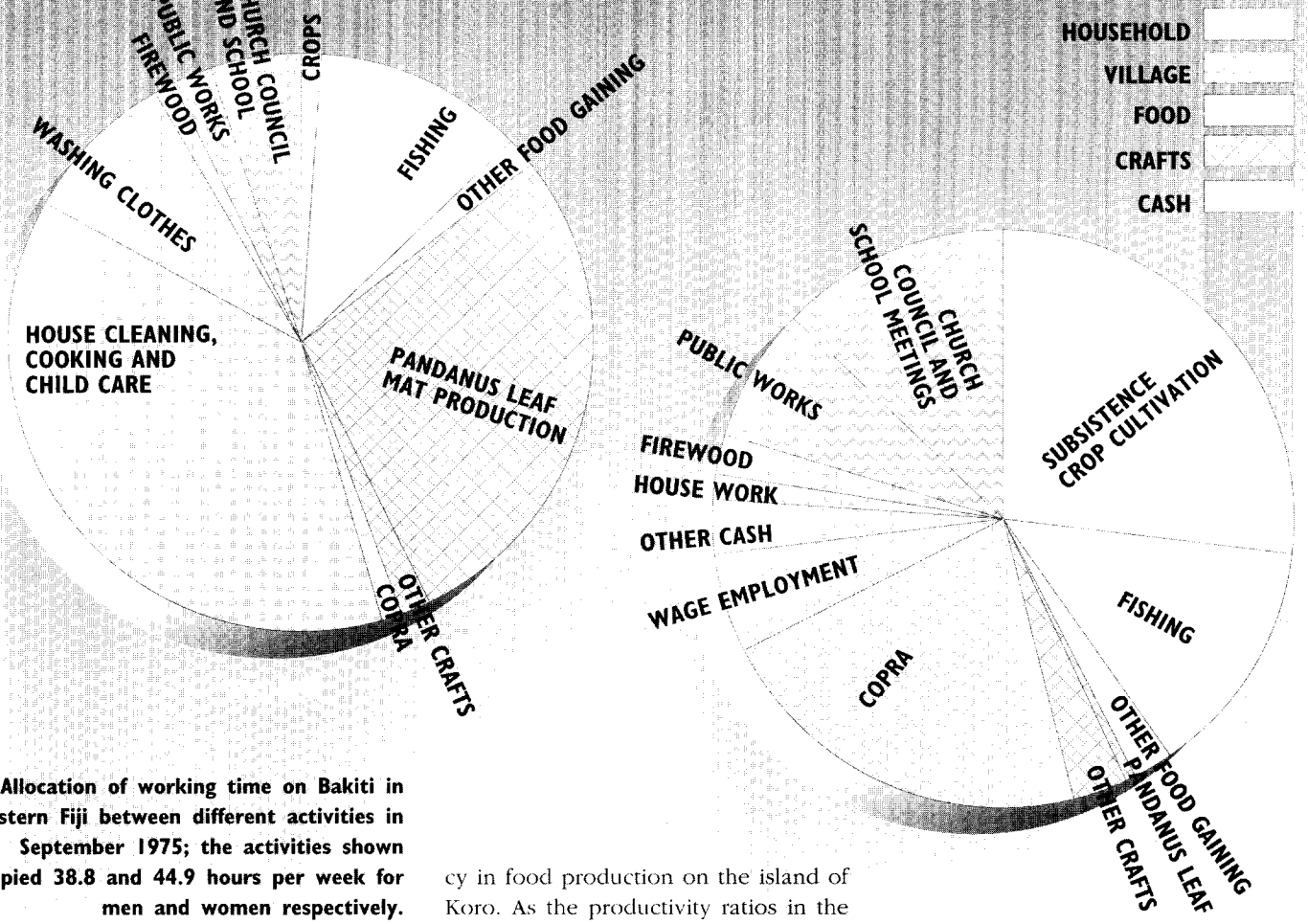
A post-project audit carried out in 1983 by project researchers, some 7-8 years after the initial field work phase, includes reflections on the discrepancies between the project's initial forecasts and subsequent events and on ways in which the research team might have been more prescient (Bayliss-Smith *et al.* 1988). This selective assessment also addresses the role of the Fiji project in the exploration of appropriate methodologies for studying population-environment relations (within MAB, and more generally) and what the experience in eastern Fiji can contribute to certain debates within geography.

Among the central concerns of the project was to assess the effects of the progressive integration of eastern Fiji into the exchange economy and into a core-periphery regional system. This integration has added to the 'time-demanding activities' of islanders very considerably. This is exemplified firstly in the new opportunities for mobility, which in serving the interests of the individual also diminish the aggregate resources of labour available in the islands through absenteeism; and secondly, in the increased diversity of activities within the rural economy, in productive, domestic and recreational spheres. New machines, new skills, new crop and new leisure pursuits have been superimposed on a base load of 'traditional' social and economic activities, few of which have actually disappeared, even after almost 150 years of exposure to alternatives.

The net result is that whereas for some islanders competition for space is not particularly important, competition for time is increasingly prominent. Consciousness of time has been transformed by the daily and weekly rhythms of church and school activities, by the periodicity of marketing opportunities, and through the introduction by return migrants of clocktime attitudes.

Activity surveys on islands such as Batiki showed that the totality of the active pursuits of villagers is both varied and substantial, occupying on average blocks of time fully equivalent to the Western norm of a 40-hour working week. Comparison of allocation of working time in 1975 an 1983 indicated an increasing involvement by women in commercial handicrafts production and by men in livestock production.

The project also used energy analysis as a way of expressing the relative value of time. For example, the com-



Allocation of working time on Bakiti in eastern Fiji between different activities in September 1975; the activities shown occupied 38.8 and 44.9 hours per week for men and women respectively.
Source: Bayliss Smith et al. 1988, page 183.

parison between copra and food crops is revealing. Copra provides returns that have generally been low, fluctuating, and outside the control of individual farmers, whereas the subsistence sector is more dependable and usually more rewarding. In this case energy analysis revealed the good economic reasons for a continuing self-sufficiency in food production on the island of Koro. As the productivity ratios in the accompanying table indicate, copra has only occasionally exceeded subsistence agriculture in its energy yield per hour of work. The optimum course of action would seem to be to abandon copra and focus all efforts on *yaqona* (a mild intoxicant), but this has not occurred for several reasons. Not all households have access to sufficient fertile land for large-scale *yaqona* production, and not all possess the male labour needed for initial clearance. The returns from *yaqona* tend to be in the form of large cash payments at infrequent intervals, whereas copra earnings are attractive in being available on an almost daily basis. There is also risk inherent in dependence on one source of livelihood, and a preference for maintaining a range of different activities. All these factors militate against a total concentration on one crop, however lucrative *yaqona* has been since the 1950s.

Among the conclusions of this part of the project was that the response of farmers on Koro to fluctuations and uncertainties (e.g. in market prices, cyclones, climatic extremes) has been both conservative and opportunistic. A strategy of risk avoidance is suggested by the reluctance to reduce the role of subsistence agriculture or to shift land use away from the two most dependable cash crops towards more speculative alternatives. On the other hand, despite their basic reluctance to change the overall structure of land use, farmers have shown that given market incentives their response can be quite flexible, as in their maximizing output of copra in response to high copra prices.

Perceived energy output per hour of work in Nacamaki (Koro) in eastern Fiji.
Source: Bayliss Smith et al. 1988, page 205

Food energy output (MJ) per person-hour of work input

	SUBSISTENCE AGRICULTURE	GREEN COPRA	YAQONA
1958	10.9	11.2	32.2
1972	10.9	4.2	25.9
1973-4	10.9	16.6 (8.2-25.6)	25.2
1975-6	10.9	5.3	57.3
1982-3	10.3	5.9	37.3

Population, environment and development in the eastern Caribbean

External links of human migration and economic trade were among those explored in a second-phase pilot project on population-environment-development interactions that took place in the eastern Caribbean from 1979 to 1981, as a joint initiative of UNESCO, UNFPA and the Institute of Social and Economic Research of the University of the West Indes. As its name implies, the overall objective of the project was conceived in rather grand, holistic terms. The central notion was that small-island countries are particularly vulnerable systems because they have both limited resources and are subjected to major perturbations in the natural and economic forces that impinge on them. These largely external forces include geophysical and meteorological phenomena (volcanic eruptions, earthquakes and hurricanes) and economic processes, such as world commodity prices for domestic exports (sugar, banana, arrowroot) and world prices for imports like oil and foodstuffs.

The project included an important modelling component, designed to identify 'stress points' in the relationships between resources, population and production rather than to define limits to development. It was felt that the identification of these stress points, whether they lay in the environmental or socio-economic areas, would allow island 'managers' to consider appropriate actions. The initial conception of the project also contained the idea that small-island systems, while not closed systems, could be more readily delimited than land-locked territories.

Another important notion was that different island states could be envisioned as on a trajectory, with different stages of development leading to different stress points; the one illuminating the other. Thus, several islands were examined in a comparative framework, including Barbados, St Lucia, St Kitts-Nevis, and St Vincent[1].

Data collection was to include national level statistics on demography, international, regional and intra-island migration, production and trade, tourism, geology-hydrology-soils, land use, energy use, waste disposal, environmental health, soil and beach erosion, and natural hazards. In addition, the project actually carried out a major primary data collection activity in the form of a social attitude and socio-economic survey of households in all four countries.

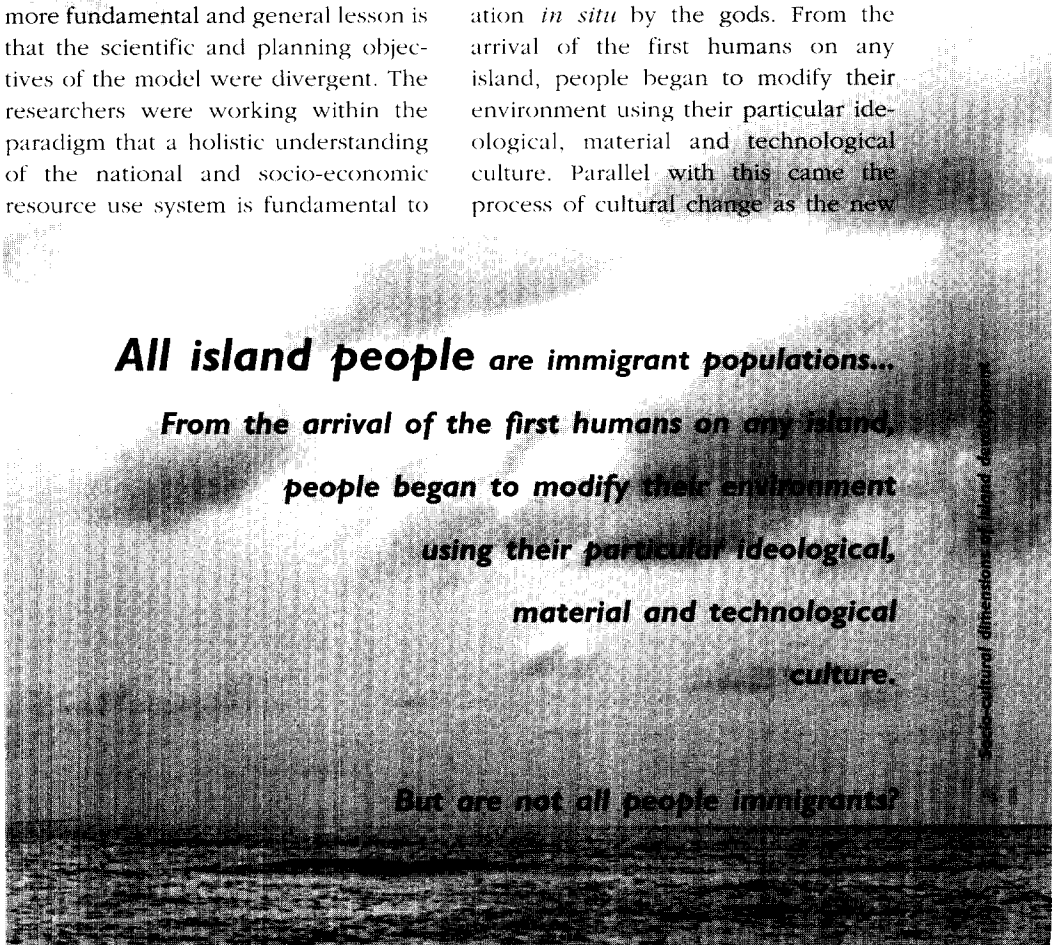
For financial and other reasons, the project never attained its intended agenda and had to curtail after just two years of operation. Among the shortcomings (Whyte *et al.* 1985) was that the overall model was not sufficiently focused, was over-ambitious in what could be achieved, and was not sufficiently directed to the needs of the decision-makers. It remained, throughout its various forms, a scientific model aimed at understanding the system holistically. Thus, the initial concepts behind the model, such as 'vulnerability and resilience', 'carrying capacity' and 'stress points' were not framed in the language of decision-makers. They were perceived by them as abstract, scientific concepts which had little relevance to the five-year Development Plans which each country was undertaking.

Several lessons can be drawn from this experience. The most obvious ones relate to the shortcomings in the procedures adopted for communication with decision-makers. However, a more fundamental and general lesson is that the scientific and planning objectives of the model were divergent. The researchers were working within the paradigm that a holistic understanding of the national and socio-economic resource use system is fundamental to an integrated planning approach. This is an important message for planners to hear. But, because the model was never able to be fully developed as either a scientific or management model, the scientists did not get that message across.

CULTURAL DEVELOPMENT AND ISLAND SOCIETIES

The effects of development on cultures (the accumulated body of norms or customs of a particular society or population) is an issue of great contemporary concern to island peoples, in the present epoch of changing patterns of world economic interdependence and rapidly shifting political context. What has been called the new fractured global order (Sagasti 1989) has special implications to the rich diversity of island cultures and the strong allegiance to home and culture of island peoples.

Clearly, the interaction of culture and development in the context of islands is not and has never been static, as underlined in a UNESCO seminar on islands' culture and development held in Mauritius. In an introductory address to that seminar, Ward (1991) emphasized that *all* island people are immigrant populations, despite some cultural traditions or myths which claim, for this or that island community, some degree of autonomous evolution or creation *in situ* by the gods. From the arrival of the first humans on any island, people began to modify their environment using their particular ideological, material and technological culture. Parallel with this came the process of cultural change as the new



1. Now, Saint Lucia, Saint Christopher and Nevis, and Saint Vincent and the Grenadines.

VAKA MOANA - THE OCEAN ROADS

Vaka Moana: the Ocean Roads is a large scale thematic programme devised under the United Nations World Decade for Cultural Development administered by UNESCO. It has been set up in response to the growing awareness amongst Pacific peoples of the importance of their heritage and of the need both to maintain and to develop further all the dimensions of that heritage.

The unifying theme of the programme is the Pacific Ocean, the generating source of the peoples' resources, and the pathway linking the lands and the peoples of the region. The title Vaka Moana comes from the widespread use in the Pacific of the words Moana for ocean, and Vaka for canoe. Vaka Moana enshrines many associated meanings, including many dimensions of traditional and contemporary culture as well as those associated with sea voyages for exploration, migration and trade.

However, the intention of the planners of the Vaka Moana Programme is that it should address a broader range of activities, including the study of traditional and contemporary cultures, the reinforcement of traditional links, the conservation of resources and traditions, and economic development based on careful use of the region's resources. Fundamental to the philosophy of the World Decade for Cultural Development and to the Vaka Moana Programme is a commitment to the recognition of cultural, spiritual and social values in the development process.

The intention of the programme is that it will lead to:

- a better understanding of and appreciation of the cultural heritage and diversity of the Pacific peoples;
- the development of cultures and attitudes which build on that heritage while taking advantage of contemporary technologies and opportunities;
- a greater understanding of and tolerance for the values, practices and attitudes of others.

Plans for the Vaka Moana project were discussed at a meeting held in Apia (Western Samoa) in May 1993, with a report published later in the year by the New Zealand National Commission for UNESCO. Follow-up discussions are scheduled for June 1994 in Western Samoa to crystallize activities during the 1994-97 implementation phase of the project (see also page 109 of the present report).

community began to adapt to its new environment and grow away from its parent culture. One feature of island cultures is the great variety they exhibit, due in large measure to isolation one from the other, even across short sea passages, and the cultural drift which this engenders. The diversity of island cultures is in part a function of boundedness, and is reflected in the richness of island languages - the fact that about 1200 languages and many more dialects are spoken in the Pacific-Oceania region, representing about one quarter of the world's languages, with an average of only 5000 speakers per language.

But these boundaries are not sealed, they are permeable to new ideas and techniques, new plants and new people. Thus cultures are changed by exogenous as well as by indigenous forces. Changes in economic and social states will inevitably create changes in the culture so that the full preservation of the one in the presence of the other is an impossibility.

Island people, like people everywhere, often stress the need to preserve their cultural, social or national identity. So do some outsiders when talking of islands. But it is possible only to a degree, and only in the short term.

***About** 1200 languages and many more dialects are spoken in the Pacific-Oceania region, representing about **one quarter of the world's languages,** with an average of only 5000 speakers per language.*

THE ISLANDER'S DILEMMA

'...it might be argued that much of the effort put into rural development with the aim of maintaining a large part of the so-called 'traditional' social systems in the South Pacific is an exercise in futility ... Islanders ... cannot have the basically 'western' lifestyle based on high *per capita* GNP to which they aspire, without changing, in a very fundamental way, the systems of social relations and community life, all of which arose from and are therefore appropriate to subsistence existence. To say that they can have the goods and services of industrialized societies while maintaining values that are inappropriate is to indulge in fantasy ... Many who call for social and cultural conservation are at the same time amongst the foremost agents for alteration of existing social and cultural arrangements. If what has been said is alarming, then Pacific Islanders must face the question of what kinds of society they want for the year 2000 and beyond. If they want a capitalist society and further westernization, then they have to take the risks required and adjust accordingly. Otherwise they must reduce their aspirations and devise other alternatives, for the present situation is untenable'. (Epeli Hau'ofa 1980, cited from Ward 1991, page 32).

In the long run it is an impossibility unless isolation were to be reimposed, as in a zoo. And that is impossible in today's world. One must accept that if cultures are to live, they must change. The problem is the choice (explicit or implicit) of what to retain and what to change, and then to keep the rates of change such that people are comfortable and secure in the cultural norms at any one time.

Ward (1991) continued his introductory address to the Mauritius seminar in reviewing some of principal themes

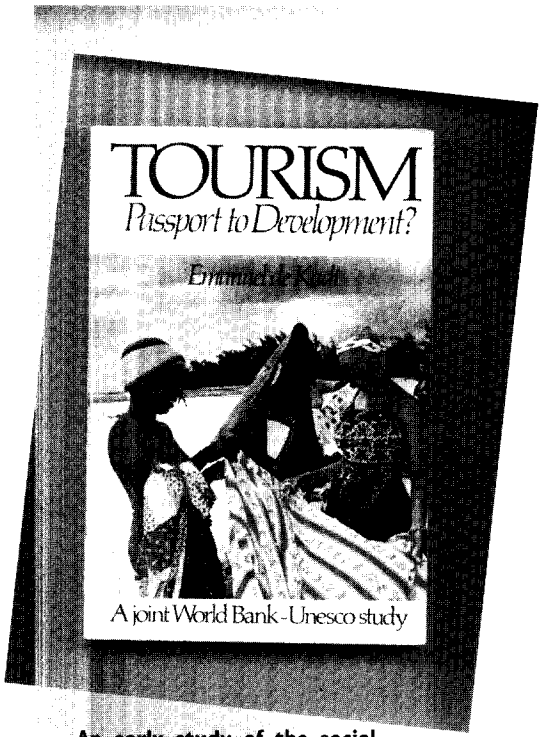
relating to culture and development in island situations, taken up in succeeding contributions: the effects of insularity as influenced by the relativities of scale and distance; the sustainability of development in island states and the importance of the breadth and quality of the resources available, the nature of the economy, the size of the population, and the standard of living acceptable to the people (a notion simple to state, but immensely difficult to quantify); the relations among insularity, migration, inter-ethnic contacts and plural societies; human resources, health and education; regional planning and development in island countries.

Issues such as these are recurrent concerns in many UNESCO field activities at the interface of people, resources and development, for example since the mid-1970s within the Man and the Biosphere (MAB) Programme and more recently within the evolving Vaka Moana (Ocean Roads) initiative in the Pacific.

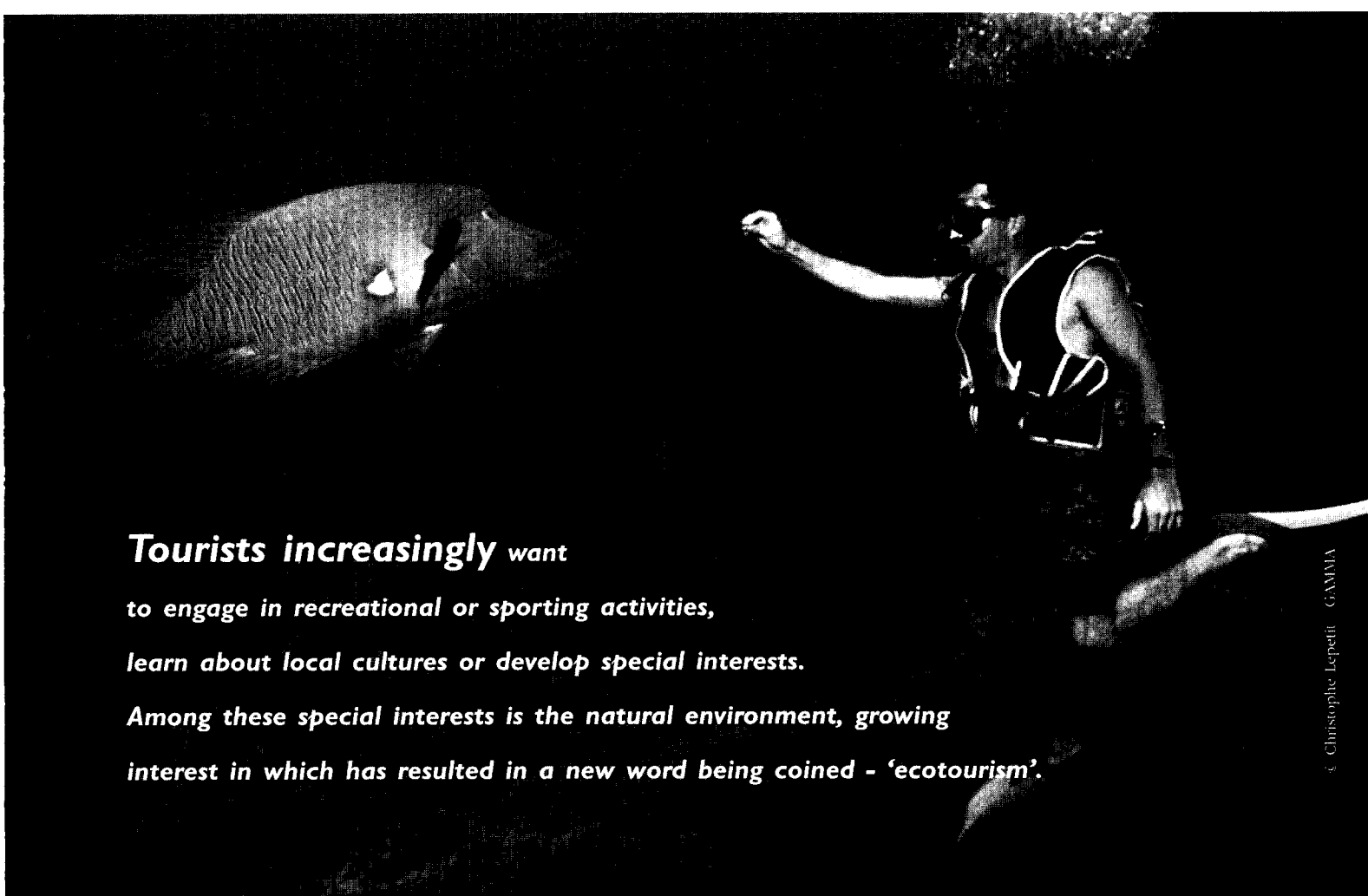
TOURISM: PASSPORT TO DEVELOPMENT?

Tourism is a major world industry serving over 450 million people travelling internationally, and ten times as many travelling domestically. A UNEP-sponsored study on sustainable tourism development (UNEP 1992c) describes some of the trends. With more than 130 million employees (in transport, accommodation, entertainment and catering, among many others), and an annual investment in capital projects of more than US $400 billion, tourism alongside such sectors as construction and petrochemicals as a major world industry. Between 1970 and 1990, world tourism grew by nearly 300%, and is expected to grow by half again before the end of the century. An annual estimated turnover of over US $3 trillion in 1992 represented 6% of the world's GNP (gross national product). Tourism's share of GNP is much higher in many small-island economies, generating 15-30% of the economy in many Caribbean countries, 18% in the Maldives.

World tourism is evolving as well as growing. As incomes rise and transportation systems improve, intercontinental travel is increasing. There is also sustained growth in what the industry has termed 'quality' tourism. The move towards quality tourism involves several trends, the overall direction of which



An early study of the social and cultural effects of tourism in developing countries included assesstments of such island situations as Bali, Bermuda, Cyprus, Malta and the Seychelles.



***Tourists increasingly** want*

to engage in recreational or sporting activities,

learn about local cultures or develop special interests.

Among these special interests is the natural environment, growing

interest in which has resulted in a new word being coined - 'ecotourism'.

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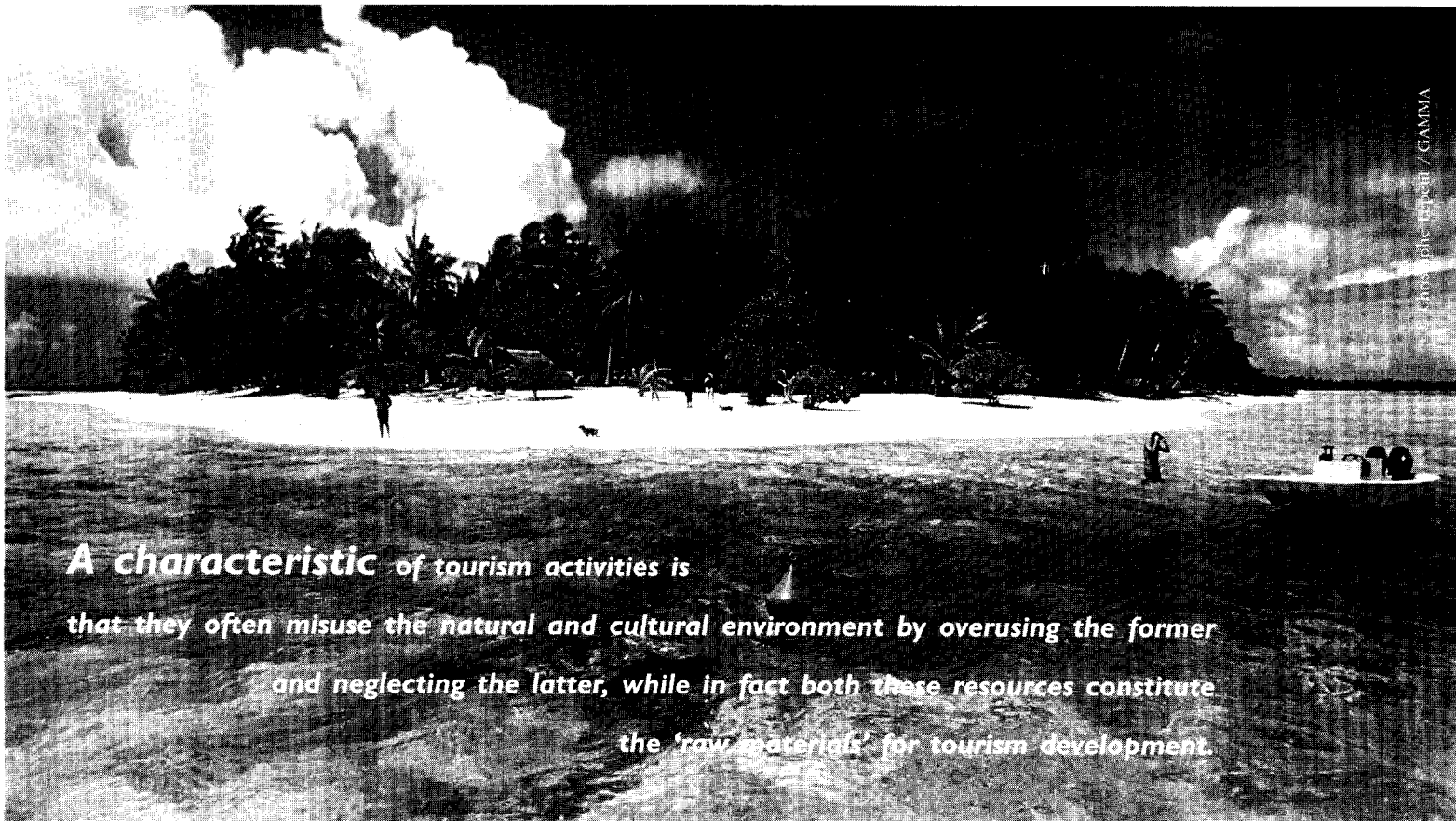


A characteristic *of tourism activities is that they often misuse the natural and cultural environment by overusing the former and neglecting the latter, while in fact both these resources constitute the 'raw materials' for tourism development.*

is a move away from the mass beach tourism that often characterized the 1960s and 1970s to a more diverse and specialized tourism industry. Tourists increasingly want to engage in recreational or sporting activities, learn about local cultures or develop special interests. Among these special interests is the natural environment, growing interest in which has resulted in a new word being coined - 'ecotourism'.

Given the scale of the tourist industry, it is scarcely surprising that its impacts are considerable - particularly on the environment and its resources and on local cultures and societies - and it is here that lie UNESCO's principal interests concerning tourism. A characteristic of tourism activities is that they often misuse the natural and cultural environment by overusing the former and neglecting the latter, while in fact both these resources constitute the 'raw materials' for tourism development.

An early initiative of UNESCO was a seminar in 1976 sponsored jointly with the World Bank, which focused on the social and cultural effects of tourism in developing countries and whose report had the challenging title of *Tourism - Passport to Development?* (de Kadt 1979). Island situations figured prominently in the assessment, including case studies of Bali, Bermuda, Cyprus, Malta and the Seychelles. Issues addressed included types of tourism, stages of tourism development, tourism planning and decision-making at different levels (transnational, national, local), economic benefits and social welfare (who gains or suffers, and how much), tourism as a modernizing influence that significantly effects the attitudes and values of people in all societies, the effects of tourism on arts, crafts and cultural manifestations. Policy recommendations and conclusions adopted by the seminar were grouped in three main domains: distribution, planning and participation; the 'encounter' and cultural aspects of tourism; measures to encourage the local culture for the benefit of the population and the tourist alike.

Since that early study, UNESCO concerns with interactions between tourism, environment and culture have included work on the links between tourism, sustainable development and World Heritage sites (von Droste *et al.* 1992). Digraph techniques called loop analysis have been used in modelling the potential impact of tourism on the natural environment and economic conditions of the Aeolian island complex (Pucci *et al.* n.d.).

Several international seminars have been organized or sponsored by UNESCO, such as those on environment, tourism and island development (Martinique, September 1988), tourism and life on small islands (Mali Losing, June 1989), human ecology, tourism and sustainable development (Bali 1990), environment, tourism and development (Malta 1990), natural and cultural heritage and new challenges for sustainable tourism in Mediterranean islands and coastal areas (Crete 1993). Studies on the effects of and prospects for tourism in particular island settings have included work on Bali (Picard 1983, Bali Human Ecology Study Group 1990, Francillon 1990), and Guadeloupe (Ayala & Cabat 1992).

At the regional level, activities have included a regional UNESCO-BIOTROP training workshop on environmental management of tourism in coastal areas in South East Asia (Bogor, July 1989).

Most recently tourism has been the focus of the first number in 1994 of INSULA's *International Journal of Island Affairs*. The issue includes a posthumously published interview with the Greek Minister of Culture Melina Mercouri, a preview of the UN Conference on Sustainable Development of Small Island Developing States, and accounts of tourism in particular island groups (e.g. in Croatia, the Arctic, the Northern Mariana Islands, Formentera). Other contributions address the role of ecotourism in island development, shades in the meaning of isolation in respect to islands, and the sustainability of tropical island tourism.

The February 1994 issue of *UNESCO Sources* also features a ten-page dossier entitled 'Attention: Tourists at Large', with a special focus on the interactions between tourists and the world's protected areas, and more particularly World Heritage sites. Background for

HUMAN SETTLEMENTS, SOCIAL SCIENCES AND SMALL ISLANDS

Development in small islands correlates closely with their human settlements. Economic and subsistence activities which are based, for example on coastal marine and ocean resources, characteristically bear an imprint from a specific village or urban structure and architecture, which, in many regions of the world form part of a distinctive and rich cultural heritage reflecting the interface between the island, its people and the surrounding ocean.

Planning for islands therefore requires perhaps a more sophisticated and detailed approach than is the case normally with large-scale regional and urban schemes. On several occasions, UNESCO has been associated with studies on human settlements in small islands, such as Nias in Indonesia (Viaro 1980) and the Lesser Antilles, as well as with urban rehabilitation projects such as those carried out in Valletta (Malta) or in Crete.

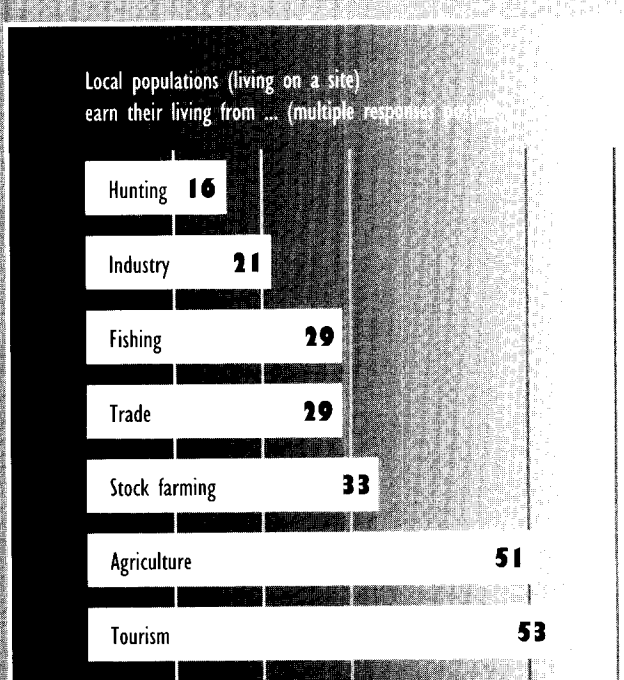
In the late 1970s-early 1980s, a number of studies on island development in the Mediterranean were sponsored as a contribution of the Social Sciences Sector to the MAB Programme, with results published in the Human Settlements and Socio-Cultural Environment Series. In addition to Salina, and as described elsewhere in this report (page 101), studies focussed on the islands of Kerkennah (Tunisia), Gozo (Malta), and Skiathos-Skopelos (Greece). Islands and human settlements formed the focus of a special issue in 1987 of the journal *Ekistics*, prepared in co-operation with UNESCO (see page 124). Support has also been made available through the UNESCO Regional Adviser for Social Sciences in Asia and the Pacific to studies on culture and society in the South Pacific region (see page 105). Reviews on social science dimensions of island life and society have also been published in UNESCO's quarterly *International Social Science Journal*, on such topics as migration as an agent of change in Caribbean island ecosytems (Marshall 1982) and Caribbean peasantry in the confines of the plantation mode of production (Beckford 1985).

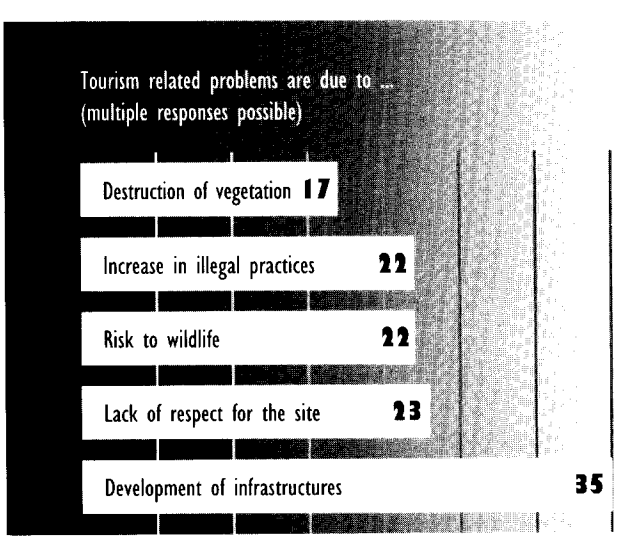
Most recently, in January 1994, UNESCO launched a new social science research initiative on 'Management of Social Transformations' (MOST). The focus is on such urgent social problems as marginalization, social exclusion, poverty, and unemployment, which exist in varying degrees in urban and rural areas of all societies, as well as the social consequences of transnational phenomena such as migration, environmental questions and technological and financial flows.

the *Sources* issue was provided by a meeting of representatives of the World Heritage sites, which took place at the UNESCO Regional Office in Dakar (Senegal) in November 1993, to discuss problems caused by the growth of tourism and compare solutions they had tried out. The meeting - organized jointly by UNEP and UNESCO along with IUCN and the World Tourism Organization - followed a survey of tourism patterns at all natural heritage sites, carried out with Canadian government help. The survey was based on replies received from 70 of the 90 canvassed natural sites inscribed on the World Heritage List. The sites that replied to the survey receive more than 40 million tourists annually, and for the most part the numbers are on the rise. Though the extreme diversity of sites makes it difficult to draw general conclusions, it is clear that tourism plays an important part in local economies, on and around the site, taking on even more importance than agriculture. At the same time, the majority of sites consider tourism a problem - posing a real threat to wildlife and vegetation. A number of parks consider their infrastructure insufficient and one site in three admits to having no particular policy concerning tourism. A similar proportion has no information centre for tourists, but more than half charge an entry fee, which provides a minimum of control.

Further information on the survey is included in *The World Heritage Newsletter* No. 3 (September 1993), with the subsequent issue (No. 4, dated March 1994) including a four-page article based on the Dakar meeting, entitled *Reconciling tourism and natural heritage*.

World Heritage Sites and Tourism.
Survey results from 70 World Heritage Listed Sites.
Source: UNESCO/UNEP 1994, from UNESCO Sources, February 1994





ON CULTURE, LANGUAGES AND THE PREPARATION OF GLOSSARIES

Since the late 1960s, UNESCO has been working in partnership with the Pacific island countries in curriculum development programmes, including technical and vocational education. Innovations in the 1980s included the involvement of nationals as the primary means of achieving project goals, which at the time represented a radical departure from the norm.

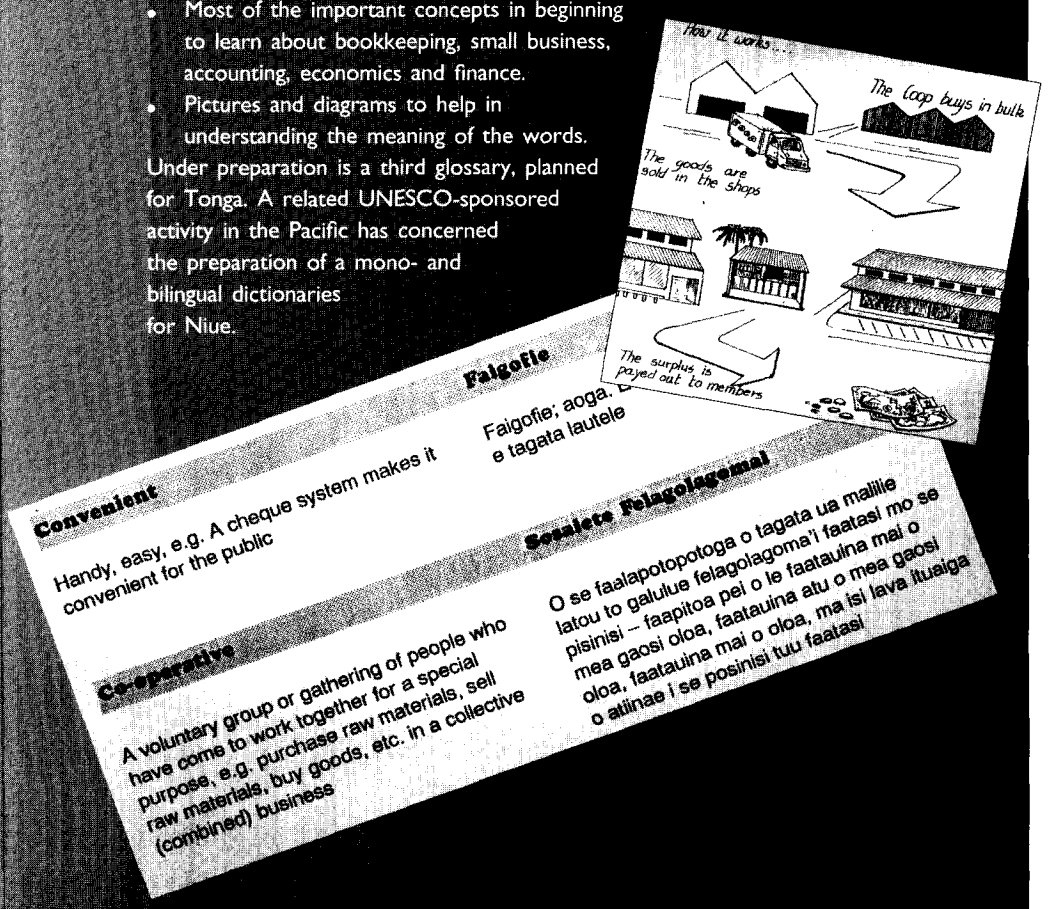
From the enthusiastic support given to this 'new' model of national empowerment, it was but a short jump to reach the conclusion that the nationals should be given a language-based tool to improve the quality of both instruction and learning. One such tool was the option of either using the vernacular language in instruction or having the means of referring to it to clarify or enrich a particular word or concept during a lesson. For one of the electives - commercial (or business) studies - the vernacular became almost essential inasmuch as the words by themselves were complex enough even to mother tongue speakers to say nothing of those having an imperfect grasp of English as a second language. Added to that, however, was the very real dilemma of finding ways of defining terms referring to concepts which had no counterpart in the cultures of the Pacific.

The idea emerged for developing bilingual glossaries. A first such was prepared for the Cook Islands Maori, in the field of commercial studies (Horsley 1987). When the glossary was published, it proved an instantaneous success, not only with the Education Department but with the business community and indeed with the Government and Cabinet of the Cook Islands. In the light of that success, UNESCO/Apia was able to secure funding for an additional country (Western Samoa) which, like the first, was selected because of the presence of a competent national commercial studies specialist, retired Education Department staff member Toleafoa Faasau. The result was an English-Samoan Glossary of Commercial Studies terms.

The Words of Accounting, Small Business, Bookkeeping, Economics and Commerce in English and Samoan (Faasau & Horsley 1991) includes:

- Most of the important bookkeeping, accounting and commerce words.
- All of the commercial words in the 3,000 most common words in the English language translated into Samoan.
- Most of the important words and ideas necessary to start and manage a small business.
- Some of the important economic words necessary to know to read development plans and understand financial discussions.
- All the words necessary to study Western Samoan Commercial Studies Forms 3-5.
- Most of the important concepts in beginning to learn about bookkeeping, small business, accounting, economics and finance.
- Pictures and diagrams to help in understanding the meaning of the words.

Under preparation is a third glossary, planned for Tonga. A related UNESCO-sponsored activity in the Pacific has concerned the preparation of a mono- and bilingual dictionaries for Niue.



MAINTAINING THE CULTURAL HERITAGE

Urban development, industrialization, pollution, armed conflicts or the unplanned development of mass tourism, present an ever-increasing threat to our cultural heritage whether in the form of sites and properties, or works of art and architecture. Less tangible forms of cultural expression are also under threat, from the revolution in communications technology and other trends towards the 'global village'.

Conserving the musical heritage

Until relatively recently, the preservation of island cultures has been primarily by word of mouth. Even today, many island languages in the Pacific, have no published texts, except the Bible. This is true for both indigenous and creole languages (Ward 1991). The recording of cultural material (in terms of oral traditions, songs or music) has been a priority for UNESCO-sponsored activities for some years. Because of its oral and gestual mode of transmission, traditional music runs a particular risk of being lost. Preserving and revitalizing this intangible cultural heritage is one of the primary aims of the UNESCO Collection of Traditional Music, which was created in 1961 in collaboration with the International Music Council (IMC) and with the scientific and financial assistance of the International Institute for Comparative Music Studies and Documentation (IICMSD).

In 1988, the collection was relaunched in collaboration with a new partner (AVVIDIS), and over 50 titles have been released since that time - both new recordings and reissues as compact discs and cassettes of UNESCO's former collections. Examples from island situations include traditional music from Bali, Corsica, Java, Sicily and the Solomon Islands, which have been featured in the three series of recording which make up the UNESCO Collection:

- **Music and Musicians of the World** includes popular or learned musical traditions from most cultural areas of the world as bearing witness to current endangered or extinct but always highly representative heritage, of a civilization, of a musical system or of a process of artistic creativity.
- **Anthology of Traditional Music** offers the most representative man-

ifestation of the great music traditions of all continents. Priority is given in this series to musics based on explicit theoretical systems as well as to musical genres of unbroken duration (traditional opera, ritual ceremonies recorded without interruption, music for mediation, ceremonies of the various religious persuasions).

- **Traditional Music of Today** pays particular attention to the creative processes or the reconstruction of traditional musics by today's performers: well-known soloists or anonymous groups, urban musics, concert, feast or carnival popular musics, musics having recently evolved or in process of transformation.

Safeguarding cultural properties

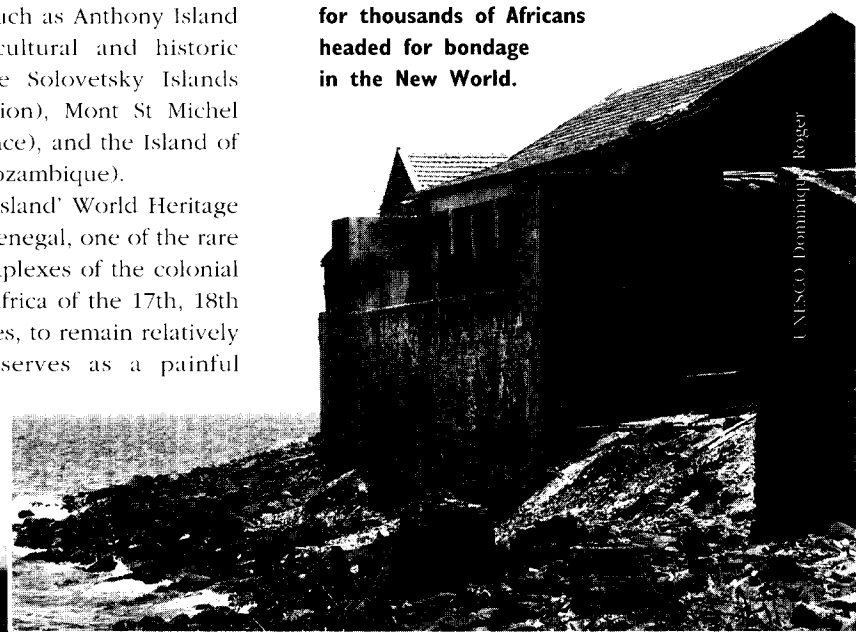
In adopting the World Heritage Convention in 1972, UNESCO set itself the ambitious task of establishing an inventory of works created by humanity and by nature, considered to be of outstanding and universal value, and of ensuring their safekeeping so that we and future generations can enjoy the world's wealth and its variety. Part of the World Heritage Fund - created by the Convention of 1972 and now administered by the World Heritage Centre in conformity with the decisions of the World Heritage Committee - as well as funds mobilized by the Culture Sector of UNESCO (Division of the Physical Heritage), have for many years contributed to the safeguarding of a number of cultural sites throughout the world.

Of the 305 cultural and 16 mixed (combining both natural and cultural properties) sites and properties included on the World Heritage List, a number relate to small islands (von Droste & Rössler 1993). In some cases, these properties are located on small islands, such as Paphos in Cyprus, several sites on Malta (Hal Saflieni Hypogeum, City of Valletta and Megalithic Temples), Pythagoreion and Heraion on the Greek island of Samos. Other sites are 'whole islands' such as Anthony Island (Canada), the cultural and historic ensemble of the Solovetsky Islands (Russian Federation), Mont St Michel and its Bay (France), and the Island of Mozambique (Mozambique).

Another 'whole island' World Heritage site is Gorée in Senegal, one of the rare architectural complexes of the colonial period in West Africa of the 17th, 18th and 19th centuries, to remain relatively intact. It also serves as a painful reminder of the slave trade. It is largely for these historical and cultural reasons that the Senegalese Government wished to stress the special significance of Gorée (inscribed on the World Heritage List in 1978) as a point of contact and exchange between different civilizations.

Following preliminary studies by UNESCO concerning the preservation of the architectural heritage of Gorée, the UNESCO General Conference, at its 20th session, endorsed the launch of the International Safeguarding Campaign, which began officially in 1980.

The House of Slaves was the point of no return for thousands of Africans headed for bondage in the New World.



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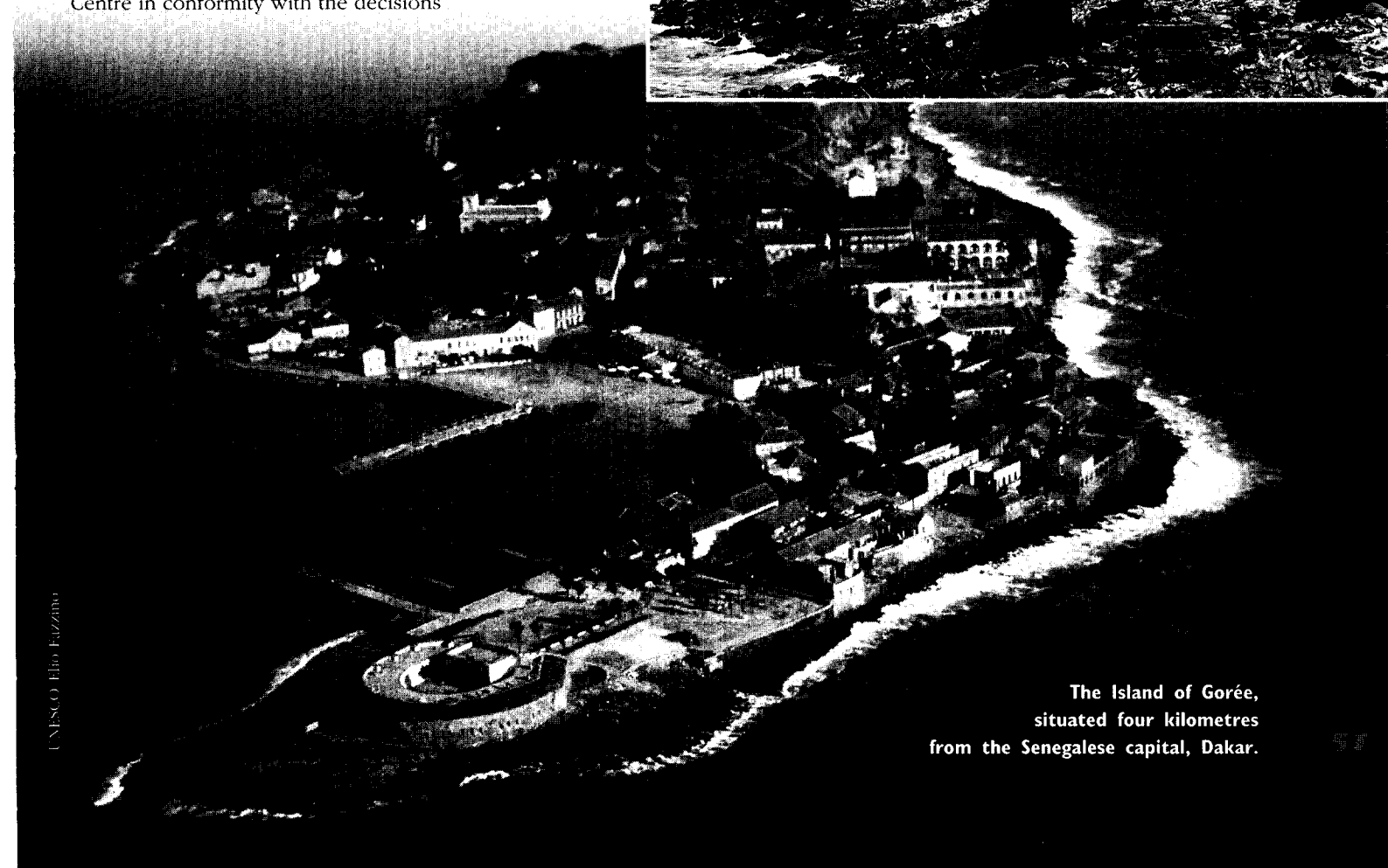

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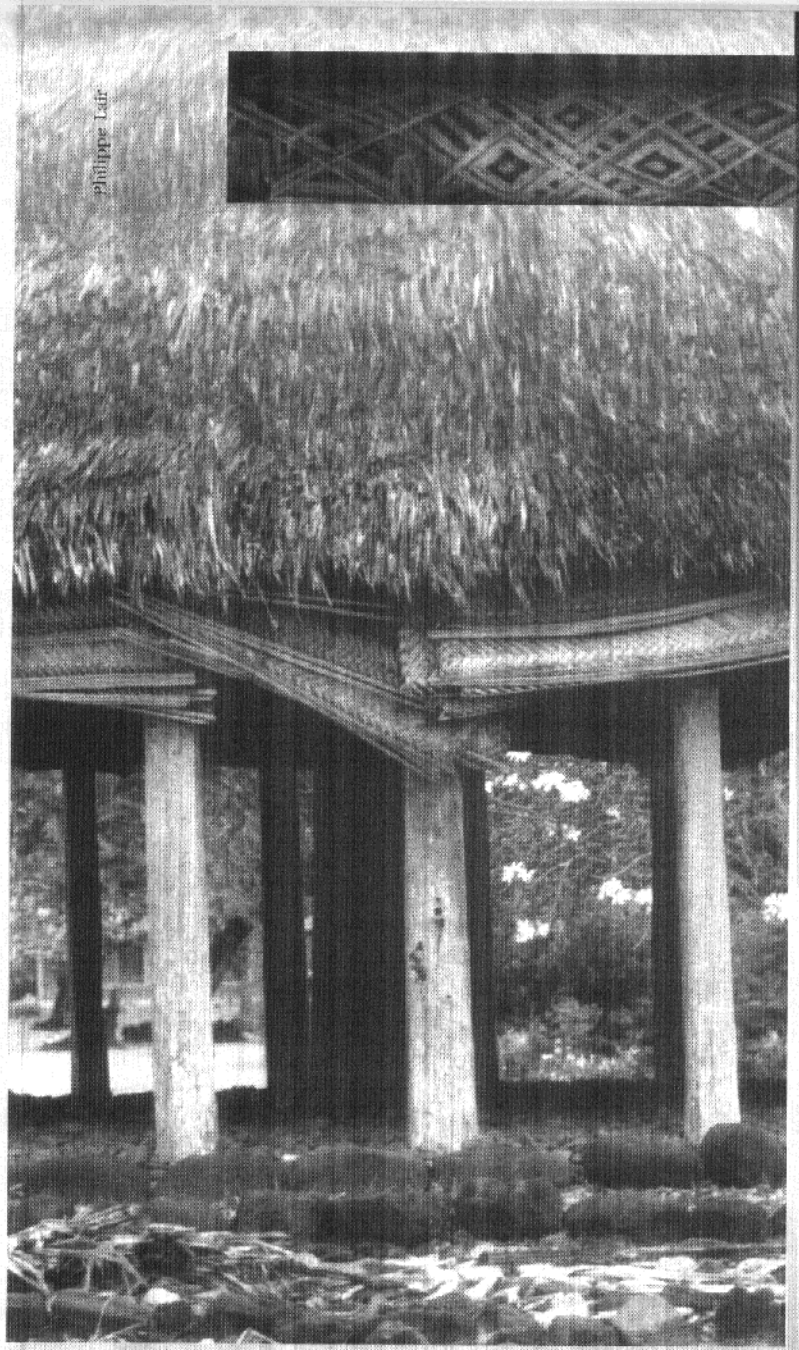
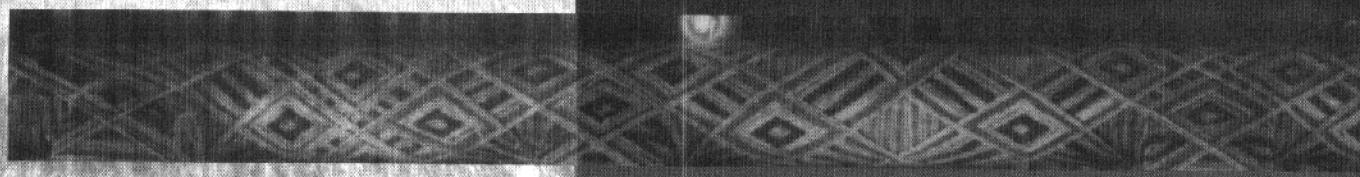
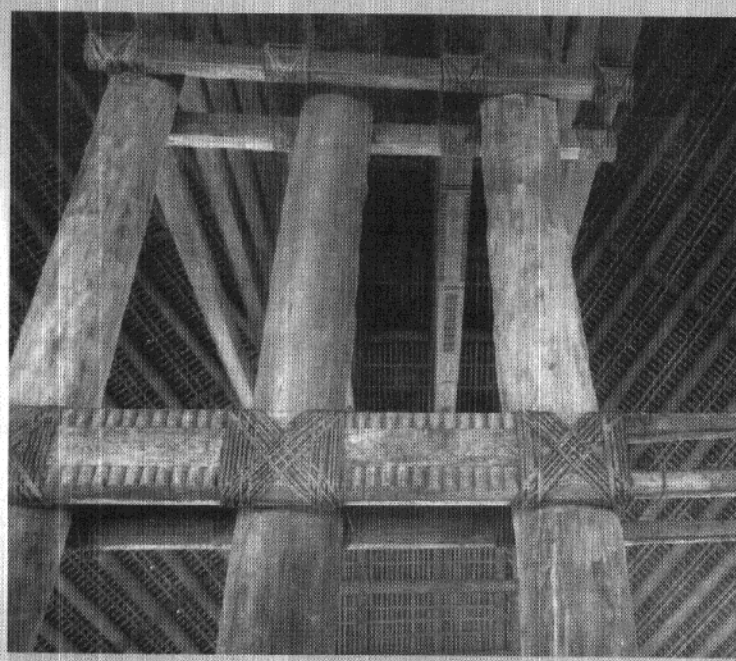
The Island of Gorée, situated four kilometres from the Senegalese capital, Dakar.

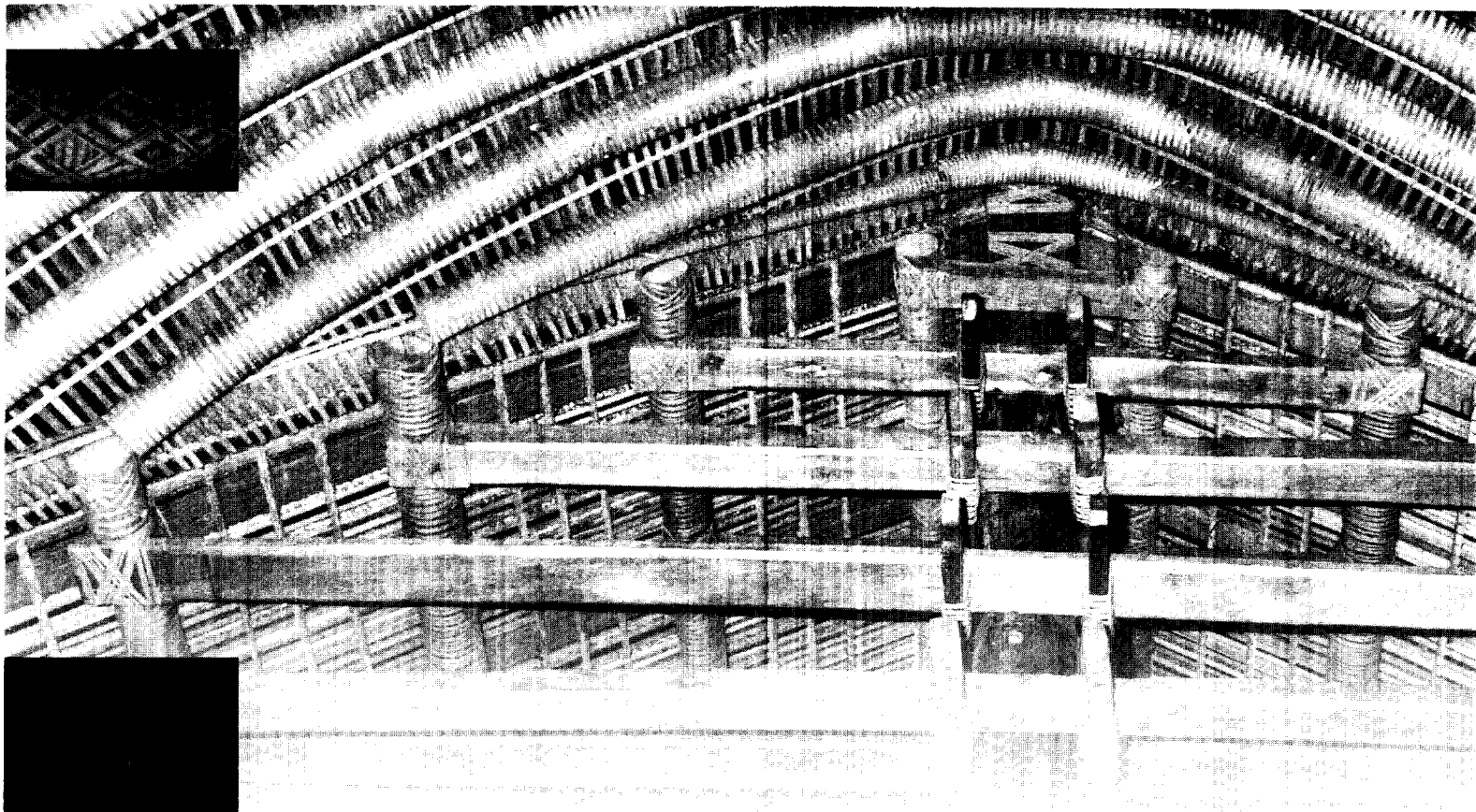


Philippe Lair



UNESCO has long encouraged the study of the world's traditional architecture, as a means of promoting the cultural heritage. One example is a study of the Samoan fale (fale is the word for house in the language of Samoa) produced by the UNESCO Office for Pacific States in Apia, Western Samoa. Author Peter Higginson joined forces with architect-photographer Philippe Lair to document and capture the essentially ceremonial fale, to describe their place in the 'faa-Samoa' (the Samoan culture or 'way of living'), and to analyze the techniques that are used in their construction. One key feature of the construction methods is the use of braided coconut husk fibre to bind together the component parts.





The campaign action plan has adopted a global interdisciplinary approach in an ambitious project for the cultural, social and economic revitalization of the island. It includes preparation and implementation of the restoration of the architectural heritage and cultural and promotional activities. Of the ten buildings included in the action plan, five have already been restored and a number of promotional activities have been carried out, including publications, an exhibition and the production of a film. In 1992, several UNESCO Clubs and NGO's sent some 50 young people to the Island of Gorée to take part in this international project. Several other restoration projects are currently being prepared, including the creation of a Museum of Human Rights.

TAKING ADVANTAGE OF TRADITIONAL KNOWLEDGE

New technologies, such as the modern communications and information technologies mentioned above, offer immense opportunities for innovative approaches to island development. At the same time, the results of transferring and applying sophisticated technologies have often been disappointing and progress short-lived, for a variety of environmental, economic and socio-cultural reasons. Whence one of the reasons for current interest in traditional approaches to the use and management of resources, which have proved their worth over the course of time. Work on traditional ecological knowledge within UNESCO's programmes is based on a number of premises:

- Local cultivators, fishermen and other resources users often have a profound knowledge of the highly varied environments where they live, which could be better tapped in assessing the potential use of locally available resources and materials and the development opportunities of their homelands.
- Much of this knowledge is unrecorded and unexploited, and every year part of this knowledge is being lost with the transformation of ecological systems and of local cultures.
- Recording and applying this traditional ecological knowledge provides one approach to making more effective use of the biological wealth of the planet, particularly in terms of biological diversity and genetic richness and their use as a starting point for strategies of integrated conservation and sustainable development.
- There may be considerable scope in diffusing information on techniques and practices refined over generations in one part of a particular geographical or ecological region, and testing and adapting them in other localities.

INSTITUTIONAL CHALLENGES FOR COMMUNITY-BASED MANAGEMENT IN THE CARIBBEAN

Those who take an interest in the problems of natural resources are gaining a better understanding of the effect of institutional arrangements in enhancing or detracting from effective governance and management. In particular, we are learning more about institutional arrangements designed or evolved by resource users themselves.

Some of the challenges in managing our common resources have been addressed in one of the 1991 issues of *Nature & Resources*, UNESCO's quarterly review of research for sustainable development. Contributing articles address such topics as tenure rights and exclusion in the Philippines (Malayang 1991) and privatization of the sea for seaweed production in Chile (Cereceda & Wormald 1991). In an article on community responsibility as one element of co-management resource strategies in the Caribbean, Renard (1991) notes that current efforts of government and other agencies are directed primarily at a simplification and reduction of resource management regimes in favour of private management of private property, and public management of state property. The author proposes that this simplification is not in the best interest of development and resource management in the region, and that there is value in preserving and enhancing the diversity of management regimes, and in establishing partnerships in management responsibilities. Among these, community management is advocated, not as an exclusive responsibility, but as one element in a co-management arrangement involving public and private interests to manage resources, which may be under private, public or communal ownership. The justification for community management can be found at four levels.

- First, community-based management promotes democracy and equity because it gives members of the community a greater opportunity to share in the decisions about how resources are used, and thereby a greater share in the benefits that are gained from their use. Priorities are no longer predetermined from the outside by bureaucracies or in boardrooms far removed from the everyday concerns of the users. Rather, they are developed from within by those whose livelihoods are directly affected by those choices. Similarly, it enhances the opportunities to increase the local benefits of resource use because means of production are more likely to be smaller in scale and owned by the users themselves.
- Second, community-based management is economically and technically efficient. Users have more clearly defined responsibilities for their decisions and actions and can provide a wide variety and considerable quantity of local resources, land, skills, technology, labour, capital, knowledge, and infrastructure to implement them. In particular, local and traditional knowledge and resource monitoring by community members can provide significant information to planning and development agencies on the characteristics of a resource. Local responsibility also decreases the need for costly outside enforcement, which many governments cannot afford.
- Third, community management is effective because it is adaptive and responsive to variation in local social and environmental conditions and changes in those conditions. Often it is the failure of centralized strategies to accommodate the local socio-cultural conditions, not the resource conditions, that leads to the failure of the strategy. Furthermore, resource users are constantly aware of the condition of the resources upon which they depend, and they can be quick to respond and adapt to changes in the condition of those resources.
- Fourth, local community control brings a measure of stability and commitment to management that a centralized government approach cannot duplicate. Government decision-making usually operates over a relatively short-term time horizon and is often met with resistance on the ground. On the other hand, people will show more commitment to decisions they have made themselves based on their own priorities. These priorities should reflect the objectives of long-term socio-cultural and resource sustainability, which are clearly in their best interest to ensure.

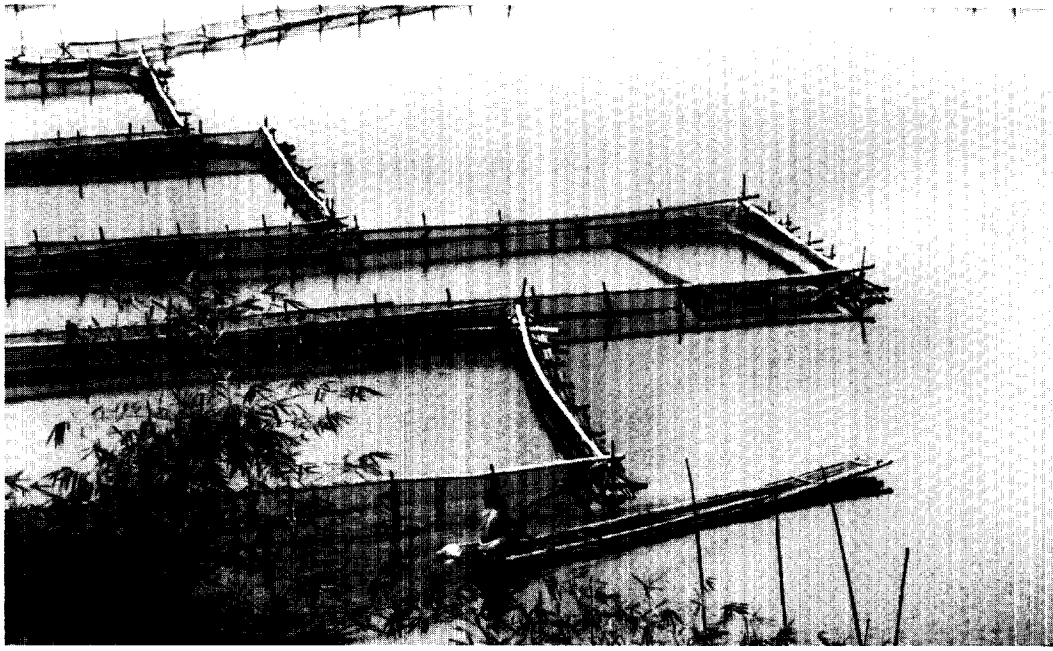
The study goes on to propose five primary directions for change and action on the institutional front: strengthening community-based organizations, defining the role of non-governmental organizations, reforming governmental institutions and their operations, revising the role of multilateral, bilateral and donor agencies, and designing new approaches to training and education.

Such orientations and approaches seek to contribute to a process that promotes social equity, respects popular needs and wisdom, and maintains cultural integrity and sovereignty. It is scarcely surprising that these orientations meet with a certain opposition where there is fear of such a process releasing new talents and redistributing power and responsibilities. Institutional change will be slow, but it would appear indispensable to achieve the goals of resource management and community development in the Caribbean, and indeed elsewhere.

- There is great mutual advantage to researchers, planners and local people in introducing or improving practices that bring benefit in the short term (e.g. a growing season, or five-year span of a decision-maker) and that are low-cost and 'self-reproducing'.
- Indigenous and international knowledge systems are complementary - each can benefit from the other.
- There may be considerable scope in diffusing information on techniques and practices refined over generations in one part of a particular geographical or ecological region, and testing and adapting them in other localities.
- There is great mutual advantage to researchers, planners and local people in introducing or improving practices that bring benefit in the short term (e.g. a growing season, or five-year span of a decision-maker) and that are low-cost and 'self-reproducing'.

These premises themselves have emerged from field studies on indigenous peoples and their decision-making and resource use systems carried out during the 1970s and 1980s, some of them by national institutions participating in UNESCO's programmes in a variety of ecological and cultural settings. Thus, UNESCO-sponsored studies have

encompassed such topics as traditional medicinal plants in the islands of the Caribbean (Weniger & Robineau 1987, 1989) and the Mediterranean (Giani 1987); the use of a traditional community gathering - the Maori *Hui* - for discussing research and development plans in a coastal marine area in New Zealand (Simpson *et al.* 1987); community-based systems of resource in coastal zones of Canada (Cohen & Hanson 1989, Hanson & Lamson 1990); traditional marine resource management in the Pacific Basin (Ruddle & Johannes 1985, 1990).



Carlos Arnaldo

Traditional management of tropical marine environments

That traditional conservation methods are effective and sophisticated is strongly underscored by consideration of indigenous control and regulation of tropical marine habitats. Coral reefs, lagoons and small islands are among the world's most fragile environments. Because oceanic islands have no continental shelves, their seafood stocks are confined largely to nearshore reefs and lagoons and are thus particularly vulnerable to over-harvesting.

Over hundreds, perhaps serveral thousand years, Pacific islanders devised appropriate technologies and methods of sustainable resource harvest to conserve and protect their limited island-reef resources. The success of some of these adaptations stands in sharp contrast to destructive resource harvest methods employed by Europeans and others, beginning in the sixteenth century.

Pacific islanders carefully managed their resources without creating severe environmental alteration, despite estimates of pre-European high population densities of sustained duration. How did they manage to do this? Tropical fisheries biologist R.E. Johannes' investigations have led him to conclude that the islanders 'devised and practised almost every basic form of modern marine fisheries conservation measure centuries ago, long before the need for marine conservation was even recognized in western countries. These conservation measures included closed seasons, closed areas, quotas and size restrictions, ownership of species, ownership and control of fishing techniques, restricted entry, and reef and lagoon tenure. For example, fishing was closed during spawning runs, areas were closed periodically to protect fish, crab and turtle populations, and some areas were made sanctuaries. Restrictions existed on types of gear, access to fishing techniques, availability of specialized knowledge, and some species were even 'owned' and available only to particular segments of society. Fishing and turtle and dugong hunting areas were 'fallowed' a manner similar to swidden agriculture to permit recovery.

One of the most important and widespread means used to regulate fishing pressure and to control access was enforcement of property rights over reefs and lagoons. Marine tenure systems in Oceania are designed to enable the islanders to control the types and degrees of exploitation of their waters and thereby protect them against impoverishment. The mechanism is simple. Where fishing rights exist it is clearly to the advantage of those who control them to fish in moderation, for this ensures the future productivity of their fishing grounds. In the absence of such controls it would be to the advantage of a fisherman to catch all he could and to use destructive methods in doing so if they simplified his task. If he didn't someone else would. Moderation would be pointless and the resource would therefore dwindle.

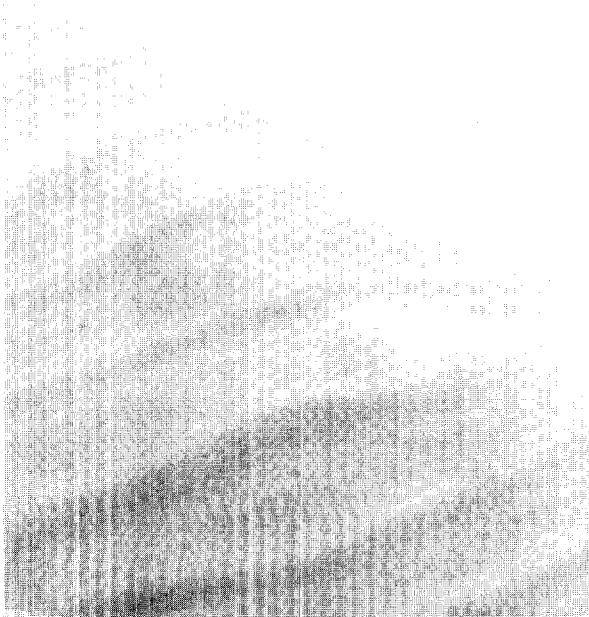
The spread of colonialism, foreign competition for island and marine resources, and new political and legal systems that continue to the present have weakened or obliterated some indigenous conservation techniques used by many island societies. Yet many methods still remain and are enforced and in some places there has been a revitalization of traditional resource management.

It is no accident that there has been a resurgence in the awareness and appreciation of traditional coastal resource systems and their management. Those techniques that have survived were apparently designed empirically, often over centuries, and it may be supposed that an important element in their success was the inclusion of feedback loops by which a system could be developed and maintained to provide a yield for human use (Lasserre & Ruddle 1983). Attempts to replace such traditional resource systems with those based on higher technology and large fossil fuel flows often cause feedback loops to be lost, resulting in resource exploitation rather than resource management. Such a linear rearrangement may produce high yields in the short run, but is neither stable nor enduring. As yields decline, one common human response is to develop regulated systems which attempt to keep the flows of a resource system small enough to permit its natural support without requiring human investment in either its running or maintenance. The history of resource management in the industrialized world, particularly in the marine environment, emphasizes the difficulty of designing and enforcing regulated systems, even where yield limits can be estimated.

The modern challenge is, therefore, to combine the power of energy subsidies and technology with the approach of traditional management to produce enduring and sustainable resource systems. Some of the insights that can be gained from such traditional systems are described in two reports published in 1985 and 1990 by the UNESCO Regional Office in Jakarta, compiled and edited by Kenneth Ruddle and R.E. Johannes (see pages 123 and 125).

If our present era is one of a revolution in information technology and networks, then communication systems are of special importance to island societies - for informing and educating, for catalysing and mobilizing, for generating income and reinforcing self-reliance. But to use technologies wisely, communication infrastructures must be adapted to the needs and aspirations of the islanders and to the objectives of development as defined by them.

Insularity and communication: turning challenges



BREAKING INSULARITY

The single most important factor about islands is their very insularity. They are alone, cut off from the mainlands, from alternative sources of revenue, alternate sources of social and political power, economic goods and even raw materials. In many cases, particularly in the Pacific, island states are remote even from each other, requiring two to eight hours of air travel to reach some islands, and then only if there is an airstrip long enough to bear the weight, speed and landing length of modern jets. Many of the Pacific islands are visited by large ships only infrequently, and only if there is a deepwater port large enough. Hence, heavy materials and construction equipment are difficult to obtain. Major infrastructures cannot be easily built.

Some islands are so small that they do not have the institutions to develop educated manpower, nor the raw materials to create industries, nor the skills to negotiate trade and political agreements. In international fora, small island states have rarely had the opportunity to be represented, sometimes through lack of financial resources to travel to the venues of these fora, and sometimes for lack of suitable spokespersons to represent the issues and concerns of islands.

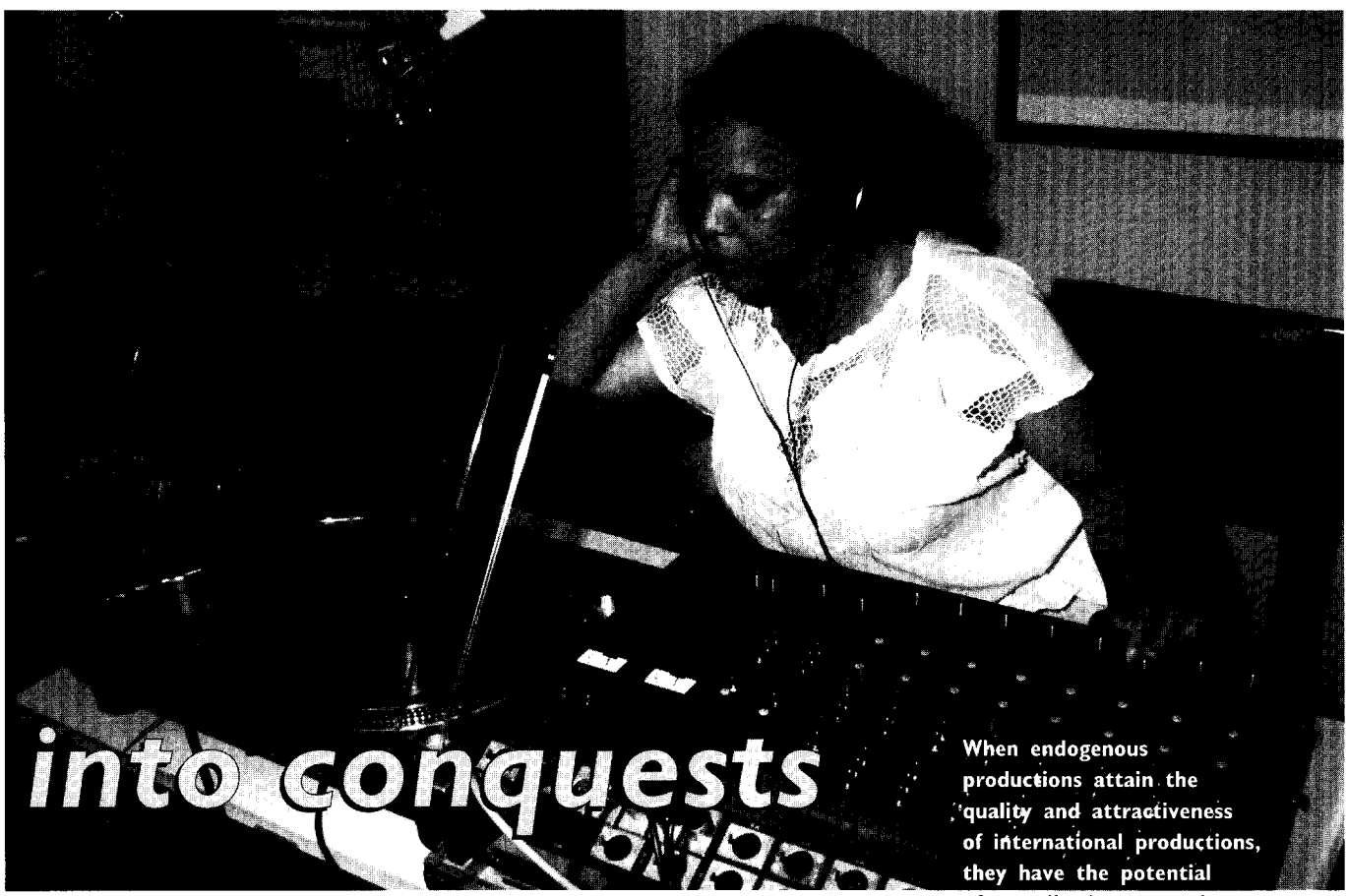
Diverse kinds of insularity therefore demand innovative and island-specific approaches to sustainable development, and specifically to building communication facilities to catalyze development. In primal societies, where almost the entire population was a group of a dozen families or so, people communicated mainly face to face. Today, social structures are much more complex, even on small islands, and distances require a more sophisticated development of communication structures that go beyond the possibilities of interpersonal dialogue. Communication systems have to inform people about development, catalyze decisions that lead to development, motivate communities to act on development decisions and coordinate their actions vis à vis the several development agencies. Communication also informs of coming natural disasters and how to cope with them, for the security of the population.

In performing these tasks, communicators have to take account of cultural and linguistic differences, giving full appreciation to these values, while at the same time working towards unifying society in development endeavours. Hence, in planning communication systems, comprehensive training in all social aspects is as important as technical training to operate and manage media operations.

Most islands are in need of basic communication infrastructure. For very small islands, this could be a low power FM station radiating programmes up to 20 to 30 kilometres in radius; a local newspaper could be a useful adjunct. For archipelago countries and medium to large island regions, a news and information service may be required; in some cases, this service can be elevated to the operation of a regional news agency linking to other agencies in the region or in other regions. Where feasible and appropriate, and in view of the inexorable invasion of television by satellite and by cable, islands too will need television to show the image of themselves and how they themselves want to shape that image through education, information and entertainment, despite the allure of the unreachable good life shown in imported video.

For all media, it is not merely a question of unpacking boxes and setting up technical equipment. Above all, it is a matter of creative planning and production of messages with an impact on sustainable development in all its aspects - culture, environment, the role and status of women, disaster preparation, national unity and identity.

For all islands, however, this approach to building communication structures, training communicators, and creating innovative productions, must be adapted to each situation: medium to large island regions (Caribbean, Pacific, Indian Ocean); archipelago countries (Cape Verde, Fiji, Kiribati, Philippines, Tonga); isolated large islands (Madagascar) or small ones (Saint Lucia, Niue). The approach must take into account the specific infrastructure problems, size, population, economy, sources of education and training, and links to other islands or countries.



Carlos Arnaldo

When endogenous productions attain the quality and attractiveness of international productions, they have the potential of contributing not only to building self-identity and cultural self-preservation of islanders, they can also generate income and reinforce self-reliance. Hence it is also important to provide the opportunity for island production companies to exchange, distribute and market their televised products through participation in international festivals.

REGIONAL STRATEGIES

Where islands are grouped geographically in a region, there is a great possibility of economizing resources and

multiplying inputs through astutely designed regional mechanisms that can assist in building up resources at least in one or several countries of the region, while also ensuring participation of and impact on the member islands. Twenty years ago, this might not have been a facile proposition, as islands hardly recognized their regional groupings nor had any representational role in international bodies as regional entities. That has changed since then. An exception is the Caribbean which already created several regional structures since the 1960s, a factor which has greatly facilitated regional approaches.

By the 1980s, the accelerated accession of small island-states to membership in the United Nations and in UNESCO and other specialized agencies, showed these islands as regional groupings that did merit particular attention. It was at this time that Caribbean representatives formed an informal Sub-group within the Latin American Group for more focussed discussions and for voting. Consequently, in 1982, UNESCO opened a regional office in Kingston, Jamaica with Secretariat officers in education, communication, and recently culture. Subsequently, the Pacific States of Tonga, Western Samoa, Kiribati, Tuvalu and the Cook Islands became members, and consequently, UNESCO opened a regional office in 1988 in Apia, Western Samoa, staffed with Secretariat officers in education, communication, culture, and later science. These decisions served to orient the communication programme more directly to serve the needs of the islands.

Reflecting these trends, the 1981-83 programme focussed on rural communication projects, to take greater account of the socio-economically underprivileged, isolated groups, islanders and minorities using little-known local languages. These projects were to be planned in an interdisciplinary manner and encouraged local forms of expression and linking to mainstream communication media. Later programmes also stressed increased attention to islands, least developed and land-locked countries.

A major experiment in building communication infrastructure on a regional level, to break this insularity and bring islands together, was the creation in 1976 of the Caribbean News Agency, CANA, financed by the United Nations Development Programme (UNDP) and later by Germany. The overriding philosophy behind this project was to recruit experts from the region; develop a comprehensive English-language news service and make links with other news agency services in the Spanish-speaking Caribbean; to link closely with Reuters news agency and endeavour to launch a financial and economics newswire; create a strong region-based source of revenue from both newspapers and broadcasting organizations; develop a radio voice service aimed at broadcasting stations.

This experiment was possible for a combination of reasons. First, the Caribbean islands, though numerous, are in relatively close proximity to each other, and frequent contact is possible by telephone, telex, or air travel. Second, there was adequate educational infrastructure to ensure a reasonable base of managers and decision-makers; the key institution for training future communicators is the Caribbean Institute of Mass Communication (CARIMAC, created in 1974) in Kingston, Jamaica, which itself has a strong regional programme including summer outreach courses to specific islands. CARIMAC itself was a pivotal regional undertaking, representing today the major source for all communication training for all Caribbean island states. Third, being an autonomous news agency, not beholden to governments, CANA was able to establish its credibility early and maintain it. And part of that credibility has been CANA's positive stance towards news concerning development and the advancement of its island members.

Not all problems have been solved, and a nagging one is maintaining competitive subscription prices in the face of rising telecommunication tariffs. It is expected that a UNESCO/ITU study on telecommunications tariffs in 1993 will enable institutions like CANA and other regional networks to benefit more economically from modern telecom applications, and possibly through cooperative networking.

In the Pacific, this regional strategy was adapted to reinforce the use of radio to bring islands together and reduce the distances both within archipelagoes and from island to island. Under the region-wide project in radio production training, called PACBROAD, an interdisciplinary team of experts from the Asia Pacific Institute for Broadcasting Development (AIBD, Kuala Lumpur), the Asian Mass Communication Research and Information Centre (AMIC, Singapore), Friedrich Ebert Stiftung (FES, Germany) and UNESCO planned a four year project financed by FES and IPDC with three sub-regional bases to be associated with the broadcasting stations in Fiji, Western Samoa and Papua New Guinea.

It was felt necessary to have three bases, because of the wide spread of islands over some ten million square kilometres of ocean. In the long run, this would save on air travel, while at the same time contribute to building up broadcasting facilities on the three base islands. A team of two regional trainers, supported by some 20 national trainers, was scheduled to run courses over the four year period. These national trainers would in turn be prepared to continue local, on-the-job training in their home station. Promising national trainers would join the regional experts on sub-regional courses. Among the spin-

Where islands are grouped geographically in a region, there is a great possibility of economizing resources and multiplying inputs through astutely designed regional mechanisms that can assist in building up resources at least in one or several countries of the region, while also ensuring participation of and impact on the member islands.

offs from the programme is a daily regional news service, known as PACNEWS, which was originally based in Fiji but has subsequently moved to the Solomon Islands.

A similar strategy was used to launch training in journalism and development of the printed media (PACJOURN) financed by Germany from 1989 to 1991. In this case, a single regional base was organized at the University of Papua New Guinea, Department of Journalism. This project produced a three volume manual for journalism in the Pacific edited by two of the project trainers (Henshall & Ingram 1991). Several newspapers were able to benefit from the contribution of desktop publishing equipment.

The regional approach was also successfully implemented in television training in 1990 with a regional base at the South Pacific Commission Media Training Centre in Suva, Fiji. Aside from providing basic training in video production, the project PACVIDEO, financed by Australia, paved the way for a major seminar on the introduction of television in the Pacific region and a modest project PACTEL, supported by the IPDC, to provide advice and training in preparation for the advent of television to these isolated islands.

A recent initiative is the Technical Support Service study financed by UNDP that is being undertaken in the Pacific to determine ways of gathering and disseminating information on environment. The study was completed in late 1993. Experience has shown that regional strategies can make more economical use of resources as well as ensure benefit to participating islands. But the approach has to be adapted to each situation, to each medium and to the objectives of each project.

BUILDING-UP ISLAND PRODUCTION CAPACITIES

Islands need not only training and equipment, but also creativity and marketing skills to make programmes that can compete with the all-too-easy influx of imported programmes that, slick as they are, have little relevance to the socio-economic situation or culture of most islands. One case is Banyan, a private, non-profit video production company in Trinidad and Tobago that was given a modest UNESCO grant in 1974 to acquire video cameras and recorders. But it was more than ten years later in 1988 that Banyan became more internationally known with *Crossing Over*, a one-hour documentary series co-produced with the National Film and Television Institute of Ghana (NAFTI). The TV programme sought to investigate mutual sources of music and culture in the two countries, following the strains of highlife to the swings of calypso. This was followed in 1991 by *Return to Mahé*, co-produced by the Seychelles and NAFTI, based on the story of King Prempreh III of Ghana who was exiled under British colonial rule to the Seychelles. New co-productions are being prepared for Jamaica and Venezuela.

Banyan has now transcended its island borders to become a major training and production resource for the region. With support from IPDC and Germany, its staff have trained producers of seven smaller island-states of the eastern Caribbean. This training led in 1988 to the first co-production of televised programmes in the region, and laid the basis for the ongoing television distribution and satellite exchange of programmes, Caribvision, presently distributed by the Caribbean Broadcasting Union.

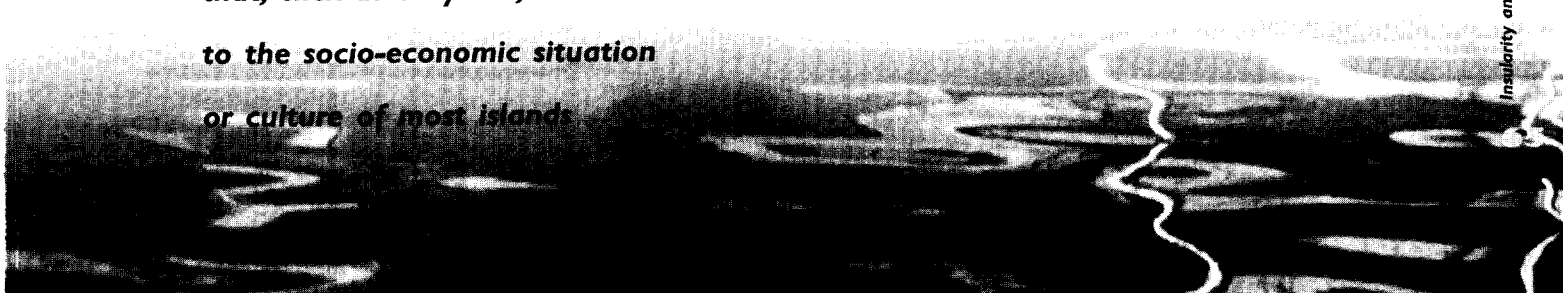
In 1990, a regular television feature throughout the islands was *Caribbean Eye*, an all-region co-produced series on different aspects of culture and society in the Caribbean. *Triumphs*, another production, was completed in 1992, and highlights the successes of women in the Caribbean.

In 1984, the Creative Production and Training Centre (CPTC), was set up by women TV producers in Jamaica with support from IPDC. Although a national institution, it has a regional outlook and in 1993 its Training Division completed a regional workshop on TV current affairs for women. In late 1993, CPTC co-produced a television programme on youth and freedom in cooperation with Artevision Foundation of Venezuela.

When endogenous productions attain the quality and attractiveness of international productions, they have the potential of contributing not only to building self-identity and cultural self-preservation of islanders, they can also generate income and reinforce self-reliance. Hence it is also important to provide the opportunity for island production companies to exchange, distribute and market their televised products through participation in international festivals such as Screening Days (held in Sweden and New York), the New York Film Festival, MIPCOM in Cannes.

Regional programme production and exchange mechanisms, of which small island states are members, can also provide dynamic marketing opportunities. The Seychelles, Mauritius, Cape Verde and Sao Tome and Principe are members of the *Union des Radios et des Télévisions Nationales en Afrique* (URTNA) which has a Programme Exchange Centre in Nairobi.

***Islands need not only training** and equipment, but also creativity and marketing skills to make programmes that can compete with the all-too-easy influx of imported programmes that, slick as they are, have little relevance to the socio-economic situation or culture of most islands*



AIRWAVES OVER THE OCEAN WAVES

For breaking insularity over great distances, radio is a medium that is economic and efficient, and while it requires technical skills to operate and maintain transmissions, these skills are not out of the reach of most islanders. The advances made in design of integrated electronic circuits have greatly simplified the design, construction and maintenance of transmitters, whether for frequency modulation (FM) or amplitude modulation (AM, which can be tuned to either medium wave or shortwave frequencies).

After prototype experiments were carried out in Homa Bay, Kenya, a full fledged project was set up in Sri Lanka to train 40 mobile radio producers in teams that visited the villages of new settlers moved downstream as the recently constructed irrigation dams of the Mahaweli River System were

opened. The project, financed by DANIDA, established the first FM community station in Guirandurokotte where it is fully integrated with the community of some 100,000 settlers. The team assembled their own 10 watt FM transmitter under the guidance of a consultant, and proceeded on their own to design and assemble a 100 watt prototype amplifier to boost the signal. Except for a week during the civil crisis in 1989, the station has been continuously on the air since 1987 when it was inaugurated by President Jayawardene. Guirandurokotte Community Radio, having only a staff of six, has recruited over 20 volunteers from the villages who co-produce programmes, announce, run a village clinic and manage livelihood projects, such as breeding gold fish and dubbing music cassettes of traditional folk airs for sale in town.

At about the same time, UNESCO held a technical workshop in Kingston, Jamaica to present the Mallard Concepts transmitter design and guide broadcast engineers in its assembly. Staff at Radio Saint Lucia took this work seriously and even designed their own stereo encoder for it, the first such adaptation for this transmitter. After several tests, Radio Saint Lucia requested two 100 watt amplifiers to increase signal strength. The experiment has greatly benefitted Radio Saint Lucia.

In the archipelago of Tonga in the Pacific, design parameters were greatly stretched to accommodate some 300 islands stretching north/south for almost 750 kilometres, way beyond the reach of low cost FM technology. The overall transmission schema now has FM transmitters placed in the capital and on an adjacent island (30 kilometres distant), and on a more distant island some 150 kilometres to the north. To cover all the islands, a one kilowatt shortwave transmitter (also newly designed and handcrafted) relays the FM programme so that it reaches the farthest islands to the north. But this service is so powerful that it also reaches New Zealand.

Similarly for Niue, a small island of some 3,000 inhabitants, a compact FM relay system was installed with two repeaters, ensuring coverage of the whole island. Radio Voice of the Maldives, already broadcasting on medium wave, installed the FM transmitter to open a new service, Radio Voice of Malé, the capital. This enables the station to programme separately for the tourist population and cater to more demanding metropolitan needs in banking, trade and commercial information.

In the Philippines, a new concept was started, Tambuli Community Radio. Financed by DANIDA, this project has set up a management and training team that cooperates with communities to organize a community centre, with a small radio station and local newspaper. The first experimental station was established in Batanes, the northernmost group of islands, not reached by any of the national radio stations and where newspapers are flown in only three times a week. A second station was set up in Laurel, Batangas, a town that has not yet reached its development peak and that suffers from the competition of neighbouring towns that have better infrastructure, media and roads. Two more stations are being prepared, one in Ibajay on the coast of the Island of Panay, the other on the island of Olutanga in Zamboanga.

One of the merits of this project is that it has cooperated very closely with the communities, and with the local institutions, such as the agricultural college, development foundations, city radio stations and newspapers (from which many trainers and advisers are recruited), and the local offices of national development agencies. An evaluation is scheduled in 1994 and the findings may be relevant to other island situations in the world.

In Cape Verde, a formidable challenge was faced: ten islands of an archipelago spread out as far as 350 kilometres from each other, and the urgent need to multiply educational forces to reach the populations on all islands. Shortly after its independence, a technical mission was sent to Cape Verde which followed the basic plan of the International Telecommunication Union (ITU) to set up a network of FM transmitters on the two major islands, Santiago and San Vicente, and from these set up relays to other islands and shadow zones. In 1990, a further FM link was installed on the island of Sal, site of the international airport and a tourist hotel. This was done under the project *Radio Educativa*, financed by Germany. Once the backbone transmission was installed, trainers worked with the 20 radio producers from the Ministry of Education and participating ministeries to prepare a daily log of some ten programmes on various development topics: kindergarten on the air, child care, youth, agricultural cooperatives and marketing, family planning, health and community hygiene, school subjects (geography, history, language). Project design, activities and accomplishments are described in two reports prepared for the Cape Verde government by UNESCO (1981b, 1992a).

Rounding out this work is assistance to various island radio stations: training and production facilities for 535 Radio Grenada, Saint Vincent and the Grenadines, Saint Christopher and Nevis, Montserrat, Cayman Islands, Turks and Caicos, Aruba and Netherlands Antilles as well as Educational TV in Antigua and Barbuda, all in the Caribbean; Sao Tome and Principe, in Africa; and Kiribati, Tuvalu and Western Samoa in the Pacific.

In the Philippines, a series of local radio stations is being set up, linked to community centres, local newspapers and institutions such as agricultural colleges and the local offices of national development agencies.

Carlos Arnaldo

Shown here: hands-on training at Laurel in the Batangas Province.

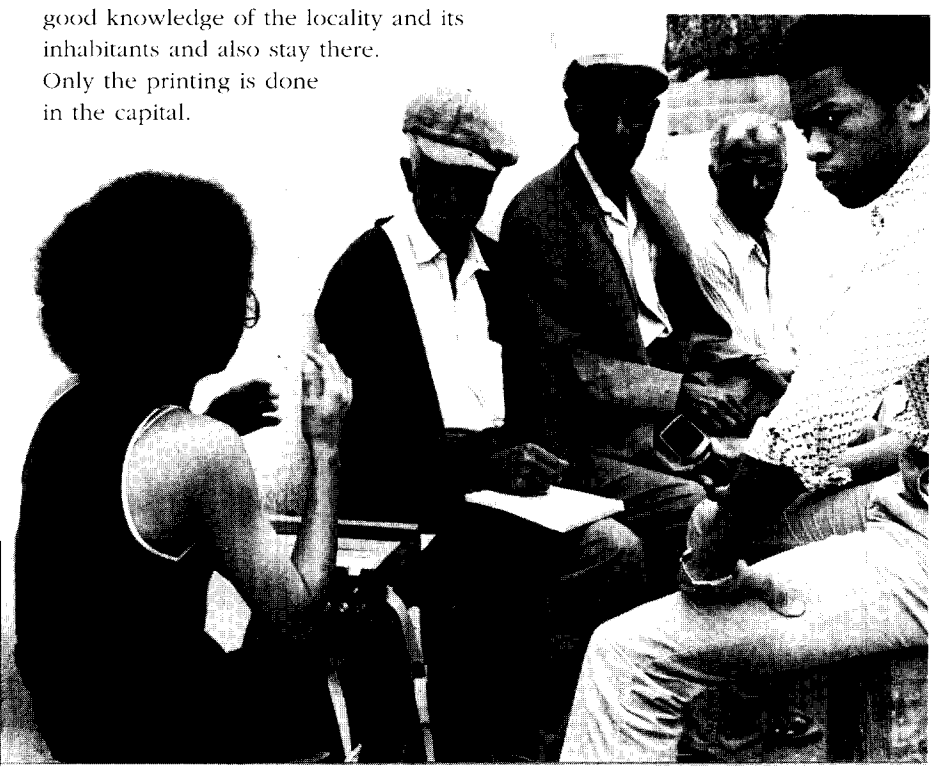
CURING BLINDNESS TO LETTERS

In Africa, in the 1970s, there was a significant decline in literacy rates, one of the causes of which was the lapse into illiteracy of newly educated literates. This was mainly because there were no reading materials available to maintain and sharpen reading skills. It was at this time that UNESCO designed a comprehensive programme for rural communication emphasizing rural newspapers, particularly in Africa, as a dynamic component of literacy and general education campaigns.

Despite a long tradition of writing, a little over half of the inhabitants of Grande Ile in Madagascar are still illiterate. A considerable number of them are in the rural areas, nearly 70% of them women. Nearly 5000 literacy centres have been established and headed by young graduates and volunteers from the communities. While nearly 500,000 adults have benefited from literacy campaigns, without further reading materials, the fragile knowledge acquired risks oblivion.

In 1986, three rural newspapers were established with funds from Norway, on the island of Madagascar. Though Madagascar is very far from being a small island, their story is typical of the possibilities on many other islands in the world. Their aim was to reach the village, and typically the papers were named after the lands on which they were born: *Rasavolana* (interminable discussions), *Antsiva* (sea conch) and *Hazolahy* (tambourine). *Rasavolana* was set up on the shores of Madagascar's biggest lake, Alaotra Lake in the vast Sihanaka region, where the secular marriage between man and the earth has created infinite supply of rice grains for the granary of Grande Ile. *Antsiva* preferred to keep its distance, in relation to Grande Terre, and thus settled on Petite Ile, perfumed with Nosy Be, where farming for export and high sea fishing rhyme with daily life. *Hazolahy* nested itself in the remote parts of South East Coastal area, where the waves from the Indian Ocean subside and where the hinterland rustles the echoes of that great forest nearby. The three newspapers are being irreversibly integrated into the education and culture of the areas in which they were set up.

The rural newspapers set about to reach the isolated readers in the village, to popularize writing and to ensure a post-literacy programme oriented to enrich the socio- cultural status of the islanders. *Rasavolana, Antsiva* and *Hazolahy* are totally decentralized in rural towns of Madagascar. They are conceived and produced by a team of journalists and technicians who are often natives of the region and have a good knowledge of the locality and its inhabitants and also stay there. Only the printing is done in the capital.



While literacy is the main objective and theme of the newspapers, they all try to broaden their scope to satisfy a wider range of clients: school children, secondary school pupils, traders, labourers, artisans and civil servants also read the rural newspapers. Addressing only new literates would limit the potential of this medium, and might marginalize its impact to only a limited group.

Even illiterates have become involved in the newspapers, as they invite newspaper subscribers to their huts and serve them with Toaka Gasy (rum, locally prepared from sugar cane). In this informal social setting, they would ask the literates to read the whole newspaper to them because they were illiterate!

Recently at the initiative of the Madagascar National Commission for UNESCO, the biosphere reserve project of Mananara Nord on the North-East Coast (an important project for environmental protection and integrated rural development) and the rural newspapers worked out a long-term co-operation. With modest support from the biosphere reserve project, *Rasavolana* would prepare a series of articles to sensitize and educate readers on environment issues of the region. Circulation is one of the most difficult tasks of the newspaper teams. Each centre has a four-wheel drive vehicle for direct distribution to all selling points. The white delivery vehicle is often awaited impatiently and its arrival becomes a small event which interrupts the monotony of the life in the village. During delivery, the journalists collect the money for the copies they left the

previous month. They gather news, gossip and information on recent events, and sometimes they even go to the extent of settling petty quarrels (which have no direct bearing on the objective of the newspaper but are also very important locally).

After four years of service, the vehicles look far from new; patches and bumps, repairs and small improvisations, are common. But they have become part of the local scene and *Rasavolana* has also become the pet name given to any white four-wheel-drive on the road.

In the Pacific, islanders face more difficult obstacles in setting up a newspaper. Nonetheless, the Cook Islands decided to advance to leading edge technology and opted for a completely computerized newspaper, including still-video photos. The main reasons were the recurrent expenses of supporting a conventional photo laboratory, and the possibility of transmitting both text and photos by a modem connected to an ordinary telephone. In this way, even with very limited staff, the paper could ensure its comprehensive weekly output with fresh news from the outer islands as well.

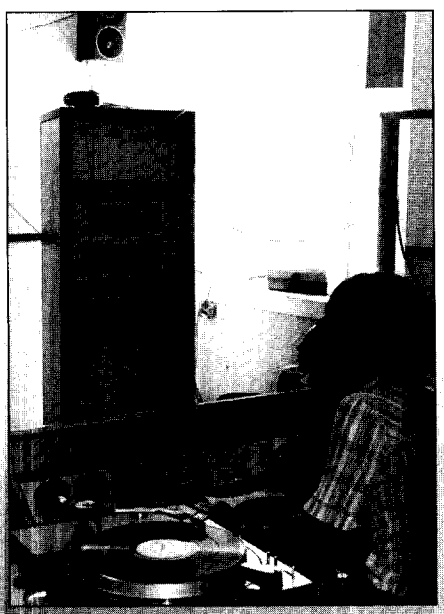
Photos are taken with the still-video camera which stores images on an analog disc; these can be erased or retaken (shot over), thus saving on 'film.' The disc is put into a photo converter where it can be printed for the layout or converted to a digital image and enhanced, enlarged, reduced, cropped. All text is input on computer or edited after receipt via modem from outer islands.

This experimental electronic newspaper, the first in the Pacific was supported by IPDC and was evaluated in 1993. The final report showed positive lessons and possible applications to other islands in the world.

Other newspapers in the Pacific have received IPDC assistance under the project PACJOURN or their own projects, notably *Te Uekera* in Kiribati and *Savali* in Western Samoa.

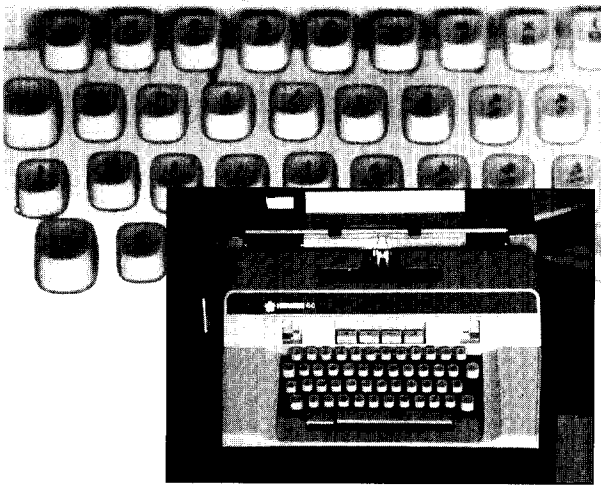
COMPUTERIZED SCRIPTS

Closely related to desktop publishing of books and newspapers is the computerization of ancient scripts in countries where those scripts are still in use, such as the Maldives and Sri Lanka. When assisting the Department of Information in the Maldives in 1983 with its weekly newspaper, *Haaveru*, and Radio Voice of the Maldives, UNESCO was asked also to look into the possibilities of designing *divehi* fonts (the written language of the Maldives) and integrating them on IBM-pc compatibles. By 1984, the prototype fonts were completed and retouched by the Maldivian experts. They have been put to use in documents and official correspondence but have not yet been applied to professional printing of newspapers or school books.



Carlos Arnaldo

Developing a system of educational radio has been the focus of a long-term UNESCO project on the nine inhabited islands of Cape Verde. With support from the Federal Republic of Germany, a basic FM radio network was set up, and a training scheme developed on the production of educational radio programmes. Among the radio studios, that at Praia (far left) has been panelled with straw mats and sugar sacks, to absorb sound. Radio Educativa is the principal means of training teachers. It has also been used to call together meetings of villagers to discuss common problems like marketing of produce and co-operatives.



Prototype of the divehi typewriter, with Thaana fonts (Thaana is the written language). This limited-production prototype machine paved the way for a Maldives-UNESCO project, which led to the computerization of Thaana script in 1984.

In Sri Lanka, assistance was provided to prepare Sinhala fonts on 80386 IBM-pc compatibles and integrate these into Microsoft Windows and any commercial software applications. This was reported to the UNESCO Seminars on Computer Processing of Asian Languages, held in Bangkok in 1989 and in Kanpur in 1992. These are now being marketed commercially, together with other localized software packages, for desktop publishing and various kinds of databases.

ELECTRONIC COMMUNICATION AND NETWORKS

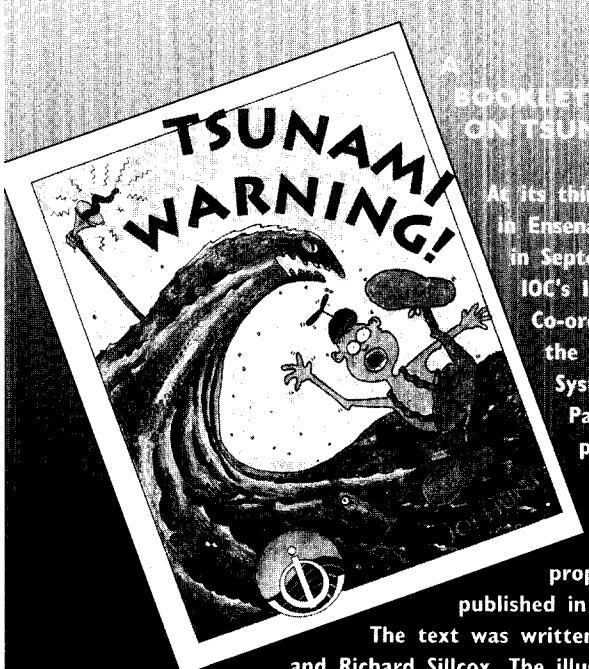
Related to the work of computerizing scripts is the possibility of transferring such scripts or ordinary text by various means: electronic mail or e-mail by computer and an ordinary modem; accessing on-line mainframe computers; transmission by FM pocket radio, and in some cases even by shortwave. The need, especially for isolated and small islands to keep in contact with major educational, archival and technical institutions is urgent and vital to advancement in these fields.

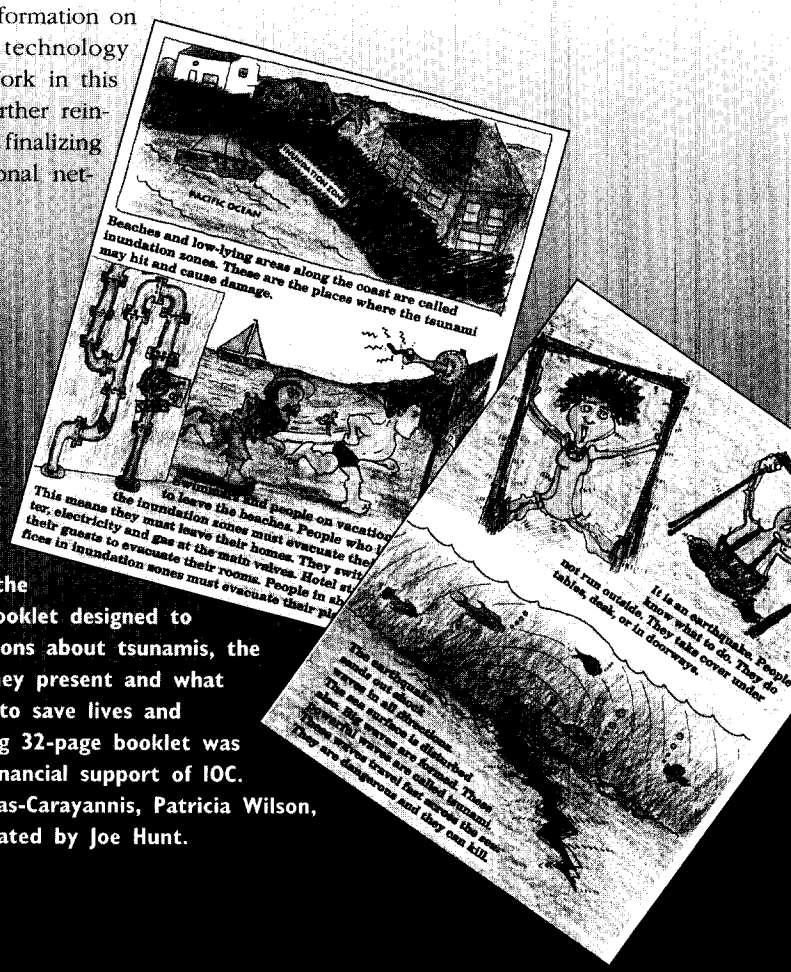
UNESCO and the Arthur C. Clarke Centre for Modern Technologies in Sri Lanka cooperated on a national seminar on data transmission, testing all three methods of transmission. The electronic mailbox developed by Mallard Concepts is now in wide use in many Pacific island libraries and archives for transfer of bibliographical and reference data. The network is also linked to main libraries and archives in Europe and North America. This alone has changed the whole concept of running libraries in these island states. Linking to major networks such as RINSEAP could also be a practical and economic option for many small island states.

In the Caribbean, several initiatives have started to study and set up networks for exchanging information on science and technology (CARSTIN). Work in this area merits further reinforcement and finalizing of an operational network system.

The same technology (e-mail and telecommunication) or adaptations of it could be used for networking subscribers or reporters to a regional news agency or information service, a macro-version of the Cook Islands electronic news service. In the same vein, the Arthur C. Clarke Centre has also discussed the possibility of a regional electronic library, whereby local libraries, instead of stocking books, would have a terminal on-line to the Centre's mainframe, from which they could access bibliographies, whole texts or abstracts. When the day of digitized multi-media computers arrives at reasonable cost, one could also retrieve photos, video stills, art designs, or any graphic image as well. Experiments are already well advanced in this field through the International Council of Multi-Media Users set up in 1993.

A possible relevant application would be multi-user satellite services, whereby channels are rented on a 24-hour basis by a consortium of media users, each of which has set times for transmission. For emergency transmission, certain hours would be tagged as priority only. In this way, several media enterprises, including disaster centre networks, could access satellite services while contributing only a third or a fourth of the total cost, or in some cases even less.





A BOOKLET ON TSUNAMIS

At its thirteenth session in Ensenada (Mexico) in September 1991, IOC's International Co-ordinating Group for the Tsunami Warning System in the Pacific, encouraged the preparation of a booklet designed to inform young persons about tsunamis, the dangers which they present and what should be done to save lives and property. The resulting 32-page booklet was published in 1993, with the financial support of IOC. The text was written by George Pararas-Carayannis, Patricia Wilson, and Richard Sillcox. The illustrations were created by Joe Hunt.

NATURAL DISASTERS

Protecting islands from the hazards of the environment and natural disasters is a field which requires urgent and profound attention. Some broadcasting stations have produced disaster manuals to prepare their staff, but any approach must really go to the roots of the problem, which is early warning. And in this, communication has a primordial role to fulfil, between the warning centres and the media, between the media and their publics.

In 1993 a study was commissioned by UNESCO to the Caribbean Disaster Emergency and Relief Agency (CDERA) on the potential use of the communication media (particularly satellites) in disaster and emergency warning and relief in the Caribbean. The study will begin with a workshop of experts on the subject, and will try to identify relevant sources for early warning on hurricanes, tidal waves, earthquakes, volcanic eruptions and other natural disasters; specific details on the role of communication will be delineated. But the most difficult part will be ensuring constant and continuous participation of all partners. Such communications based studies and information initiatives on natural disasters, such as the illustrated booklet on Tsunami Warning produced by IOC's International Co-ordinating Group for the Tsunami Warning System in the Pacific (Hunt 1993).

PROSPECTS FOR THE FUTURE

In any approach to sustainable development, one must examine the tools and use them in the best and most effective manner. Communication is only one such tool, although a basic one, at the heart of all technology transfer. To use communication, one must have communication infrastructures adapted to the needs and aspirations of the islanders and to the objectives of development as defined by them.

While it is necessary to be alert to the possible applications of new communication technology, these are not always the best response. One must examine first the problem and see which tool is most relevant. Experience has shown that the right tools can be selected and put to use in development tasks.

Carlos Arnaldo

In many small island societies, individuals often cover several roles. People must remain polyvalent and essentially reactive. Conversely, they generally cannot afford the luxury of locking themselves away, totally absorbed in a single project. Here, the reporter-editor in English and Kiribati of Kiribati's newspaper Te Vekera, who also contributes to Radio Kiribati.

Education and the world

island states are showing the way to a new vision of education in the 21st century.

EDUCATION IN AN ISLAND CONTEXT

The last decade has seen a burgeoning of interest in educational and capacity building issues in small states, many of which are small island states. This interest undoubtedly reflects their emergence at the forefront of the international scene, and their undeniable strategic importance - which can be demonstrated if only by counting the number of small states that have joined UNESCO over the last five years. This interest is not simply political jockeying. Small island countries are confronted with a host of extremely complex problems in providing cost-effective education and training to their citizens.

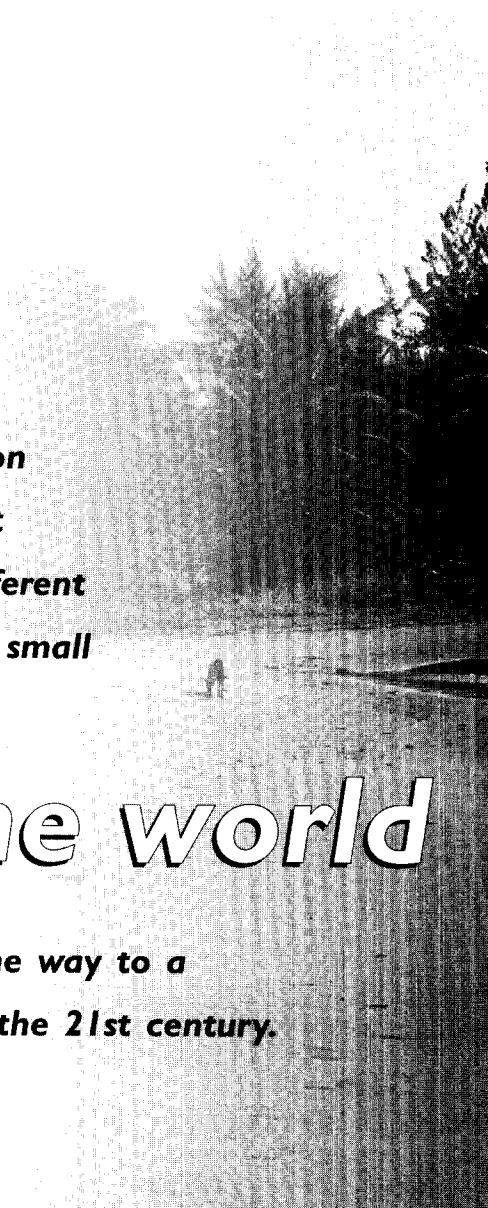
Educational problems and challenges in small island states are compounded by the three now well-known variables - scale, isolation and dependence - examined so fruitfully as part of the preparation and convening of the Commonwealth Secretariat's 1985 Mauritius Conference (Brock 1984, Commonwealth Secretariat 1986). Important questions are also raised by the application of western, large-country models of educational planning to the development paradigms of small island states. These problems have been analyzed by the former head of UNESCO's Regional Office for the Pacific States in papers prepared for the Mauritius Conference and for UNESCO's educational review *Prospects* (Higginson 1987, 1991). They are summarized hereafter.

On scale, isolation and dependence

In terms of scale, some consider that small island states are penalized because of their size, not necessarily maliciously but not always inadvertently either. The claims of small island states for a fair share of the resources of international agencies are frequently lost in the better practised and more compelling rhetoric of their giant neighbours.

Smallness has meant that the island states, which typically have fewer people in their Education Ministries, frequently cannot release their staff or indeed even afford to pay for them to attend international policy making and programming conferences. Many of these conferences have been convened for the sole purpose of deciding policy and what resources go where. As the French saying goes: '*Les absents ont toujours tort*' and the islands miss out. The reverse holds as well. Technical staff in international agencies are normally much in demand to mount or

Going back to the early 1950s education has had pride of place in all growth-oriented development models. Today, still, the rhetoric of education for self-reliance continues largely unchallenged... save in small island states. In these countries, education is revered as elsewhere, but increasingly for entirely different reasons. In some ways, the small



backstop technical assistance projects in Member States. Faced with the choice between servicing a large or a small country, they tend to opt for the former. Indeed, as many islanders will confirm, it is not uncommon for small countries, be they developing small island states or industrialized nations, to be gently but firmly reminded of their relative importance in the larger scheme of things.

Several multi-lateral funding sources have project formatting and review procedures which arguably disavantage small island states. The traditional design of projects has an enormous influence on how the allocation of funds is determined. UNDP's so-called 'Indicative Planning Figures' (IPFs) for supporting Country Programmes are predictably modest in the case of small states. But small or large, there are limits to how much one can modify project budgets, the components of which are dictated in large measure by the use of standard costs in calculating line items and aggravated by the high cost of travel and shipment to isolated project sites. The result is that a single small project may, by itself, entirely consume the country's IPF and still not attain the critical mass needed to achieve the stated objectives of the project to a country. The result is that the project budget may be consumed mainly by personnel costs.

Where UNDP is concerned, a common strategy adopted by many small island states is to make extensive use of so-called ICP (Inter-Country Programme) funds, which are often larger than all the sub-regional IPFs combined. Two problems are attendant on such a strategy, however: first, individual small island states are not always happy with regional solutions to national education problems, in part because of traditional rivalries between island nations, and in part because national educational reform in such states, as elsewhere, is an intensely local enterprise. The second problem is the general dearth of regional research institutions which have experience in project design and implementation. In the Pacific, the South Pacific Board for Educational Assessment has been a notable exception though progress has been made recently by such bodies as the University of the South Pacific Institute of Education.

UNESCO/Dominique Roger

of small island states

The isolation of small island states in the several ocean regions aggravates the problem of scale. International organizations and bilateral assistance agencies are very often situated far from regions such as the Pacific or the south-western Indian Ocean, which obviously considerably hinders any actions to address the very problems they seek to alleviate.

Dependence is a third major characteristic of small nation states. One of the penalties of a high degree of dependence on external assistance is that individual countries know that dependence is a two-way street. It is common knowledge that a country like Tonga or Western Samoa receives over 30% of its income in the form of overseas aid and to this extent, because their service sectors - health and education - could not exist without it, their degree of dependence is high. Yet the agencies, both multilateral and bilateral, exist to provide assistance. Aid, so to speak, is their stock in trade, and a high market demand for their services is seen as evidence of both their skills and, more especially, justification for their *raison d'être*. In the case of some international banks, career advancement is directly linked to one's success in negotiating loans. National indebtedness is, thus, an unwritten objective, not an unavoidable by-product.

Large-country models and small island paradigms

International missions to developing countries, whether their terms of reference are to conduct sectoral studies or to identify and prepare externally-funded projects, tend to fall prey to using the yardstick of the intellectual baggage they brought with them. Since they are typically composed of people from large industrialized countries with most of their professional experience gained in catering to large developing countries, their conclusions and recommendations tend to be derived from typically western, large-country development models. When these putative solutions are applied to the problems of small island states, they experience a high failure rate.

Typical examples of mismatched solutions to educational problems in small island nations are projects to create a classic planning unit and the establishment, or expansion, of technical institutes. The decision to create a full-scale planning unit is predicated on the assumption that enough is or can be known about the future of small island economies and their human resource requirements to extrapolate reliable educational targets.

Yet it is widely known - though ostensibly often conveniently ignored - that in many small island countries, exports are in the main limited to a very small number of primary sector commodities - copra, sugar and the like - and apart from being in direct competition with dozens of other countries all trying to sell the same thing, they are subject to wild market fluctuations over which they have no control.

Though the economy of some small island states is growing, for most it is either static or regressive. In some islands, very significant percentages - up to 70% - of all school leavers cannot, indeed probably never will, find employment in the monetized economy. Their future is ineluctably one of subsistence which for many, will be at the village level. In view of these circumstances, goals like planning for 'sustainable development' and 'self-reliance' are, on the face of it, unrealistic. When applied to many small island states, one must question whether the goals of education adequately reflect the true needs of society and the realities of its economy.

The goals of education are typically limited to a belief in the desirability of employment for production which explains the themes of many educational programmes over the years - e.g. 'work-oriented' education, 'functional' literacy, and the like. Similarly, since the curriculum tends to be exams-driven, the thrust tends to emphasize systemic efficiency: the satisfaction of purely institutional goals, namely passing from one class to the next. Little more than lip service is given to the external productivity of the system.

As more politicians and educators are coming to grips with these problems, a growing wave of concern is being expressed over the need to educate for the 'quality of life'. Life quality has normative, culture-free components such as health but is also deeply rooted in issues related to language and culture, both particularly vulnerable in an island context.

Turning to the question of establishing or reinforcing technical education institutions in small states, common criticisms include the unacceptably high per capita fixed and recurrent costs, inappropriate curricula, the tendency for institutions to want to graduate to the status of a polytechnic, and a steely resistance to change.

Some technical schools are linked to real human-resource requirements, yet the training process, once set in

SPECIALISTS OR GENERALISTS: THE NEED FOR A DIFFERENT APPROACH?

Small states often require generalists more than specialists. But this need is not always met. Two authors (Bennell & Oxenham, 1983, adapted from Bray, 1992) have suggested that new ways of thinking are needed.

Very finely honed specialists are the products of communities large enough to support them. When the social base is too small to enable an adequate livelihood to be earned from a particular specialization, the specialist must broaden his or her craft - the carpenter has to be something of a plumber, the rural administrator has to double as judge and jailer. The human capacity for diversification and substitutability is brought into play. The small society then should be prepared to foster few specialists and large numbers of polyvalent handymen and handywomen.

Since the SIS [Small Island States] are by definition small and since their export/haemorrhage of skill suggest that indeed they cannot support certain specialists (at least in the style the specialists feel they deserve), it can be reasonably expected that they could have turned their minds to encouraging substitutability and polyvalence.

However, this does not appear to be the case in many countries. Human resources development planning adheres to the specializations of larger societies and seems unwilling to accept the implications of smallness. In this it is urged and abetted by the professions. The ambivalence about 'viability', the need to be connected to larger states and the larger world and the sheer pride of being professionally equal, press the SIS to behave like large, not small, societies.

In posing these considerations, Bray (1992, p. 32) asks readers '*Do you agree with this analysis? If so, how can the situation be changed?*'

motion, seems to some to be unstoppable. Many schools produce technicians with exaggeratedly high notions of their own worth, for an insufficient number of jobs, with skills learned on machinery that seems to exist only at the technical college in question, with little if any ability to be retrained, and a disinclination to work anywhere but in the major urban centres.

Counterpart contributions and recurrent costs are other key obstacles to the success of development projects in small island states. The classic technical assistance model requires that an internationally recruited specialist is supposed to transfer his/her skills and knowledge to a national within a recognized period of time, thereby rendering continued in-country presence redundant. In addition, technical assistance is supposed to respond to a national request which reflects a national need and focuses on national priorities.

In a large country, there is generally no lack of appropriate national staff. In small islands, this is not the case. In the Pacific, for example, the demand for counterparts by aid agencies far exceeds the supply-side capacity to deliver. And even when counterparts are assigned to projects, they invariably service several others as well as remaining at the call of their superiors and mentors.

SMALL COUNTRIES AND THE NEED FOR PRIORITIES IN EDUCATION

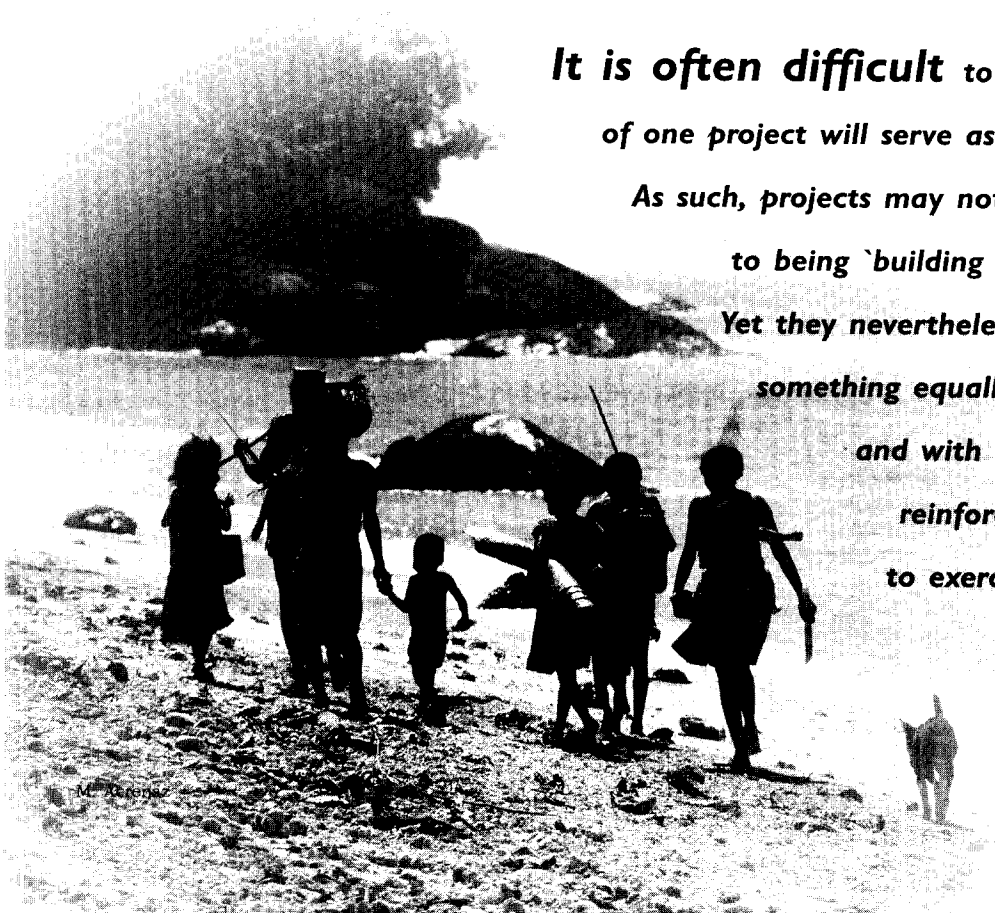
Based on Bray 1992

Small countries, almost by definition, feel the effects of human and other resource constraints more keenly than large countries. Setting priorities, an unescapable necessity, is thus often a nationally wrenching, drama-filled undertaking. The decision over whether to have a university is a case in point. Cape Verde, Comoros, the Maldives and Tonga, have no national universities. Again, the Solomon Islands has no secondary school-inspectors.

Some see these limitations as serious. But whilst the functions might seem important, countries can and do continue to function without them.

Small countries without universities send qualified students for tertiary studies in large countries rather than building their own. And many countries which do maintain school inspectorates fail to use inspectors for professional support of in-service teachers and achievement monitoring. Others, attempting to service outer island schools, are able to arrange visits only very unfrequently, so that some schools (especially the more remote ones) never actually see an inspector for years at a time. The quality of education obviously suffers but the schools carry on anyway out of sheer determination.

It is often difficult to ensure that the outputs of one project will serve as the inputs for the next. As such, projects may not always lend themselves to being 'building blocks for development'. Yet they nevertheless appear to accomplish something equally valuable. They create and, with each succeeding project, reinforce the national capacity to exercise enlightened criticism of what is good and bad for the welfare of a country. Because small island projects are, on the whole, small, their duration tends to be brief. Opportunities to re-examine planning assumptions are thus more frequent than those in larger countries, and it is these that constitute the stone against which many small island states are honing their critical faculties.



***It is often difficult** to ensure that the outputs of one project will serve as the inputs for the next. As such, projects may not always lend themselves to being 'building blocks for development'. Yet they nevertheless appear to accomplish something equally valuable. They create, and with each succeeding project, reinforce the national capacity to exercise enlightened criticism of what is good and bad for the welfare of a country.*

***To serve the basic learning needs** of all requires more than a recommitment to basic education as it now exists. What is needed is an 'expanded vision' that surpasses present resource levels, institutional structures, curricula, and conventional delivery systems while building on the best in current practices. New possibilities exist today which result from the convergence of the increase in information and the unprecedented capacity to communicate. We must seize them with creativity and a determination for increased effectiveness (World Declaration on Education for All 1990).*

Education for All

An examination of primary education in small island countries is timely given the commitment by the international community to a Basic Education for All and Learning without Frontiers.

During the World Conference on Education for All in Jomtien, Thailand in 1990, the *World Declaration on Education for All: Meeting Basic Learning Needs* was proclaimed. A major goal of the Declaration is to provide all people with the opportunities to meet their basic learning needs. To this end, the essential learning tools identified were literacy, oral expression, numeracy, problem solving and a knowledge of skills, values and attitudes 'required by human beings to be able to survive, to develop their full capacities', and 'to participate in development'.

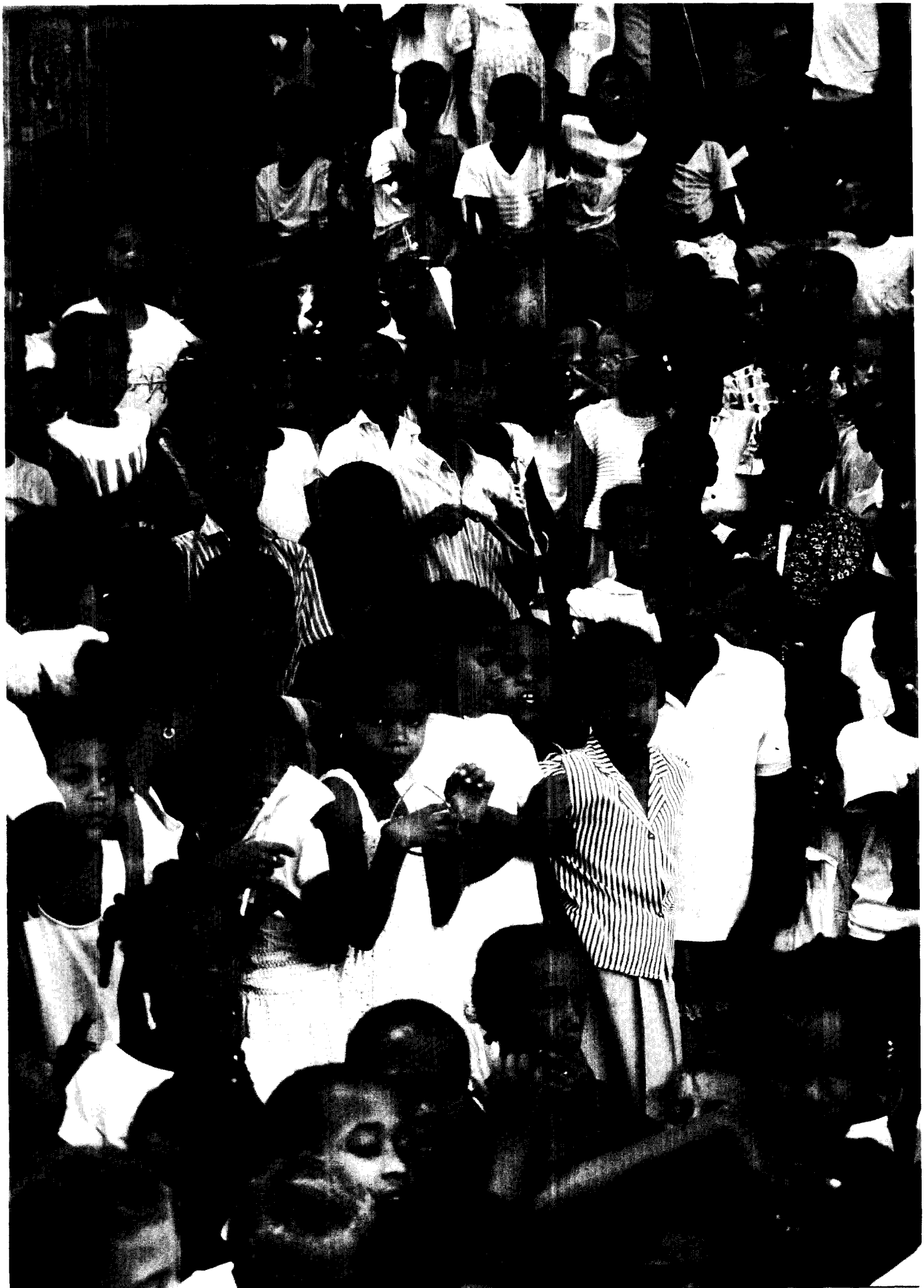
If Basic Education for All is to be achieved, universal access to a reasonable standard of primary education has to be promoted as an important stepping stone to further education. More consideration also has to be given to how people learn, and to developing environments that enhance learning. At the same time, the definition of basic education has to be broadened so that it can more adequately meet the above needs, and contribute to lifelong learning.

The World Conference on Education for All (1990) also made the point that if 'effective and innovative ways to meeting basic learning needs' were to be developed, consideration would have to be given to the use of 'non-conventional delivery systems such as radio' to create 'learning environments' inside and outside the classroom.

Learning without Frontiers

The commitment to a Basic Education for All was again reaffirmed by UNESCO in 1993 when it adopted the concept of *Learning without Frontiers* proposed by the Forum of Reflection. The Forum argued that many of the problems facing the world were to be found principally in education and that UNESCO should therefore concentrate its energies in coming years primarily on this sector. The Forum also said that the initial focus must be on improved primary education so that 'a continuum' can be established to higher forms of education.

In order to facilitate learning without frontiers, the Forum of Reflection recommended that UNESCO establish a new World System of Open Education using distance education as the delivery vehicle. At a regional level, various developments make timely the discussion of improved primary education through distance education and other means. In the Pacific, for example, these initiatives include the Basic Education and Life Skills (BELS) project and the Pacific Islands Regional Association for Distance Education (PIRADE) (see pages 107-109).



Percentage of illiteracy in small island states (Population of 15 years of age and over).
Source: Atchoarena (1993), based on UNESCO. Statistical Yearbook. 1990, and Basic Education and Literacy: World Statistical Indicators (UNESCO, 1990)

COUNTRY	YEAR	PERCENTAGE OF ILLITERACY
Cape Verde	1989	33.5
Comoros	1980	52.1
Sao Tome and Principe	1981	42.6
Seychelles	1971	42.3
Barbados	1970	0.7
Dominica	1970	5.9
Grenada	1970	2.2
Saint Christopher and Nevis	1970	2.4
Saint Lucia	1970	18.3
Saint Vincent and the Grenadines	1970	4.4
Trinidad and Tobago	1980	5.1
Cyprus	1987	6.0
Maldives	1985	8.7
Fiji	1985	14.5
Tonga	1976	0.4
Samoa	1971	2.2
Vanuatu	1979	47.1
World total	**1990**	**26.9**
Africa	1990	52.7
Latin America and the Caribbean	1990	15.2
Developing countries	1990	35.1

EDUCATIONAL PLANNING AND DEVELOPMENT

Increasing interest in educational issues in small states is reflected in a number of meetings organized by various international organizations such as UNESCO, the World Bank and the Commonwealth Secretariat. Recent examples include: a conference on post-secondary education in small states, organized by the Commonwealth Secretariat (Saint Lucia 1988); a round table on educational planning in small states, organized by UNESCO during the International Congress on Planning and Management of Educational Development (Mexico City 1990); a large conference on policy, planning and management of education in small states (London 1991); and the conference on higher education in small states, organized by the World Bank (Brunei Darussalam 1992).

In part as a result of meetings such as these, the recent literature on educational planning and higher education in small states is quite rich, and comprises a variety of materials produced by academics, national authorities, donor agencies and international organizations, more particularly the Commonwealth Secretariat, the Commonwealth of Learning, the World Bank, UNESCO

Enrolment rate by level of education in certain small island states.
Source: Adapted from Atchoarena (1993), based on UNESCO Statistical Yearbook, 1990.

		1st LEVEL		2nd LEVEL		1st+2nd LEVEL	3rd LEVEL
COUNTRY	YEAR	GROSS	NET	GROSS	NET	GROSS	GROSS
Cape Verde	1987	109	92	16	11	70	-
Comoros	1987	80	-	-	-	-	-
Mauritius	1988	105	95	53	-	78	1.8
Barbados	1984	110	-	93	90	101	19.4
Trinidad and Tobago	1987	100	88	82	70	93	4.7
Cyprus	1988	104	100	87	83	96	11.0
Malta	1988	108	97	80	75	93	6.8
Fiji	1986	129	100	56	-	96	3.2
World total	**1990**	**100.1**	**-**	**52.8**	**-**	**-**	**13.5**
Africa	1990	79.7	-	32.4	-	-	4.9
Latin America and the Caribbean	1990	109.3	-	57.6	-	-	18.7
Oceania	1990	110.3	-	81.4	-	-	26.5
Developing countries	1990	99.8	-	44.9	-	-	8.3

Several recent studies have served to continue and to raise the international debate on the planning and management of education in small states, responding to such questions as: What are the distinctive features or commonalities of educational problems in small states? To what extent are they not similar to those experienced by larger systems? What are the implications of small systems to teacher education, higher education, labour market, curriculum development and materials provision? Are there specific linguistic, religious, social, class and cultural implications of planning and managing education within small multicultural societies?

and the International Institute for Educational Planning (IIEP, established by UNESCO in 1963). These materials include a number of articles in UNESCO's quarterly educational journal *Prospects*, such as an analysis on education, the national scale and the world of small states (Brock 1988).

More recently, an open file on education in small states (*Prospects* No. 80, Vol. 21, No. 4, 1991), has included contributions on such topics as: growth of interest and emergence of a theory on education in small states (M. Bray), curriculum issues in small states (S. Packer), difficulties and strategies in post-secondary education (D. Atchoarena), the experience of co-operation in education for and between the microstates of the Pacific, and its applicability elsewhere (P. Higginson), the challenge of educational reform in microstates, as reflected in a case-study of the Organization of Eastern Caribbean States (H.A. Fergus), the major educational problems facing small isolated states in the Pacific ('A.M. Taufe'ulungaki), educational development in a small island state, Malta (C.J. Farrugia).

Other monographs and multi-authored studies have included those on *Educational planning in small countries* (Bray 1992), *Policy, planning and management of education in small states* (Lillis 1993), and *Educational strategies for small island states* (Atchoarena 1993).

Mark Bray's book on *Educational planning in small countries* examines the 'nature of the ecology of small countries and its implications for educational planning'. The book is divided into three parts. The first part focuses on contexts, approaches and structures. It discusses the dimensions of scale, the nature of educational planning in small countries, sources of expertise, and international linkages. The second part is concerned with the planning of specific components (curriculum development, special education, post-secondary education). The third and last part brings together the discussion in summary and conclusion, linking back to the conceptual framework with which the book began. In noting ways to develop the planning capacity of small countries, the author discusses what can be, is being and should be done by the small countries themselves, concerned larger countries, and UNESCO and other international organizations.

The ten chapters of *Policy, planning and management of education in small states* address such topics as reframing the issue of scale, problems and challenges in decentralizing education, distance education, dependence and interdependence, aid and education. Conceptual issues raised by editor Kevin Lillis in an introductory chapter include definitions and conceptualization of smallness, the nature of decision-making in small systems, disadvantages and advantages of smallness, patterns of educational provision, appropriate models and alternative pathways to development.

In his monograph on *Educational strategies for small island states*, David Atchoarena analyzes the significance, relevance and particular implications for educational planning of insularity and small size. An introductory

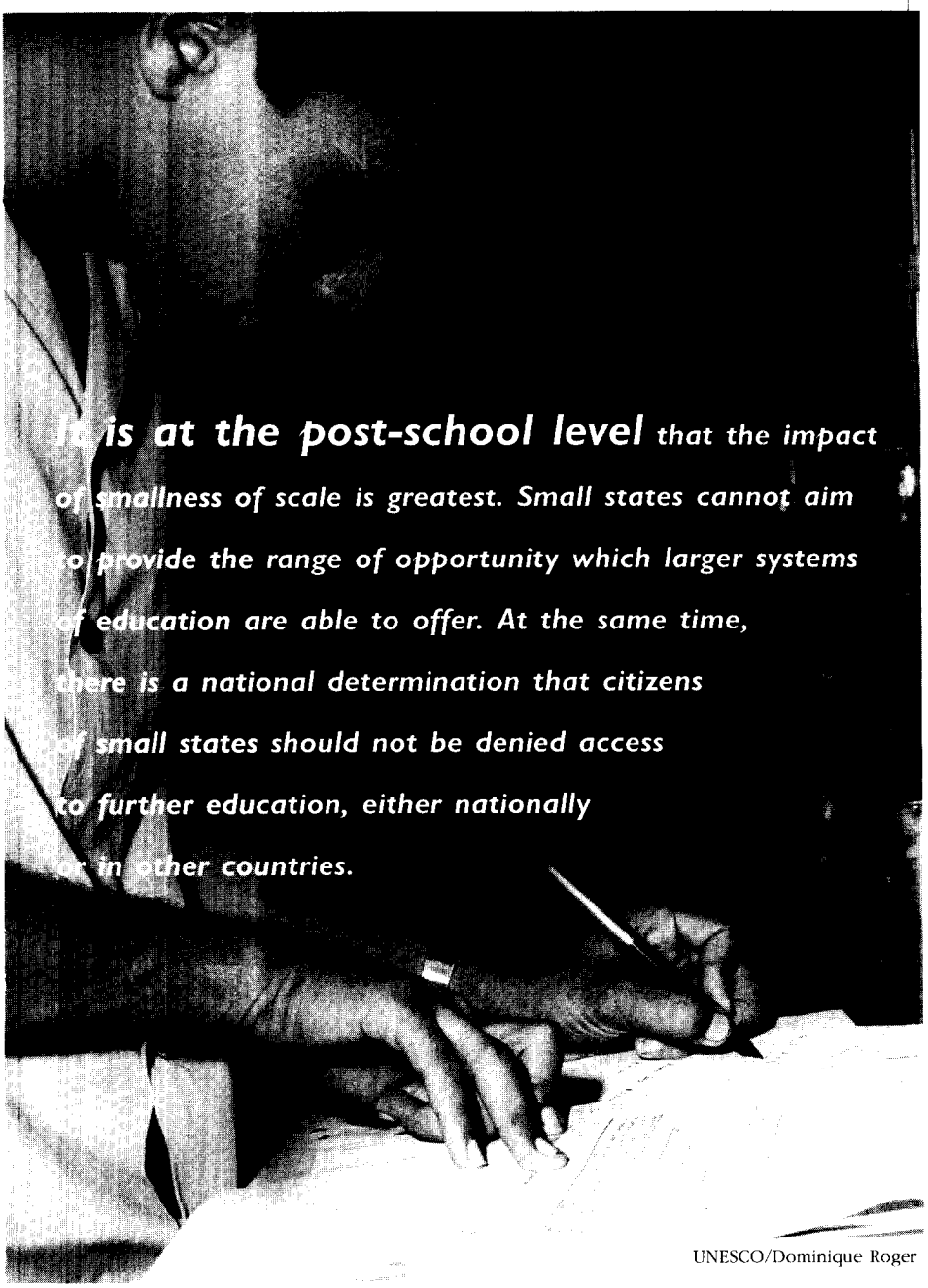
Level of development of higher education in certain small island states
Source: Atchoarena (1993), based on UNESCO Statistical Yearbook, 1990.

COUNTRY	YEAR	NUMBER OF STUDENTS PER 100,000 INHABITANTS
Mauritius	1988	196
Barbados	1985	2,065
Trinidad and Tobago	1987	498
Cyprus	1988	748
Malta	1988	482
Fiji	1988	413

Strategies for the development of higher education in small island states
Source: Atchoarena (1993)

OBJECTIVES	MEANS	ADVANTAGES	DISADVANTAGES
Finding students in sufficient numbers	Offering study fellowships to foreigners, opening recruitment to students from neighbouring countries where the training supply is deficient	Strong incentive power	High cost Strong heterogeneity of profiles and needs
	Constituting regional structures	Reinforcement of national identity, stage towards definition of regional human resources development policies	Unequal distribution of benefits among different members, difficult to maintain overall cohesion
	Developing distance teaching	Reduction of structural costs, possibility of reaching an extremely dispersed population	Complexity and high cost of teaching material preparation, difficult to evaluate learning achievements, weak effect on the environment
Attracting teachers	Offering high salaries or particularly favourable working and living conditions	Strong incentive power	No guarantee of competence of candidates, strong mobility of teaching staff, lack of specific identity, no capitalization, high cost
	Constituting regional structures	Opportunity to combine quality, coherence and stability	Risk of conflict between scientific (university level) and political (nationality) recruitment criteria
Developing scientific activity	Integration with international scientific networks (participation in seminars, organization of colloquia, student and professor exchanges, participation in inter-university research projects)	Promotes international contacts and makes research and teaching more dynamic	Risk of dispersion and/or dependence
	Provide access to information by modern means (consultation of databases by computer and telecommunications)	Systems well suited for countries poor in documentary resources and relatively isolated	Relatively high cost
Choosing a certification system	Negotiate equivalences with foreign diplomas	Contributes to mobility of graduates	Risk of unsuitability for national requirements and strong dependence
	Opt for a specific system	Corresponds to national context	Increases the risk of graduate unemployment

discussion of the theoretical and historical perspectives of small states, leads on to an analysis of the implications of small size for educational planning. A statistical overview of education in small states (in terms for example of enrolment levels and participation in higher education) gives a sense of the problems that are encountered. For example, in terms of the enrolment situation most countries post a gross enrolment rate in primary of more than 100%, and hence at the average calculated for the group of developing countries. However, among the countries for which data are available, there are three that find themselves below 100%, which corresponds to marked under-enrolment. In six of the thirteen countries for which information is available, gross enrolment rates in secondary vary between 80% and 93%, which is substantially higher than the average calculated for all developing countries. As regards the situation of higher education, the density criterion, or the number of students per 100,000 inhabitants, confirms the observation of enrolment rates. Juxtaposition of the two tables reveals Barbados, as the



UNESCO/Dominique Roger

state with the strongest development of higher education, among the small countries for which data are available. The other countries are far behind this level, forming a very dispersed configuration.

Indications such as these provide a backcloth to the specificity of educational planning in small states. This overview also reveals, in an indirect way, the significance of context-dependent factors (history, culture, level of development) for the educational behaviour and circumstances of the countries concerned. Despite such real diversity, small size and insularity subject the management and development of education to common constraints in all cases. These particular constraints often result from the concerted impact of vulnerability factors of a demographic, socio-economic and geographic nature.

- Absence of economies of scale;
- Narrowness of the labour market;
- Significance of emigration;
- Extreme dependence on the outside world;
- Remoteness;
- Territorial fragmentation (the case of archipelagoes);
- Vulnerability to natural disasters.

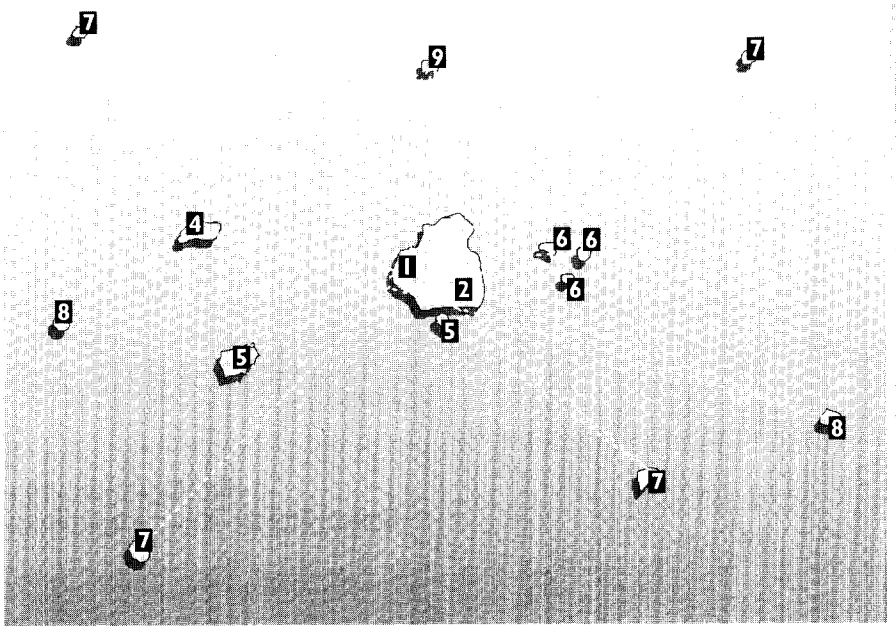
Analysis sheds convergent rays of light on the 'educational pathology' that small countries develop, and leads the author to propose a reconstruction of the planning framework and to suggest several principles of action which could serve as a guide for the educational planner. Faced by double challenge of small size and insularity, the planner must simultaneously overcome unusual handicaps and know how to transform certain constraints into advantages. For this task, the educational planner has at his or her disposal a set of tools and methods, many of which belong to the classical panoply of educational planning. And thus, apart from the presentation of innovative approaches, the articulation of action strategies in Atchoarena's study seeks to show how the general principles of planning can be put at the service of small countries. Rather than approaching these issues by level of education or type of training, strategic reflection is essentially organized around several major functions: forecasting, pedagogy, administration, co-operation.

POST-SECONDARY EDUCATION AND TRAINING

Small island states encounter a fairly large number of common problems in establishing and in developing their educational systems. While the need for economic, social and cultural development calls for human-resource development in the small island states, the scale of their economies does not allow, in many instances, the setting up of full-fledged national systems of higher education as the acknowledged means to achieve that goal. Consequently, in a large number of cases, education opportunities at the post-secondary level are limited locally, thus forcing students to pursue higher education studies abroad at costs which become a growing burden for the respective economies and feed the brain drain.

This issue of post-secondary education and training is probably the most significant, difficult and contentious issue currently confronting small national systems of education in the developing countries (Packer 1993). It is at the post-school level that the impact of smallness of scale is greatest. Small states cannot aim to provide the range of opportunity which larger systems of education are able to offer. At the same time, there is a national determination that citizens of small states should not be denied access to further education, either nationally or in other countries. So there is a combined and related search to enhance and diversify national provision and to develop a broad range of flexible linkages with educational partners at the sub-regional, regional and international levels.

The concern for improving national provision is being met very largely by the concentration of post-secondary



Patterns of networks and links in post-secondary education in the Caribbean and South Pacific. After Packer (1993)

1. Post-secondary college on a non-campus territory
2. Regional university extension centre
3. Offshore college
4. Regional university
5. Regional development organization
6. Sub-regional institutional networks
7. Metropolitan universities and colleges
8. Bilateral aid agencies
9. Multilateral organizations

education and training in tertiary or community colleges. These colleges are charged with offering higher education, professional and vocational training and community outreach programmes. A sample of examples (with date of establishment) include:

- Barbados Community College (1968)
- College of the Bahamas (1974)
- Antigua State College (1977)
- Clifton Dupigny Community College (Dominica) (1982)
- Seychelles Polytechnic (1983)
- Solomon Islands College of Higher Education (1985)
- Sir Arthur Lewis Community College (Saint Lucia) (1986)
- Tonga Community Development and Training Centre (1988)
- Grenada State College (1988)

The concern to diversify linkages and co-operative arrangements takes many forms. The above figure attempts to highlight some of these complex arrangements with a South Pacific or Caribbean non-university campus country at the heart of the diagram. Among the key issues and linkages is that of the role of the regional university.

The regional university is a major and continuing achievement of small state co-operation. The University of the West Indies (UWI), created in 1949, is supported by 14 independent states and dependent territories, and serves other countries in its region, most notably Guyana. The University of the South Pacific (USP), established in 1968, serves 11 countries. The two universities have acquired a great deal of useful experience and have demonstrated the potential of regional and international co-operation to address the needs in higher education of small island states. However, this experience has also triggered criticism and calls for improvement, in part because some small island states have felt that regional institutions

University of the South Pacific

Science Open Day at the School of Natural Resources, University of the South Pacific, Suva, Fiji. Among the items on display, posters from a UNESCO exhibit on Ecology in Action, comprising 36 posters organized around five main themes: integrated approaches to land use; tropical forests; marginal lands; cities and urbanization; conservation of nature and biosphere reserves.

The Engineering Faculty of the University of the West Indies, was established at St. Augustine, Trinidad and Tobago, with the assistance of UNDP and UNESCO. Professors and Senior lecturers were made available to initiate courses in civil, mechanical and electrical engineering and to set up teaching and research laboratories. Shown here: bending of beans in the strength-of-materials testing laboratory.

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had not responded adequately to their needs. In this vein, a number of governments of small island states increasingly wish to develop domestic provision for higher education, while recognizing the major obstacles that are posed by the small size of the population and of the labour market, as well as the high cost of tertiary education. Both the regional universities are having to re-assess their roles. The factors involved are highlighted by two observations cited by Packer (1993) in a review on dependence and interdependence in the planning and management of education and human resource development in small states:

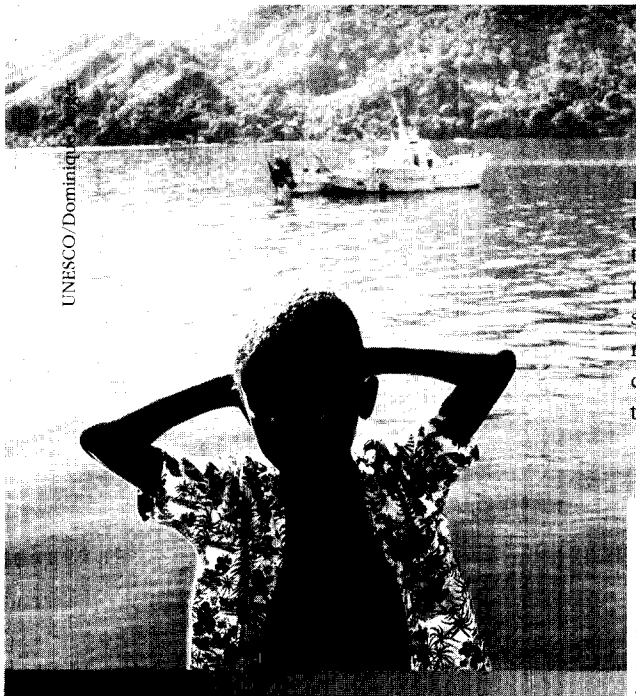
> '...regional solutions to national problems are less popular than a decade ago, not to the extent of neglecting regional facilities, but of insisting on more national-based facilities. The biggest problem with regional solutions has been the equitable distribution of benefits and costs. Countries which are not headquarters to such institutions have come increasingly to the conclusion that the headquarters country is the beneficiary and that others are progressively marginalized. Thus they look increasingly to national or bilateral solutions'.
>
> Crocombe & Meleisa (1988, p. 427)

> 'The situation is now rapidly changing as these countries [the Member Countries of the University] realize that many of the needs that they have expected UWI to fill in the past might eventually be filled more economically and more appropriately by a tertiary institution ... or perhaps by a sub-regional programme ... These developments point to the need to re-assess the University's role within the total education system in the region, particularly with respect to its relationship with these emerging tertiary institutions, and the balance of its own programmes, including the relative emphasis to be placed on undergraduate and post-graduate work'.
>
> Loubser *et al.* (1988)

The articulation of the regional/national relationships will occupy a central place in the development of both regional universities for some years to come.

More generally, UNESCO has been approached by the governments of several small island developing states, with a request to obtain support from the international community in order to establish or enhance their national systems of higher education and research.

In response to that request, an expert's meeting on Higher Education in Small Island States has been planned (Praia, Cape Verde, March 1994), with a twofold aim: first, to take stock of the strategies and operational mechanisms implemented by small island states to develop higher education, with special reference to regional co-operation and collaborative arrangements; second, to formulate recommendations and to put forward concrete proposals - to the small island states, to UNESCO, to other intergovernmental organizations and to the international community in general - designed to consolidate and to develop systems of higher education and research in the small island states, with the assistance of the international community.



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DEVELOPING CURRICULA AND LEARNING MATERIALS

Educational goals in small island countries may have distinctive characteristics. Small countries are likely to have particularly open economies; and in social and cultural matters they may be more obviously dependent on larger countries. Some small countries rely on tourism as a substantial source of income, while others depend on remittances from migrants in other countries. All small states must have people who can be adaptable and multi-functional. These factors have major implications for the curriculum.

UNESCO has for several decades been concerned with helping its member states in curriculum planning, including support to the development of curriculum units, in such small island states as

EDUCATIONAL DEVELOPMENT IN SMALL ISLAND COUNTRIES

For several decades, UNESCO has been involved in education and training projects in small island countries and regions, working in tandem with the countries concerned and a range of funding and other collaborating bodies. A sampling of projects and activities gives an idea of the sorts of challenges and issues addressed:

- In the Pacific States and Maldives, development, testing and introduction of a computer-based education management information system with training offered, variously by UNESCO's Apia and Bangkok Offices.
- In Mauritius, preparation of a master plan for education which is widely considered to be exemplary.
- In the Pacific, projects on such topics as technical education curriculum development for secondary schools (in Home Economics, Commercial Studies, Industrial Arts), reinforcing literacy measures, education management, promotion and teaching of population education, basic education and life skills.
- In the Caribbean, projects of educational planning, curriculum development and capacity building.
- IIEP regional workshops on education, employment and human resource development (Mauritius 1992), policy and planning for vocational education and training (Barbados 1993), capacity building in educational planning for human resource management (Fiji 1993).

DISTANCE EDUCATION

Distance education is believed by many to hold enormous promise for small internally and externally isolated countries. It is seen as a means of expanding educational provision to an extent otherwise impossible for a small nation were it to rely solely on conventional delivery systems.

Distance education unquestionably has considerable value in promoting inter-institutional collaboration within a given country, as well as promoting international collaboration. At the university level, insights are provided by experience at the University of the South Pacific (USP) and the University of the West Indes (UWI) (Jenkins 1992). At USP, 160 courses are available from University Extension Services by means of which students can complete a Batchelor of Education degree disseminated from Suva while remaining in their own islands. In the Caribbean, UWI has launched a Distance Teaching Enterprise (UWIDITE), using an interactive telecommunications network for teaching students located in fourteen countries in the region. The Eastern Caribbean countries are all linked together by microwave and UHF and they in turn are linked to Jamaica by optical fibres. Distance education techniques are being tested in several of UNESCO's education and training programmes. One example is the learning modules on new and renewable sources of energy, being prepared in collaboration with the Commonwealth of Learning (see page 37).

Similarly, in 1994, the International Institute for Educational Planning (IIEP) of UNESCO is organizing, jointly with the University of the West Indies, a distance learning programme on *Textbooks for all: a course for educational planners and policy makers*. The course, based on a series of twelve training modules on the subject developed by IIEP, is using the UWIDITE facility for the majority of the participants but giving the possibility to candidates from non-UWIDITE countries in the region to participate in the course under a self-study option. This procedure has the dual advantage over a traditional training course in that (i) it widens the range of participants in the programme, and (ii) the total operating cost is considerably less than that of a traditional course.

Another example relates to work on Training and Education in Coastal Marine Sciences (TREDMAR), and the preparation of a series of computer-based learning modules using coastal and marine image data from a variety of satellite, airborne and *in situ* sensors. Starting in 1989 with the distribution of a first module, the project has produced 28 interactive applications in four modules (20 Mb) and generated a global faculty network of coastal and marine lesson users and producers in over 500 universities, research institutes, government services, companies and secondary education institutes in over 70 countries (Robinson *et al.* 1993).

In another initiative, UNESCO has recently conducted an extensive feasibility study of distance education for primary and junior secondary education in the Pacific (to be published in 1994). The study is important because it is the first of its type in the region and the first to turn a strong light on some widely held but very vulnerable assumptions made about distance education. The study concludes that, under certain circumstances, a multi-channel approach (a mix of print and electronic media) is indeed promising in an isolated island context. But it emphasizes that distance education is not as flexible as believed by many, is anything but fool-proof and is definitely not a panacea. Its message, in short, is 'yes but': the potential is there but in island states, one must go into it with one's eyes open. Distance education works in some settings, for certain subject areas, for certain age levels, and with a certain management structure; in others, success is anything but assured. *Caveat emptor.*

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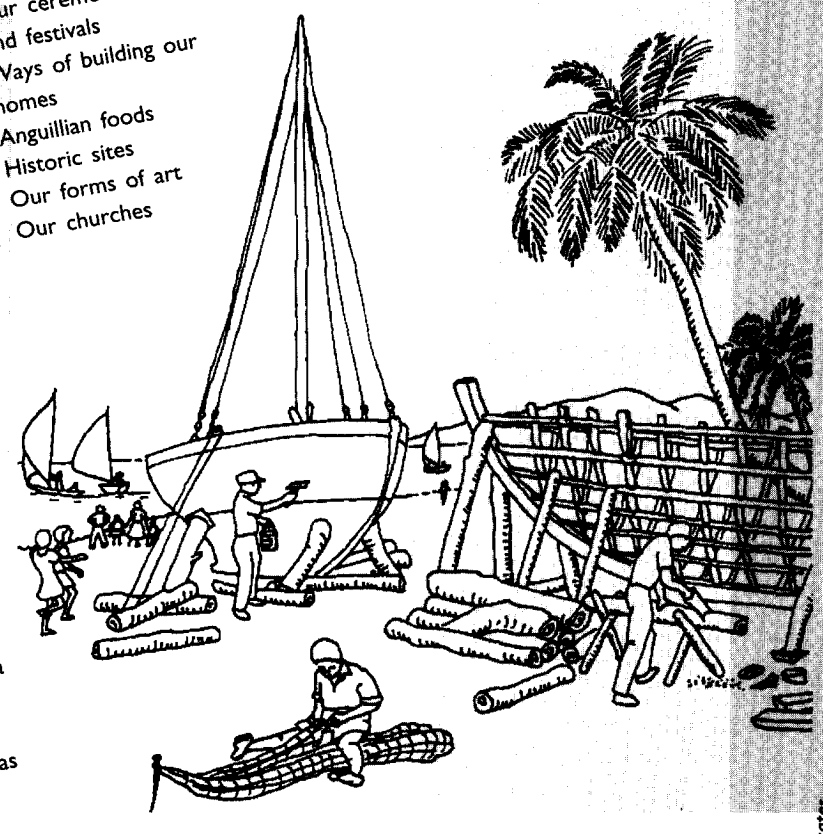
- How our leaders are elected
- Services our government provides
- Health services
- A closer look at some of our health workers
- Raising and spending revenue

Our traditions and culture
- Symbols of our country
- Our ceremonies and festivals
- Ways of building our homes
- Anguillian foods
- Historic sites
- Our forms of art
- Our churches

Macmillan Caribbean
PRIMARY SOCIAL STUDIES PROJECT

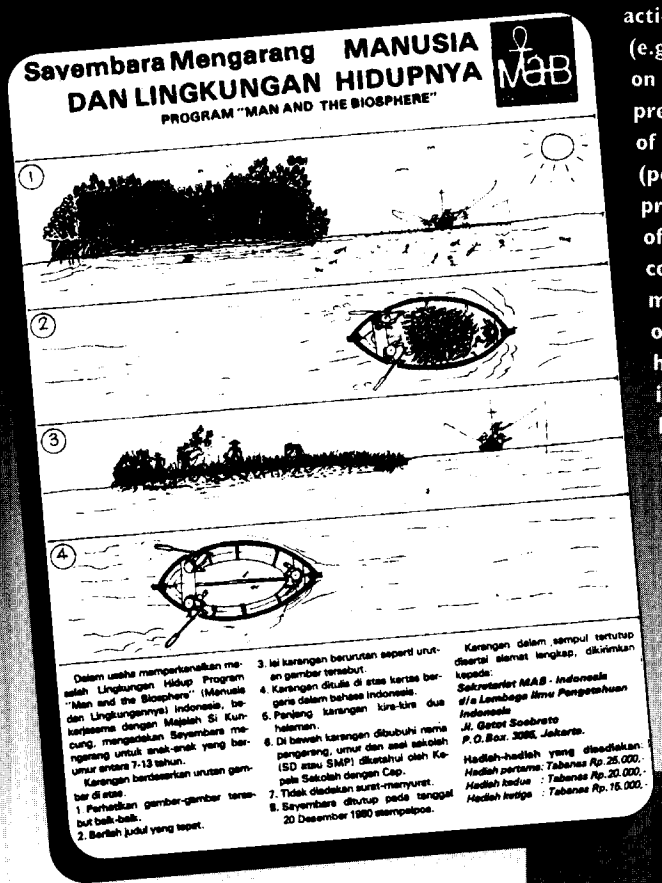
Anguilla, Our Island



the Cook Islands, Maldives, Mauritius, Solomon Islands, Tonga and Western Samoa. A related aspect is encouragement to preparation of educational materials geared to the local needs and local context.

One example of what is possible concerns a studies textbook produced in Anguilla in 1990 (Bray 1992, page 76). With a population of just 8,000 Anguilla is among the smallest of the small. But the book, entitled *Anguilla, Our Island*, is both attractive and successful. Preparation of the book entailed co-operation among teachers, a university and an international organization. The first draft was written in 1986 by a team of nine Anguillian primary school teachers. The workshop was planned and directed by a senior lecturer in Social Studies Education at the University of the West Indies (UWI), together with a consultant recruited through UNESCO.

In Indonesia, scientists, education specialists and communicators have joined forces in designing and testing pilot programmes of environmental education, at both formal and non-formal levels. The non-formal programme has included community action projects (e.g. on clean water, on waste disposal), preparation and diffusion of information materials (posters, films, slide-tape programmes) and a series of painting and writing contests in children's magazines. In the type of contest depicted here, children are invited to write a story based on drawings of environmental problems induced by unfettered human activity. Cash prizes are awarded to winning entries.



Savembara Mengarang MANUSIA DAN LINGKUNGAN HIDUPNYA

PROGRAM "MAN AND THE BIOSPHERE"

MAB

Dalam usaha memperkenalkan masalah Lingkungan Hidup Program "Man and the Biosphere" (Manusia dan Lingkungannya) Indonesia, bekerjasama dengan Majalah Si Kuncung, mengadakan Sayembara mengarang untuk anak-anak yang berumur antara 7-13 tahun.

Karangan berdasarkan urutan gambar di atas.

1. Perhatikan gambar-gambar tersebut baik-baik.
2. Berilah judul yang tepat.
3. Isi karangan berurutan seperti urutan gambar tersebut.
4. Karangan ditulis di atas kertas bergaris dalam bahasa Indonesia.
5. Panjang karangan kira-kira dua halaman.
6. Di bawah karangan dituliskan nama pengarang, umur dan asal sekolah (SD atau SMP) ditandatangani oleh Kepala Sekolah dengan Cap.
7. Tidak diadakan surat-menyurat.
8. Sayembara ditutup pada tanggal 20 Desember 1980 stempelpos.

Karangan dalam sampul tertutup disertai alamat lengkap, dikirimkan kepada:

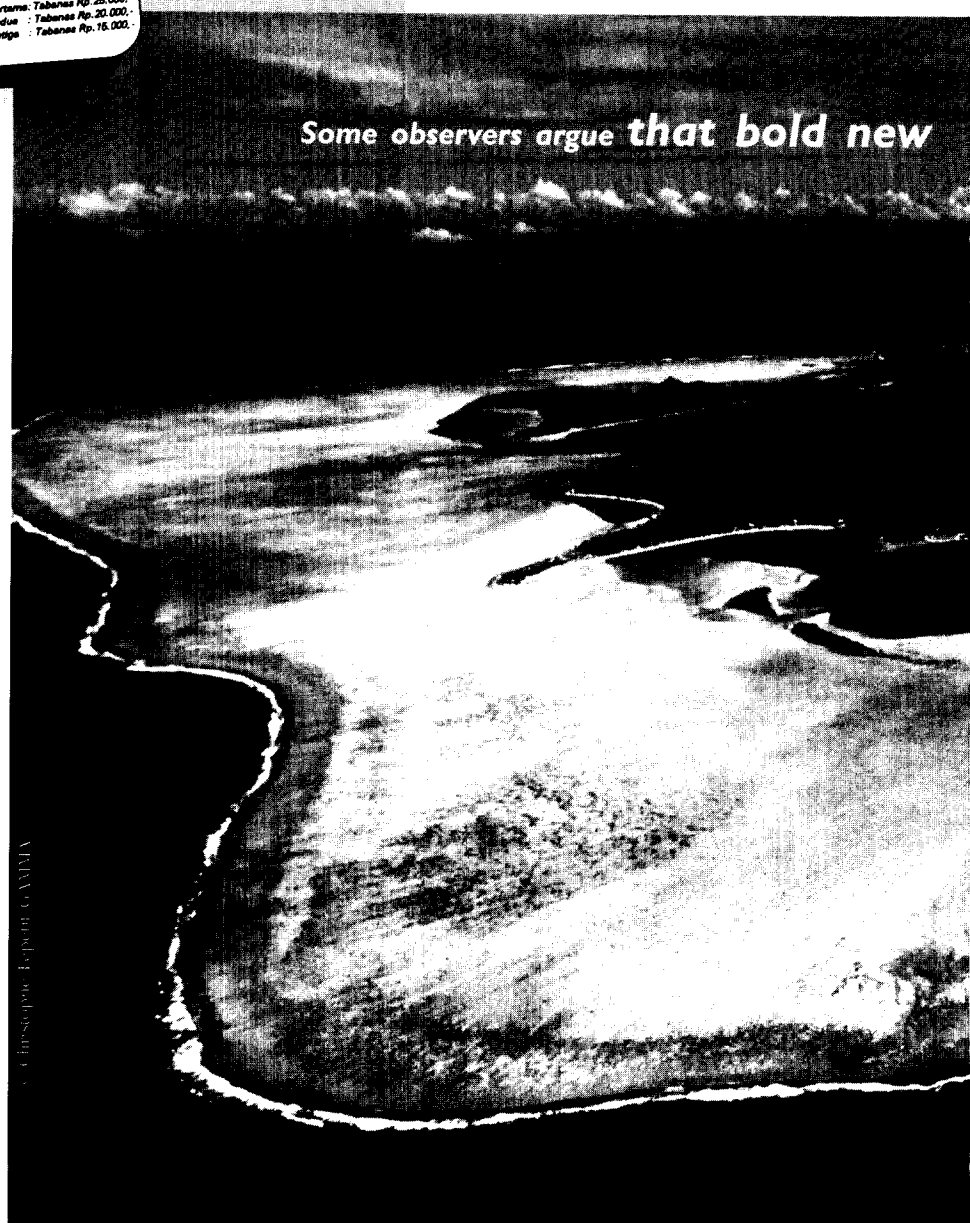
Sekretariat MAB - Indonesia
d/a Lembaga Ilmu Pengetahuan Indonesia
Jl. Gatot Soebroto
P.O.Box. 3066, Jakarta.

Hadiah-hadiah yang disediakan:
Hadiah pertama: Tabanas Rp. 25.000,-
Hadiah kedua : Tabanas Rp. 20.000,-
Hadiah ketiga : Tabanas Rp. 15.000,-

enabling them to develop site-specific teaching materials and activities suited to their own environmental settings. The training programme concentrates on field study exercises and produces competent environmental analysts after two exposures to a 'high-density' regime. Graduates are then responsible for organizing national workshops and intervening directly with curriculum units in order to expand the practice of environmental education in relation to the concept of sustainability. This activity has contributed toward the outline of an 'environmental education framework' to help strengthen the concept of sustainable development with island states.

TOWARDS NEW PARADIGMS AND NEW PARTNERSHIPS IN EDUCATIONAL INNOVATION

In education, as indeed other fields, some observers argue that bold new paradigms are needed for dealing with



As reflected in the list of contents, the book covers key topics for anyone being brought up and living in Anguilla (and indeed visiting the island). Every child in every country ought to have materials on such topics, through regrettably not every country has yet made the effort exemplified by Anguilla. The final manuscript was the result of considerable interaction among the authors. The book has many drawings and photographs, some in colour. The contract for the actual printing was made with a commercial company. Unit costs were certainly high, but the Anguillians were able to secure much of the necessary finance through external aid.

Taking another example, through its Regional Offices in Jakarta and Apia, UNESCO has devoted considerable attention to education concerning coastal, marine and small island environments (see also page 104). In particular, secondary school teachers from island states have received training in a series of field-study programmes

HARNESSING COMMUNITY EXPERTISE: AN EXAMPLE FROM NIUE

Source: Bray (1992)

In 1988 the government of Niue commissioned an overall review of the education system. The authorities required a comprehensive report which examined in detail wide-ranging issues of policy and practice.

With a total population of just 2,000, and at that time only seven primary schools and one secondary school, Niue is a very small society. A study of the type that the authorities had in mind could not easily be undertaken by the Ministry of Education alone. By utilizing the resources in the wider community, however, the government was able to secure a very thorough and valuable report.

The mix of government and community involvement was evident from the composition of the review committee:

Atapana Siakimotu	Director of Education (Chairperson)
Lapati Paka	Housewife/Ex-Nurse [community officer]
Togia Viviani	Grower/Ex-Head Teacher
Ataloma Misihepi	High School Principal

the future of small island states. A non-traditional approach to the style of development for small states is necessary as we cannot continue to follow the well trodden routes to development that have been carved out (and some consider are now exhausted) by First World societies. For example, indigenous responses can be fashioned through the combined efforts of public

PRODUCING MATHEMATICS VIDEO TAPES IN JAMAICA

In Jamaica, a set of video-cassettes on Mathematics has been produced to help students studying for the CXC (Caribbean Examinations council) examination.

The project has entailed innovative institutional cooperation linking private sector, academia, government and international agency. The origins of the project can be traced to the concern of Mutual Life, a large Jamaican financial institution, as part of its corporate outreach programme, about the consistently poor quality of the results attained by Jamaican students in the CXC mathematical examinations. It was felt that these poor results were having a direct and negative impact on the Jamaican employment market, affecting both employees and potential employers whose businesses require the services of persons with mathematical skills.

A committee was set up to pilot the project, with membership drawn from the Ministry of Education, the University of the West Indies, the Caribbean Examinations Council, UNESCO, the Commonwealth of Learning, and the private sector. Teaching videos were eventually produced to cover vital aspects of the mathematics syllabus.

Children from several secondary schools with varying levels of mathematical proficiency were taught by a master teacher for the purposes of recording the video cassette. Special attention was paid to making the production culturally relevant to the students by the use of music throughout, and an attractive set design. The tapes were designed to be used to supplement the teaching of the CXC mathematics syllabus.

The Creative Production and Training Centre (CPTC), a UNESCO sponsored project, working with an executive producer and creative director, was responsible for the various aspects of the production, with the exception of the duplication of the tapes. The project thus featured the combined efforts of a private sector company, the Ministry of Education, the University of the West Indies and UNESCO.

ADOPT-A-SCHOOL

Worldwide, in countries at all stages of socio-economic development, schools are in need of different types of assistance which Ministeries of Education and Finance may find difficult to fulfil: for example in terms of: advice and feedback from the community; technical help with special projects; teaching assistance; interaction with wider community through visits; money or materials for improving the school environment; books and other resources; help with extra-curricular activities; support for work days and other self-help projects; equipment and various facilities for learning; food.

Such needs are particularly acute in developing countries in general, and in small states in particular. Whence the interest in such schemes as 'Adopting-A-School', as has been done in Jamaica.

The scheme in Jamaica has its origins in a call made by the Prime Minister in May 1989, for Jamaicans to work on schools as Labour Day projects. The idea was to stimulate community assessment to schools and encourage public sector support locally and internationally. The response was overwhelming, and led to 'Adopt-A-School' becoming a full-fledged programme of the Ministry of Education.

Adopting a school means that an organization or individual takes on some of the responsibility for the caring and development of the institution. It involves giving practical assistance according to the needs of the school and the capacity of the adopting body or individual. Among those involved are private and public sector companies (large and small), service clubs, social organizations, groups of private citizens, and individuals. Another variant is when an overseas school twins with a Jamaican school.

The 'Adopt-A-School' scheme forms one component of the School Community Outreach Programme for Education, sponsored by the Ministry of Education and Culture and US-AID. The aims are to promote the process by which schools and various community bodies or agents are empowered to forge meaningful and lasting interrelationships and partnerships, in order to participate effectively in a decentralized and enhanced primary education system. The underlying motivation is that research in many different parts of the world, including Jamaica, has shown that where school-community interrelationships are positive and dynamic, the quality of education offered is enhanced.

and private sectors working with regional and international organizations and joining forces in order to tackle the question of educational development in small island states.

Jamaica is a source of several such innovations in education, such as the Adopt-A-School programme, where local schools are adopted by private sector companies. Another example lies in a set of Mathematics Video Cassettes, which was produced by the Mutual Life group of companies in association with UNESCO and the Ministry of Education, with a view to helping students studying for their mathematics examinations.

At a more strategic level, there may also be value in rethinking some of the tenets underpinning higher education. As illustration, mention might be made of the lengthy training of specialized personnel. What in the past was considered in terms of 'overproduction' and 'wastage' resulting in a 'brain drain' could be reconsidered in terms of a deliberate effort of small island states to provide human resources for knowledge and service based industries to First World countries. A pattern of development that was once regarded as a negative could now be seen in a positive light. Small states could be encouraged to strengthen their own educational base so as to provide not only human resources for their own needs, but to locate themselves globally so as to provide personnel needed by other countries, for example, in the fields of education, commerce and service industries. What in the past was regarded as a brain drain could then be seen as a brain surplus, and small states could be perceived as being in possession of high quality educational programmes which are able to turn out enough suitably skilled people to serve their own needs as well as the needs of other countries.

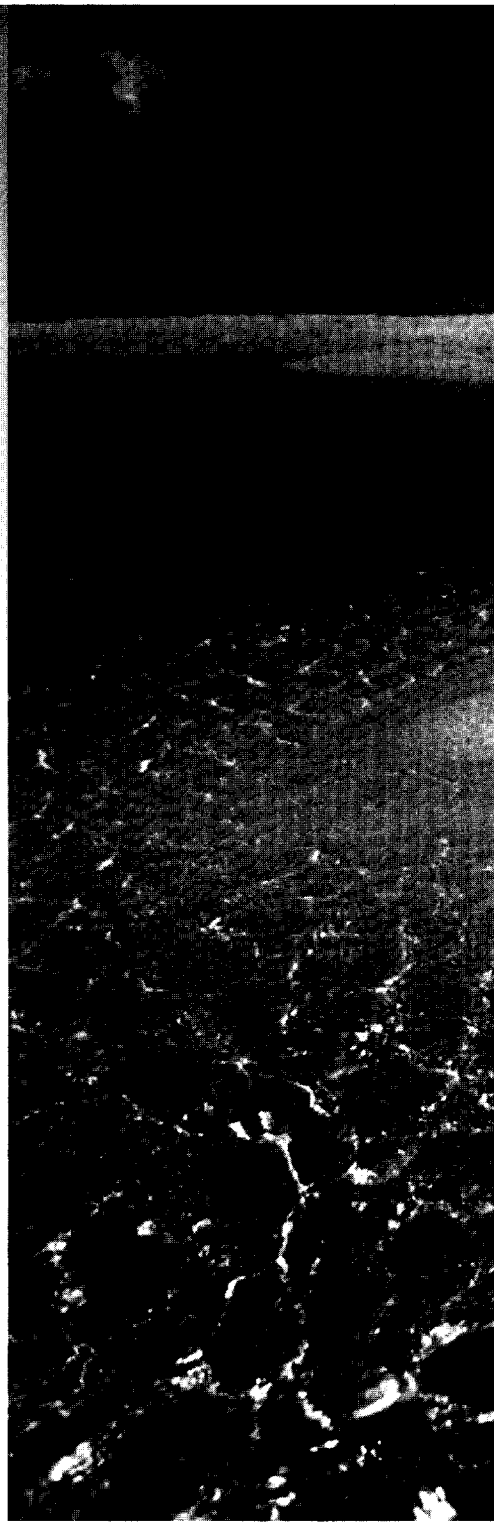
As illustration, for discussion purposes, small states might be encouraged to boldly overproduce skilled personnel in the areas of medicine and education. Nurses and teachers could be attracted into their professions through the benefits of a 'rotation' scheme. That is, small states would train personnel who would then be bonded to work within their national system for a prescribed period, of say, two years. Those who show interest in working in developed countries could then under this scheme, be allowed to work in a First

UNESCO/Dominique Roger

World country for another two years; at the end of this period, they would return to their country of origin, bringing back such knowledge as they have acquired in advanced technologies, at the same time benefitting from the higher salaries that developed countries are able to offer. This rotating cycle would introduce new methodology which could (i) add impetus to the relevant services, (ii) foster cultural understanding among the countries (this could be particularly relevant in countries with large migrant populations), (iii) improve the financial status of those involved in the programme and (iv) enable small states to retain qualified personnel.

Small states could also be encouraged to identify nationals living in developed countries with a view towards incorporating them in the development process. Coalitions formed with professionals living abroad can be of great benefit to developing states. They can be encouraged to give short-term service to the country of their origin. For example, medical teams who do intensive short-term clinics in specialist fields can provide tremendous service to developing countries where specialist services can be extremely expensive and difficult to obtain.

Small island states might also be considered as privileged locations for undertaking certain innovations in the field of education. Thus, traditional modalities of education tend to be bound by stereotypical behaviour and tradition while accelerated or decelerated educational programmes are often undertaken by the private sector with a great deal of success. Most educational institutions are bound by rules which seem cast in stone. One aspect open to reassessment and reform is that institutions should be prepared to pay less attention to entry qualifications and more to exit attainment. Some people who are perfectly capable of performing brilliantly once they are admitted to a course of study, are barred from doing so because of prescribed entry requirements. Special innovative schemes might be set up in small island states to produce results that will help to challenge and hopefully to change some of the more outmoded modalities which have no place in modern education.



With their varying environmental characteristics, cultural histories and geo-political affiliations, island groups in the various oceanic regions have a variety of preoccupations, priorities and interests. This chapter provides further examples on UNESCO-related activities carried out in particular islands and archipelagoes, as well as information on regional co-operative activities and recommendations on natural resources management in several regions.

ATLANTIC

In contrast to islands in certain other oceanic basins (such as the Caribbean and South Pacific), the small islands of the Atlantic are not grouped in any particular geopolitical framework. Though some are independent states (e.g. Sao Tome and Principe), the overwhelming majority form part of larger continental countries and UNESCO's activities have reflected those relationships. Regional cooperative activities for some islands (e.g. Canaries) have tended to be linked to work in Mediterranean, though there are some examples of cooperation outside that framework (e.g. between islands in Brittany and Estonia).

Cape Verde and Sao Tome and Principe: Improved Quality of Education Through the Use of Radio

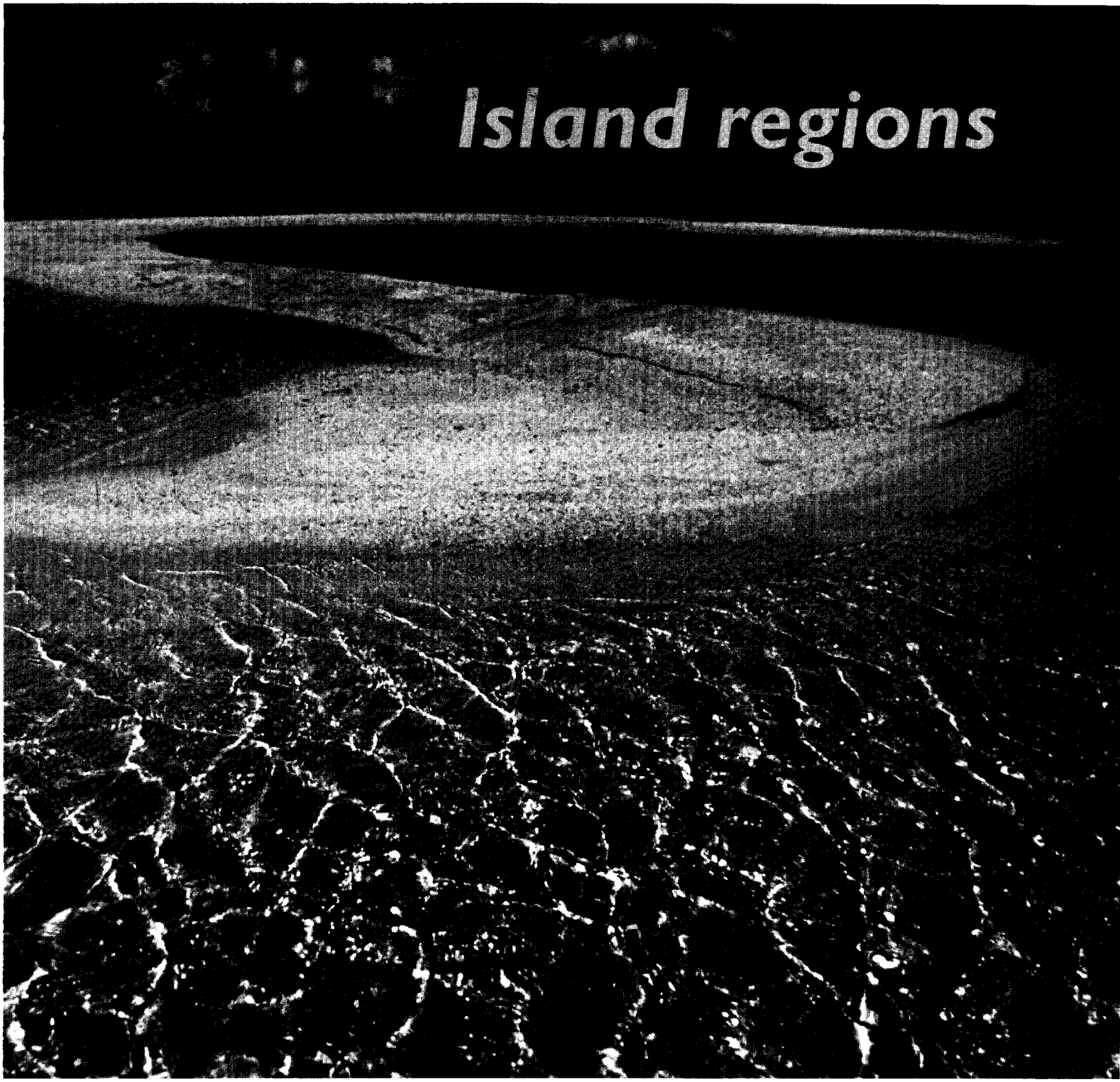
Angola, Cape Verde, Guinea-Bissau, Mozambique, and Sao Tome and Principe, also called the PALOP (African Countries with Portuguese as an Official Language), have a problem in common: the lack of adequate learning results at the basic level. Much of this problem is due to poor teaching in Mathematics and Portuguese, a second language for most of the students, and their teachers.

During the UNESCO Regional Seminar on Distance Education in Africa, held in Arusha, Tanzania, in September 1990, the PALOP countries decided to find a shared solution for their common problem. They suggested that mass communication media be used to supplement the teachers. Radio reaches most of the schools. It is also the medium which, where it does not yet reach all schools, can most easily be upgraded to do so. Thus the IRI/PALOP project was born. The project aims at producing radio programmes in Mathematics and Portuguese as a second language for the first four grades of primary education. It also aims at capacity building in the PALOP countries to produce such programmes.

IRI/PALOP stands for Interactive Radio Instruction (IRI) in the PALOP countries. IRI uses radio in an innovative way. As the term indicates, communication with the students is *interactive*. Students respond to the medium, verbally as well as by doing things, every ten to fifteen seconds. The radio is programmed to prompt the children to learn actively. IRI programmes are also based on the principle that learning small portions of content is more effective than concentrating on large chunks of subject matter. Application of this principle of *distributed learning* results in educational radio programmes with great variety. Every few minutes the topic changes so that the learner's attention is continuously kept. Children and teachers enjoy these programmes. Teachers usually learn from them as well. By using the programmes their own teaching style becomes more active.

UNESCO's Southern Africa office in Harare, Zimbabwe, in collaboration with the USAID funded LearnTech project, is playing a lead role in developing the IRI/PALOP project. There are four stages in this process: project design and preparation; execution of preliminary activities; research and development of the IRI programmes; implementation of the programmes in

Island regions



© Christophe Lepetit/GAMMA

the five countries. The first and second stage are jointly funded by USAID and UNESCO.

The first stage has been successfully completed. Preliminary activities are now underway in Cape Verde, the site for the sub-regional research and development work, in anticipation of full-scale funding for the project, which is being negotiated. A small and enthusiastic team in Mindelo, Cape Verde, has produced twenty radio mathematics lessons for initial testing in the schools. A UNDP funded study on the feasibility of shared curriculum development in the context of the IRI/PALOP project started in mid-1993. National implementation of the IRI/PALOP programmes is expected to result in significant learning gains at the primary level in all five countries.

'Ecoplan' for La Gomera

The island of La Gomera, in the Canaries Archipelago, is unique among islands of its size (378 km^2). The dramatic cliffs which make up its coastline, the deep ravines that score its hinterland and its sheer volcanic chimneys, not to mention the amazing terracing created by its inhabitants over the centuries, make a spectacular impression on the visitor. The vegetation, too, is astonishing, ranging from wet sub-tropical forest to sub-desert formations of succulent plants, among which species of the *Euphorbia* genus are the most representative. This wide vegetation span can perhaps be explained by the uneven nature of the island's annual average water intake. This ranges from around 3000 mm at the heads of the north-facing ravines to 150 mm on the southern seaboard.

In the centre of the island stands the Garajonay National Park and World Heritage Site, consisting mainly of

'laurisilva' forest, which has traditionally been respected by the people of La Gomera. Their special understanding of the importance of the forest is well expressed in a local saying often heard amongst country folk that the forest 'milks the clouds'. In fact, the hydrology of the island is in no small measure dependent upon the forest's capacity for condensing water from fog.

As in many other small islands, recent years have seen marked changes on La Gomera, not all of them welcomed. The need for a reappraisal of the development options for La Gomera led to 'Ecoplan' initiative originated by the Foundation for Ecology and Environmental Protection and supported by the Spanish Government and MAB, with the fundamentals of the plan described in a monograph published in 1988 by the General Environment Directorate of Spain (Gomez *et al.*, 1988). The underlying philosophy and approach of the ecoplan had earlier been examined during a seminar on the 'ecodevelopment' of La Gomera, organized in March 1987 by the Spanish MAB National Committee and attended by national and international experts, government and island representatives and members of the Ecoplan study group. Visits were made to the various areas where action was proposed, the available thematic information was distributed and work groups were formed which later presented written reports on the conclusions they had reached. From the seminar and later discussions a number of strategic actions were agreed upon as being essential prerequisites to putting the proposed Ecoplan into practice. Actions set in train included: the setting-up of a data bank on La Gomera; improved coordination and communication among the various administrative bodies so as to ensure suitable chanelling of public investment; diversification of tourist facilities, including transport and recreation activities; training to facilitate involvement of local people in tourism administration on a cooperative, part time basis.

Experience gained in La Gomera has helped shape other initiatives to promote integrated approaches to whole island development, such as those associated with Menorca and Lanzarote (see page 31).

Ile d'Ouessant seminars on comparative research methodology and planning

The Island of Ouessant off the westernmost tip of France forms part of the international network of biosphere reserves and of the French contribution to the MAB Programme. Ouessant has also provided the venue for several seminars on comparative research, methodology and planning.

In April 1988, Ouessant was the setting for an international MAB seminar on 'Comparative Research Methodology for Small Island Development in the Mediterranean and Northern Europe'. At the meeting, 40 specialists from 11 countries compared research methods and techniques such as simulation modelling, and projects for sustainable development on islands ranging from the Shetlands (UK) to Kerkennah (Tunisia), the Balearics (Spain) to the Cyclades (Greece).

More recently, in March 1993 in Ouessant, a workshop on island biosphere reserves brought together researchers and managers from four island group-

La Gomera is the only one of seven islands in the western part of the Canary Islands that has not experienced a volcanic eruption in recent times. The ash and lava fields have eroded away, leaving mature basaltic soils.
The 4000 hectare Garagonay National Park (inscribed on the World Heritage List in 1986) covers an altitudinal range of 600 to nearly 1500 m with annual rainfall in the order of 600-800 mm.
The subtropical vegetation is noted for its laurel forest. Its lushness is maintained by numerous streams and springs, as well as by mists and condensed water vapour.

ings - three of them biosphere reserves (Ouessant-Molena Archipelago, Hiiumaa-West Estonian Archipelago and Menorca in the Balearic Islands of Spain), and the fourth a potential biosphere reserve (Bijagos Archipelago in Guinea Bissau). The aim was to develop protocols for comparative research on observing environmental change in island situations, with a particular focus on the ecological and socio-economic relations between humans, environment and landscapes. A four-phased initiative is envisaged during the period 1993-96, including syntheses of existing information, elaboration of indicators of ecological and socio-economic change, integrated environmental mapping, and research and actions for underpinning approaches to sustainable development in island environments. Measures for the exchange of information include reciprocal site visits, such as that of a group of researchers from Ouessant to Hiiumaa in West Estonia in September 1992 (Bioret *et al.*, 1992) and follow-up interactive workshops, such as that held in Menorca in late 1993.

Human response to environmental stress in the Koster islands (Sweden)

A study on human response to environmental stress is being carried out since 1987 in the Koster islands, the westernmost populated islands in Sweden, situated 10 kilometres west of the Swedish mainland (the city of Strömstad) and close to the Norwegian border. The area is subjected to severe environmental changes affecting the environment of the islanders, their choice of life style and their health. Scientists from 15 different disciplines from the University of Gothenburg and the Chalmers Technical University of Gothenburg are contributing to the Koster islands study, which provided the principal case study for a European workshop in September 1991 on 'Environment Life Style and Health', sponsored by UNESCO-MAB among other bodies.

The particular focus of the workshop was on the use of small islands and other small area research models for establishing 'early warning systems' of environmental change and its effects on human populations. Technical presentations and group discussions focussed on such topics as human ecology and health risk management, and examination of standardized research protocols in such fields as social psychology, nutrition, human health and environmental physics. Of the twelve individually authored contributions presented in the workshop report (Follér 1992), several address issues specifically related to small islands: myths and realities in the culture of the sea people; insular environment as stress on territorial lifestyles, and tourism impact on the environment of small islands.

CARIBBEAN

A movement or change away from dependency toward greater autonomy, self-reliance and self-sufficiency is a dimension of development strategies in the Caribbean, rooted in the history of the region (Marshall 1979). Strategies for achieving this development are, however, constrained by the size of the islands and their resources. Careful use of natural resources and sensitive environmental management holds one key to the future development of such key economic sectors as tourism, in a region where the relative close proximity of the islands to each other has important implications to the development of communications and education.

Hydrogeological Atlas of Caribbean Islands

Water is a resource very often in short supply in many island situations, even in areas of abundant rainfall. This is certainly so for many islands in the Caribbean for example, where upwards of 80% of the rainfall may pass to the sea without having been used even once for municipal, agricultural or industrial purposes. At the same time, many of the small Caribbean islands are densely populated and have developed tourist facilities which consume large quantities of water. As groundwater is practically the only water resource, it has great economic and social value. Whence the interest of the International Hydrological Programme (IHP) in promoting the synthesis and diffusion of knowledge on the occurrence, movement, quantity and quality of groundwater in regions such as the Caribbean, as instanced by a project to prepare a Hydrogeological Atlas of the Caribbean Islands.

A first workshop on the atlas, held in the Dominican Republic in October 1986, examined the results of a questionnaire in preparing an account of the status of the hydrogeological information of twenty-five islands or island groups in the Caribbean (UNESCO 1986). For each entry, there is a map and summary description of (a) physiographic, climatological, hydrological and geological characteristics, and (b) hydrogeological characteristics and basic studies. Capitulatory tables summarize the status of hydrogeological studies in the various islands or island groups. Subsequently, a second workshop in Caracas in September 1988 (UNESCO 1988b) reviewed progress in the preparation of national hydrogeological maps, and charted steps for the finalization of the regional atlas.

Land-based sources of marine pollution in the Caribbean

An assessment of land-based sources of marine pollution in the wider Caribbean region was carried out by participants at a workshop in San Juan (Puerto Rico) in August 1989, organized by the US-MAB Caribbean Islands Directorate and the Caribbean Regional Programme of UNEP, with a view to working towards formulation of a strategy to be used in controlling marine pollution in the region. Participants divided their 33-page report into four major sections, each succeeding one relying for inputs from the preceding ones. These sections dealt respectively with the following topics:

- *Inventory of land-based sources of marine pollution.* This inventory, divided into point sources and non-point sources of pollutants, establishes the baseline data for dealing with marine pollution.
- *Impact of land-based sources of marine pollution.* The extent of the impact of pollutants on the ecological and economic life dependent on the marine environment calls for scientific analyses involving the nature of the polluting substances as well as that of the receiving marine areas.
- *Development of tropical water-quality and effluent standards.* Tropical water-quality criteria and standards provide essential analytical links between the use of marine waters and the control of marine pollution.

Caribbean Islands: Current situation, possibilities, and recommendations for natural resource management.
Source: Beller et al. 1990, page 404.

SECTOR	SITUATION	POSSIBILITIES	RECOMMENDATIONS
WATER High islands	Water shortages exist corresponding to season and geography. Islands support mostly small surface streams. Much flash flooding occurs in lowlands. High level of rainfall limits extent of human activity.	Use interbasin transfer (water diversion structures), water-retaining structures including reservoirs, water import from other islands or mainland, prudent use of land.	Inventory water resources. Incorporate in the water-management schemes the natural water systems, especially estuaries and freshwater systems.
Low islands	There are chronic water shortages due to scarce rainfall and virtually no surface streams. Some groundwater exists in aquifers, which are easily contaminated. Water imported; desalted.	Recycle water. Stress intensive conservation measures. Build more cisterns. Use intensive water-management techniques for small watersheds, e.g. lining ponds.	Inventory water resources. Develop and protect recharge areas. Avoid underground injection of wastes.
ENERGY High islands	Dependent on fossil fuel supplied by import and charcoal.	Where techniques are economical, use hydroelectric, hydrothermal, and solar power including wind; also, biomass and biogas, and import of charcoal.	Explore tree and sugar cane plantations as biomass alternatives to deriving charcoal from natural forests. Use energy conservation methods. Promote use of solar energy.
Low islands	Dependent on imported fossil fuel.	Develop solar resources.	Establish energy conservation policies. Focus on appropriate energy-use technologies. Recognize the restrictions on development that result from limited energy supplies. In particular, recognize the constraints placed on industrial options that will require large amount of energy.
FISHERIES	Subsistence fishing exists in most islands but people poorly understand the resource base. Waters are not very productive in the region of the islands. Tendency is to import fish.	Develop fully the artisanal use of the fisheries resources. Protect fishery habitats and the feeding grounds.	Seek ways to improve artisanal fisheries, perhaps by marketing new or underutilized fish, e.g. swordfish in the Caribbean. Curb habitat destruction especially wetlands, reefs, bays and lagoons. Determine fishery potential near the islands. Assess contributions possible through aquaculture and mariculture; seaweed cultivation; drugs from the sea.
AGRICULTURE	Vegetables grown by traditional means. Animal husbandry techniques are primitive. Seventy per cent of island-grown food produced by farmers working small areas.	Intensify agricultural production. Generate feed crops. Institute effective training and extension services. Agro-forestry.	Determine application of relevant technologies such as agro-forestry, and intensive agriculture through drip irrigation and drip fertilization, the latter methods especially applicable to water-short lands. Seek to raise the status and pay of the farmer so that he does not desert his land to work in factories in urban areas. Avoid technologies that degrade island ecologies, or increase dependency on fossil fuel.

COASTAL AND MARINE MANAGEMENT	Coastal-zone functions are critical ones for island economy including tourism. This zone is usually the focus for urban and industrial development. There are often few, if any, coastal wetlands and estuaries; and what there are, are generally meagre. However, some islands have some reefs rich in marine life. Other problems: beach erosion, pollution of coastal waters, boating safety.	Organize effective coastal-zone management. Establish protected areas. Educate public. Develop waste-water collection and treatment systems.	Develop long-range coastal-zone management plans. Control beach erosion, and sand extraction from the beaches. Seek alternate sources or substitutes for sand as a building material. Protect coastal wetlands including mangrove lagoons; and live reefs. Treat effluents and place outfalls where neither will pollute coastal areas.
WASTE DISPOSAL	Limited space for disposal of solid wastes. Disposal of sewage effluents is extremely poor. Economic constraints limit recycling of wastes. Problems also exist in the collection of wastes. Quantities of imported disposable materials are increasing.	Encourage resource recovery through processes such as incineration of wastes and the reuse of the ash and energy. Treat the liquid wastes in appropriate plants: primary, secondary, tertiary.	Provide adequate treatment of waste-waters, but avoid introduction of hazardous wastes into the treatment system. Provide for adequate disposal of sludge. Include any exceptional costs of waste disposal in commercial and industrial development plans.
FORESTRY High islands	Slopes covered with second growth. Deforestation in low lands. Agriculture is encroaching into forest lands. There are few plantations. Charcoal produced from natural forests. Islands are net importers of wood products.	Establish plantations for wood- import and energy substitution. Protect native forests for watershed, tourism and wildlife. Reduce wood imports. Couple food and fibre production through agro-forestry.	Survey and protect public forest lands. Improve forestry agencies. Couple forestry and food production, or forestry and grazing through agro-forestry.
Low islands	There is no forestry. Islands are wood importers.	Establish plantations and reforest lands for watershed protection and limited production of forest products. With native tree species, protect vital lands for wildlife.	Establish a forestry office, and support the forestry sector. Train personnel. Conduct adaptability trials for tree species that can be used for energy and fence posts.
WILDLIFE MANAGEMENT	On the low islands, wildlife has lost most of its native habitats. Although this situation is also critical on the high islands, it is less so because of natural habitats that exist in remote areas. Invasions of exotic species have occurred causing deleterious impacts on native wildlife as well as humans. Sport hunting also threatens the continued existence of some native wildlife. Islands contain vital elements of Atlantic Flyway.	Conserve and restore wildlife areas and habitats. Restore endangered populations. Provide strict enforcement against poaching. Limit hunting seasons. Promote training for hunters. Establish protected areas.	Inventory wildlife. Increase public awareness of benefits of wildlife, and the dangers to it. Avoid introduction of exotics; but where they are present, control their usurpations. Adopt and enforce hunting regulations.
TOURISM	Source of major part of foreign exchange, income, employment and perhaps future earnings for most of the islands.		Need strong planning and ecological/economic evaluations for sound development of industry and islands.

Red mangroves, with their characteristic aerial prop roots, are important nursery areas for fish and support a diverse community of sponges, algae and even corals. The roots also trap sediments and over a period of several years can extend the shoreline seaward. Mangroves can reduce the amount of runoff (and associated sewage and pollutants) which reaches offshore seagrass beds and coral reefs. This drawing by M. Beath is from a review of the marine and terrestrial ecosystems of the US Virgin Islands National Park and Biosphere Reserve (Rogers & Teytaud 1988).

- *Marine pollution control strategy.* The means for managing land-based sources of marine pollution can be divided into utilizing marine water-quality standards, effluent standards, environmental planning, and best management practices. The participants in the Puerto Rico workshop agreed on the need for a Protocol for the Wider Caribbean Region for controlling pollution from land-based sources. They saw four essential elements in such a Protocol: (a) in standard format, gather baseline pollution data, which are needed to determine the extent of pollution of the Caribbean Sea, and for determining control priorities; (b) anticipate marine-pollution problems through adequate and timely impact analyses; (c) establish the basis for controlling marine-pollution, water-quality standards and effluent standards pertinent to the Caribbean; (d) install a pollution-control strategy based on marine water-quality standards, effluent standards, environmental planning, and best management practices.

Subsequently, the recommendations and conclusions of the workshop provided one of the inputs to a meeting of the IOC and UNEP that took place in Jamaica in late August 1989, and to the process of preparation by UNEP of a draft Protocol on Land-Based Sources of Marine Pollution.

Coastal and marine systems

UNESCO's Coastal Marine Programme (COMAR) has focused interest on the interactions between the major coastal and estuarine ecosystems and their contribution to the productivity of the coastal marine environment. Emanating from this interest and concern, an initiative on Caribbean Coastal Marine Productivity (CARICOMP) has been established as a unified, long-term, Caribbean-wide operation to identify the factors responsible for sustaining the productivity and interactions of mangrove wetlands, seagrass meadows and coral reefs, and to determine the role of terrestrial and oceanic influences on these systems. CARICOMP comprises (in early 1994) a network of about 20 universities and research laboratories from 15 countries of the Caribbean, while an additional 14 universities/laboratories are associated with one or several aspects of the research programme or are likely to formally join the network. By signing a Memorandum of Understanding, the research laboratories have agreed to cooperate within the framework of CARICOMP and to apply the same research and sampling methods. A CARICOMP Data Centre has been established at the University of the West Indies, in Kingston, which is compiling and redistributing the data collected by each university/laboratory.

Since 1985, the COMAR-Coast and Beach Stability project has built Coastal Monitoring programmes into another network of countries in the Lesser Antilles. A Regional Centre to coordinate this programme is being negotiated with the University of Puerto Rico.

In November 1993 in the French Antilles, a scientific workshop on small island oceanography in relation to sustainable economic development and related coastal area management was organized by the IOC and its Subcommission for the Caribbean and Adjacent Regions and the Caribbean Environment Programme of UNEP. The underlying rationale was that the biology, chemistry, geology, and physics of the ocean and the lower atmosphere are intertwined with the economics and health of small islands, thus emphasizing the need for an integrated approach to research and management. The workshop brought together marine scientists and decision-makers from government and business with environmental responsibilities. Timescales considered ranged from those associated with storm damage and hazardous spills, to decade and longer climate change. The concentration was on quantitative effects and influence of oceanic and atmospheric events on small islands and their marine environs. Presentation and discussion of a series of

case studies was complemented by quantitative models where the ocean's physical variability is coupled to economic effects - a series of nested numerical models each providing the boundary conditions from a coarse-resolution regional circulation model to a fine-resolution island-scale circulation model to a cellular socio-economic decision-support model. Some of these models are PC based, and thus amenable to the available resources on most developing island states.

Contributing to biodiversity conservation in the Caribbean

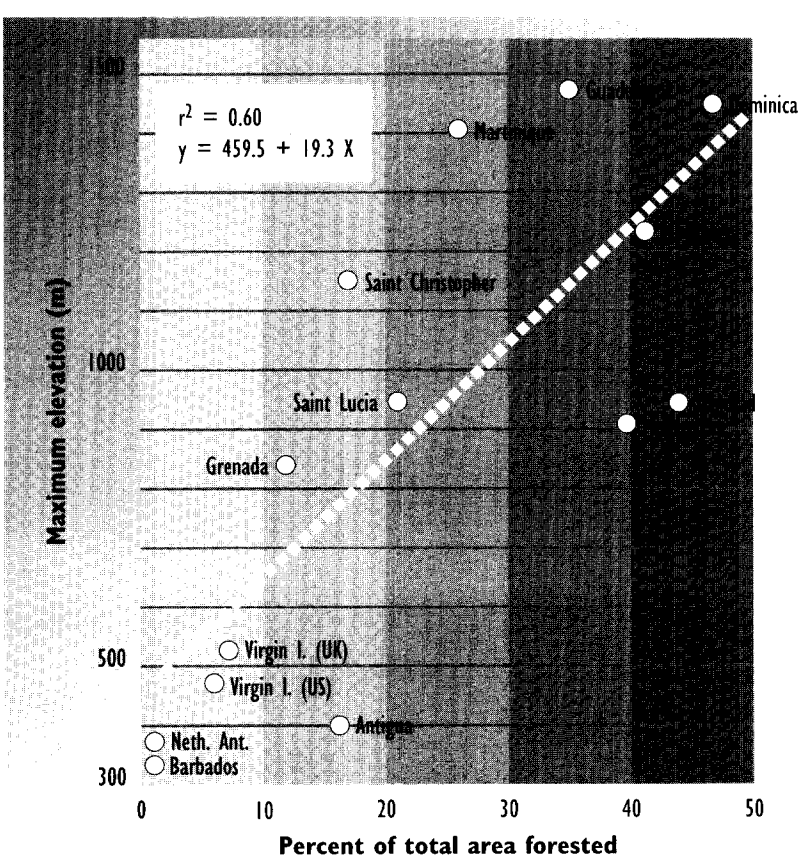
Several small-island sites in the Caribbean contribute to the international network of biosphere reserves - Guadeloupe Archipelago, Luquillo Experimental Forest (Puerto Rico), US Virgin Islands National Park. Perhaps significantly, each of these biosphere reserves forms part of a larger continental country with a long-established MAB National Committee.

The Guadeloupe Archipelago Biosphere Reserve is made up of two parts. One part comprises the tropical humid forests covering the volcanic mountainous slopes of Basse Terre to the west, and the other part consists of a vast marine lagoon bordered with mangroves and with several islets lying to the northern part of Guadeloupe around Grand Cul-de-Sac Marin. The tropical oceanic climate varies greatly with exposure to the eastern trade winds and with altitude. The rationale behind this biosphere reserve is to cover the range of coastal and terrestrial ecosystems types of this part of the Caribbean. Human settlements are located mainly in the transition areas. There are comprehensive data sets for both marine and terrestrial parts and a comprehensive basic and applied research plan is carried out by a number of institutions, including the University of Antilles-Guadeloupe.

Luquillo Experimental Station and Biosphere Reserve in Puerto Rico is particularly renowned for its long-term research on ecosystem disturbance. Research records at Luquillo date back more than a hundred years, and long-term observation plots provide baselines for studying ecosystem response to different patterns of disturbance (natural treefalls, landslides, hurricanes, selective cutting). Related lines of research include land-stream interactions, integration of ecosystem models and geographic information systems, and population biology and conservation biology of the Puerto Rican parrot. Luquillo is one of the Long-Term Ecological Research (LTER) sites in the USA supported by the National Science Foundation. Research history and opportunities at Luquillo are described in a 1983 report prepared by the Institute of Tropical Forestry at Rio Pedras (Brown *et al.* 1983), which celebrated its Golden Anniversary in May 1989 with an international symposium on 'A century of research at the Institute of Tropical Forestry: results from the first half, themes for the second'. Some two months later, Hurricane Hugo provided a massive new disturbance to Luquillo. In one permanent plot surveyed in 1988, within the Smithsonian Institution/MAB Bio-diversity Program (Dallmeier 1992) Hugo knocked down nearly half the trees in the plot.

The Virgin Islands National Park, approximately half of the island of St John (the smallest of the three principal US Virgin Islands) and some adjacent marine waters, was designated a biosphere reserve by UNESCO in 1976. In 1983, UNESCO, in co-operation with US-MAB, the US National Park Service, the Caribbean Conservation Association, and other regional agencies and organizations, sponsored an international workshop on St John. The forum focused on the role of protected areas in the sustainable development of small Caribbean islands. The workshop provided the first exposure to biosphere reserve concepts for most of the region's conservation and economic development interests. About the time of the workshop, the Virgin Islands Resource Management Co-operative was set up, bringing together representatives from federal agencies; regional agencies in the US Virgin Islands, Puerto Rico, and the British Virgin Islands; non-governmental organizations; and several universities, to obtain baseline data on natural resources and to test approaches to ecosystem restoration and regeneration. Present challenges include moving towards the integration of research and community interests for effective resource management (Partners in Parks 1993).

At the regional scale, because many Caribbean islands have relatively large human populations in proportion to their land area, only a small percentage of their land is forested (Lugo *et al.* 1981, Lugo & Brown 1982). Forest area in a given Caribbean country has been found



Relationship between maximum elevation and per cent total area forested in the Caribbean islands. The relationship is highly significant $p = 0.05$.
Source: Lugo (1990).

Gary Martin

Medicinal plants are an important part of healthcare for people throughout the Caribbean region. TRAMIL is documenting plant uses and returning information to communities about effective treatments. Conservation of these plants is essential so that their use can continue. Shown here: medicinal plant vendor, Mercado Modelo, in Santo Domingo, Dominican Republic.

to be influenced by population density, intensity of energy consumption (a measure of human activity) and topography. Fortunately forests in the Caribbean are highly productive and show rapid rates of recovery once relieved of intensive use (Lugo 1990). This resilience, an adaptation to hurricane disturbance, is the best management tool available to forestry departments.

Environmental management and economic growth in the smaller Caribbean islands

In September 1979 at St Michael in Barbados, a Conference on Environmental Management and Economic Growth in the Smaller Caribbean Islands brought together, perhaps for the first time, government-designated delegates from the islands to discuss ways to achieve the sound development of their lands. The stimulus for the conference came from the US-MAB Caribbean Islands Directorate, in tandem with the governments of the smaller Caribbean Islands, the UNEP-ECLA Caribbean Environment initiative, the UN Department for International Economic and Social Affairs, UNDP, the Caribbean Development Bank, the Caribbean Conservation Association and a range of other bodies. Some 75 policy-makers, officials, resource managers and scientists took part, including national delegates who spoke as representatives of their governments. The conference proceedings (Beller 1979) includes statements by government representatives and contributions dealing with a wide range of topics relating to environmental management and economic growth in the smaller Caribbean islands: economic choices, guidelines for project evaluation, factors constraining the growth of the economies of small states, natural and human resource constraints, constraints on human ecosystems, land and coastal resource uses, social change and magic, interrelations between different

As part of efforts to strengthen reading and improving the quality of life in the Caribbean, UNESCO's Kingston Office has produced a series of booklets within the framework of the World Declaration on *Education For All*. In an initial exercise which produced booklets concerned with AIDS, Drug Abuse and Parenting, the methodology of housing the messages in an entertaining form by way of fictional stories proved to be very popular reading, and helped to stimulate consciousness of the social problems involved. A subsequent 76-page illustrated booklet entitled Juice Box and Scandal (Campbell 1992) includes three stories for promoting environmental education and the Caribbean. The stories identify some of the ways in which individual action affects the environment and carry the message that concerted action at the local level can help to reverse current destructive trends.

THREE BOOKS ON THE ENVIRONMENT
By Hazel D. Campbell for UNESCO

development strategies and socio-cultural matters, environmental effects of uncontrolled development policies, towards a strategy for the management of living natural resources critical to development. The transactions also include summaries of sessional discussions, lists of projects and areas of interest, and a statement of concern of the governmental delegates concerning the need for structuring governmental institutions to facilitate more profound environmental management and control.

On TRAMIL and Caribbean medicinal plants

In the the early 1980s, a multi-disciplinary group including botanists, health care practitioners, pharmacists, and social scientists, began working on traditional popular medicine in Haiti and the Dominican Republic. Known as TRAMIL (Scientific Research and Popular Use of Medicinal Plants in the Caribbean), the project has now expanded to include English, Spanish and French-speaking regions in the Caribbean basin, surveying and assessing popular herbal treatments and returning recommendations on use, toxicity, and effectiveness to its users. UNESCO has been one of the bodies that has supported TRAMIL's meetings and publications (e.g. Weniger & Robineau, 1987).

The sixth TRAMIL seminar (Guadeloupe, November 1992), was attended by some 54 people from 14 Caribbean islands and nations and 10 non-Caribbean countries. The plants cited in *Towards a Caribbean Pharmacopeia* (Robineau, 1991) a TRAMIL compilation of information on selected medicinal plants, were reviewed and participants offered new data on local uses, chemical constituents, biological activity and toxicity. The conservation status of plants recommended by TRAMIL was examined and a preliminary database set up, including fields that help predict when a plant is vulnerable to over-exploitation.

Concern about conservation of plants on which people rely for basic needs was followed up by a workshop on 'Threatened Useful Plants of the Caribbean' (Santo Domingo, Dominican Republic, 28 February-4 March 1994), jointly organized by TRAMIL and the WWF-UNESCO-RBG Kew initiative on People and Plants and attended by some 36 people from 19 Caribbean and Central American countries, and three non-Caribbean countries. Participants reviewed available information on threatened useful plants in their countries, discussed the threats (mainly deforestation) to useful plants, and looked at impacts of harvesting techniques. Action plans were developed to tackle problems identified, focusing initially on medicinal plants and including:

- Developing regional and sub-regional criteria to determine which plants are threatened. Creating a regional database on threatened medicinal plants
- Continuing documentation of plant uses and identifying causes of threat
- Sharing information and educational materials between countries and islands of the region about the value of plants, their sustainable use and conservation
- Increasing communication and co-operation between communities, scientists and policy-makers
- Comparing legislation relevant to threatened useful plants in the different islands and countries of the region.

Communication development in the Caribbean

UNESCO's work in communication, information and informatics in the Caribbean dates back more than 25 years, when the needs for promoting regional integration led to governments initiating a range of communications-linked activities, including news agency development, educational broadcasting and disaster awareness.

In this review, in the 1960s, the newly independent states of the Caribbean identified several influences which impeded the integration process, among them the limited flow of news and information between countries, the shortage of technical facilities to promote the movement of information, the lack of either formal or informal training facilities for mass media personnel, and the absence of information on the manner in which media could or could not facilitate economic, social and cultural development.

As mentioned earlier in this review, an approach to UNESCO resulted in 1968 in the development of a three-year UNDP project which led to the establishment of communication media institutions such as the Caribbean News Agency (CANA) in 1976, and the Caribbean Broadcasting Union (CBU), some two years later. Between 1982 and 1991, CANA benefitted from funds-in-trust support from Germany, for the development and expansion of the Agency's operations and services. Its computerized operations provide services to subscribers both within the Caribbean basin and abroad. With the introduction of its regional broadcast service, CANA has forged a name for itself as the vanguard institution in the region for dissemination of regional news. Its main problem remains in the high costs of telecommunications tariffs and its difficulty in effectively distributing its many services and products at competitive rates.

Another institutional development that flowed from the UNDP/UNESCO project was the establishment in 1974 of the Caribbean Institute of Mass Communication. The Institute now offers a three-year Degree programme to meet the needs of both private and public bodies, and adapted to the specific communication needs of the region. Special entry-level programmes have also been initiated to enable students from the smaller island states to qualify for formal registration at the Institute. A decade later, in 1984, the Creative Production and Training Centre (CPTC) was set up in Jamaica, with UNESCO/IPDC assistance.

A number of seminars on communications issues have been organized in the Caribbean, with the technical and financial support of UNESCO. A seminar on Radio-station management specifically for the smaller Eastern Caribbean States was attended in 1989 by Chief executives and technical advisers from the subregion's broadcasting systems. A subregional seminar for women in communication was organized by CARIMAC with UNESCO assistance in 1981. In 1989, a study was commissioned by the Women and Development Unit (UWI), to prepare a report on the implementation of the Nairobi Forward-Looking Strategies for the Advancement of Women; and a television programme, part of a regional coproduction entitled 'Caribbean Eye', focussed on grass-roots women and their role in the socio-economic development of the region. In 1992, six five-minute television features entitled 'Triumphs' were prepared on successful Caribbean women for distribution

by the CBU, and the CPTC organized a regional workshop on TV current affairs for women.

Major efforts have also been made in the fields of education broadcasting and endogenous programme production, including the setting up of units in Saint Vincent and the Grenadines, and Saint Christopher and Nevis, as well as Educational TV in Antigua and Barbuda, all financed by IPDC. The need for local programming in the island regions received attention by UNESCO as early as 1969, with the organization of a six-week workshop in Jamaica on film production for screen and television for the English-speaking countries of the area. In 1974, with the assistance of a Participation Programme project, an independent non-profit local production company, Banyan Ltd, was set up in Trinidad and Tobago; later, in 1984, the Creative Production and Training Centre was set up in Jamaica.

Since its inception, Banyan has maintained a close working relationship with UNESCO, and has undertaken training throughout the Caribbean in the field of small-unit video production. An IPDC/FIT-Germany project on television training and infrastructure building for the seven smaller island-states of the Eastern Caribbean, the training of which was assured by Banyan, gave rise in 1988 to the first co-production of televised programmes in the region, and laid the basis for the ongoing television distribution and satellite exchange of programmes - 'Caribvision' - presently run by the Caribbean Broadcasting Union. Recent regional coproductions have included 'Caribbean Eye' (1990), a 13-part series on different aspects of socio-cultural and economic life in the Caribbean.

Another recent communications development in the Caribbean has related to the role of the mass media in promoting awaredness and prevention of environmental hazards and natural disasters. Following extensive hurricane damage in September 1989, engineers were dispatched to assess the impacts on the broadcasting systems in several of the smaller Caribbean Islands, and arrangements made for restoration of services. A manual on hurricane preparedness for future reference was prepared in collaboration with the CBU for radio broadcasting plants in the subregion. In 1993 a report was commissioned by UNESCO, following a regional consultation organized by the Caribbean Disaster Emergency and Relief Agency (CDERA), on the potential use of the communications media (particularly satellites) in disaster and emergency warning and relief in the Caribbean.

INDIAN OCEAN

If the world's oceanic realm, the Indian Ocean ranks third in size behind the Pacific and the Atlantic, covering 73 million km^2, one-seventh of the surface of the earth. Though this is the only major ocean that does not extend from pole to pole, there is a clear run of more than 10,000 km from the cusped arch of the Indian sub-continent south to Antarctica. Along the equator from Africa to Indonesia, the distance is not as great, but it still amounts to 7000 km. Below the equator, it opens on to the watersy expanse of the Southern Hemisphere, but some of the world's oldest and most densely populated countries fringe its northern rim. Small-island developing countries in the region include Comoros, Mauritius, Maldives and Seychelles, with some larger island states such as Madagascar and Sri Lanka and other islands forming part of continental countries.

The International Indian Ocean Expedition

Even a few decades ago, oceanographers regarded the depths and seabed of the Indian Ocean as unknown territory, even though the northern waters of the ocean were a highway for international trade almost at the start of recorded history. Addressing what was at the time the least known of the non-polar oceans was the objective of the International Indian Ocean Expedition, which took place from 1959 to 1965. The expedition was conceived and started by the international research community through the Scientific Committee on Ocean Research (SCOR). The first task of the Intergovernmental Oceanographic Commission of UNESCO after its establishment in 1960 was to assume the co-ordination role of the expedition. *Assault on the Largest Unknown* (Behrman 1981) presents to the interested layperson an account of the human dimensions of the expedition, which involved new approaches in co-operative ocean exploration and in scientific development.

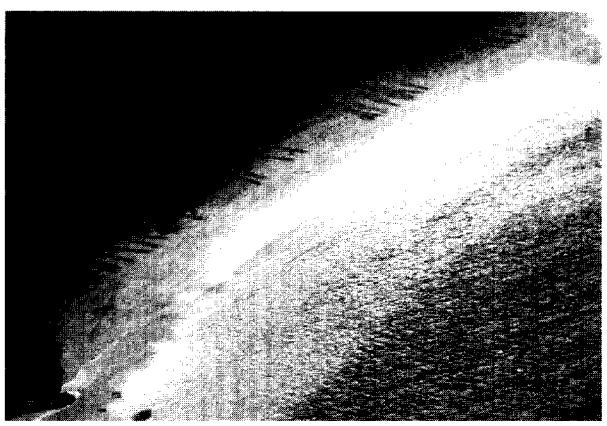
The expedition involved forty research vessels from fourteen nations with nine more countries participating in shore operations. Its contributions to marine science were immense. For the first time, ships were on the scene to study the effect on ocean currents of the seasonal reversal of the winds with the onset of the monsoon. Geologists were able to trace the mid-ocean ridge system into the Indian Ocean and lend weight to the theory of sea-floor spreading as the force responsible for the distribution of land masses on the surface of the planet. An unexpected result of the expedition was the discovery of sediments rich in metals on the bottom of the Red Sea. But perhaps most important of all was the expedition's contribution to the development in tropical regions of marine science, which is no longer the monopoly of the industrially advanced nations (Behrman, 1979, page 38).

Environmental Management in the African Zone of the Indian Ocean

Insights to environmental and natural resources management on the small islands of the African Zone of the Indian Ocean have been brought together as part of a UNESCO-sponsored sub-regional seminar that took place in Tamatave on the eastern seaboard of Madagascar in late September 1988. Participants from Comoros, Madagascar, Mauritius, Reunion and Seychelles examined a number of the basic issues and problems underlying human relations with the environment and the management of natural resources in the southwestern Indian Ocean, including the role of protected areas in the conservation of natural resources and obstacles to putting into practice an integrated approach to resource problems. Recommendations for future action were framed under 21 different headings, including those of regional and international cooperation, natural ecosystems and biodiversity, education, research, integrated rural development, agroforestry, animation of rural life and the mobilization of rural populations, forest management, tourism.

The Prime Minister of Madagascar was among the personalities who took part in the seminar. Among the major outputs of the seminar was a 16-page '*Déclaration de Tamatave*' and a 445-page proceedings volume (Maldague *et al.*

Michel Le Berre



In Comoros, in May 1993, a mission was organized under the Participation Programme of UNESCO, with a view to identifying priority areas for conservation, including potential biosphere reserves and World Heritage sites. Among the areas of special interest were the beaches on the island of Mwali (or Mohéli) which are among the most frequented by marine turtles, particularly the green turtle Chelonia mydas. The females (200 kg and more) come ashore on high tides. They lay their eggs high on the beach, leaving characteristic markings on the sand, as shown on this photograph of the Bay of Nioumachoua. Elsewhere in the southwestern Indian Ocean, Macchabee/Bel Ombre (Mauritius) forms part of the international network of biosphere reserves, while two sites in the Seychelles (Vallée de Mai and Aldabra) are inscribed on the World Heritage List.

1989) which includes contributions from Comores, Mauritius, Réunion (France) and Seychelles, as well as Madagascar, addressing such issues as deforestation, agroforestery, effects of tourism, approaches to conservation, biological diversity, and integrated rural development.

Communications development

For a number of years, UNESCO has been active in the Maldives, more recently through the International Programme for the Development of Communications (IPDC). As far back as the mid-1970s, UNESCO funded a broadcasting adviser to Malé to work with the Voice of Maldives (VOM) in developing its radio programming services. Since then, other communications activities have included: the provision of a UNESCO/Mallard designed FM radio transmitter (still in use by VOM in Malé); television equipment and training for the establishment of an educational television unit at TV Maldives (project implemented in 1990/91); an IPDC funded project to establish media resource centres on remote atolls (in 1993-94, coming to fruition). In the future, it is expected that UNESCO, through the IPDC, will be involved in further initiatives in the Maldives, particularly in the on-going development of the remote atoll media resource centres.

MEDITERRANEAN

The Mediterranean Sea - the realm of the sea-god Poseidon, the sea 'in the midst of land' - covers some 2.5 million km^2. Of the 46.000 km which make up the Mediterranean coastline, some 18.000 km belong to the numerous islands. Throughout the basin, people have become an active geological agent, profoundly shaping and modifying the characteristic ecological systems of the region.

In recent decades, human activity has had major repercussions on the natural and cultural wealth of the Mediterranean basin. Serious environmental degradation of the coastal and marine areas in the late 1960s-early 1970s triggered the first-starting and most developed of UNEP's Regional Seas programmes, pioneering a comprehensive approach to land-based pollution in all the countries bordering the Mediterranean Sea (see page 122).

In terms of UNESCO's activities, integrated approaches to island development have been the focus of a network of projects on the smaller Mediterranean islands developed since 1978 within the MAB Programme, with a twofold objective. The first is to assess the social, economic and environmental conditions for a balanced development of these systems, taking into account their inherent vulnerability and their often marginal status in relation to the continental countries to which most of them belong. The second is to provide information useful to the islanders themselves, as well as to local and national decision-makers, on whose actions their future will depend.

Within this research *problematique*, multidisciplinary studies on human habitat in small Mediterranean islands have placed humans squarely at the centre of the whole complex process of society's interaction with the island environment (d'Ayala 1992), with teams of social and natural scientists from the countries concerned working together from the beginning. Four island settings with contrasting physiographic and cultural features were selected for initial pilot studies (Kerkennah, Gozo, Skiathos-Skopelos, Salina), with work on other islands or island groups becoming part of the regional network during the 1980s.

Specialists with different disciplinary backgrounds organized their research to answer two overriding questions of deceptive simplicity: What natural, physical, and human aspects define an island's uniqueness? How does an island function today and what historical factors may have determined contemporary processes? They reasoned that by seeking responses to these apparently forthright questions, they could elucidate the different mechanisms whereby people have come to terms with their environment. At the same time that they hoped to recognize the strategies adopted by the islands' inhabitants, they expected that the understanding of these patterns and processes would shed light on what the future might hold for the islands in question (d'Ayala 1982).

Mediterranean and North Atlantic Islands: Current situation, possibilities, and recommendations for natural resource management.
Source: Beller et al. 1990, page 402.

SECTOR	SITUATION	POSSIBILITIES	RECOMMENDATIONS
WATER	Seasonal contrast: winter is humid; summer, dry. Increased demand from summer tourists. Cisterns used. Needed water often transported from island to island or, in some instances, from the mainland.	Develop economical and effective technologies for collecting rainwater. Economize on water use during the peak tourist season. Educate tourists about the need for water conservation. Use water efficiently in agriculture, industry and for domestic purposes.	Consider using desalination, recycling of water, solar ponds. Impose user fees, water-limiting devices. Overall, develop water-use plans that consider effective ways to provide potable water and its effective distribution and use.
ENERGY	Fuel is imported. Some electrical energy carried from mainland. High solar- and wind-energy potential.	Conserve energy through needed energy-use regulations, and consumer education about energy consumption.	Acquire cost-benefits derived from wind energy, hydrothermal energy, solar collectors and concentrators. Encourage use of energy-efficient devices and equipment.
TOURISM	Tourists and their activities concentrate only during summer months on the islands. Mass and 'commuter' tourism prevalent.	Promote a 'cultural' tourism. Stimulate low-season tourism.	Improve incentives for tourists to visit islands 'off-season'. Stimulate direct management of tourism by local inhabitants.
AGRICULTURE	Major changes in agriculture brought about by mechanization. Traditional agriculture abandoned; traditional management of grazing collapsing. High use of agrochemicals; soil degrading because of their incorrect use.	Promote adding value to agricultural products. Cultivate perennial forage species for animals, and for soil stabilization. Cultivate greenhouse products. Produce sufficient crops to satisfy tourist requirements. Use conservative management practices for grazing animals.	Evaluate traditional agricultural management systems in terms of cost-benefit ratios. Determine domestic and export demand for agricultural products. Institute effective soil-conservation practices.
FORESTRY	Deforestation is resulting in soil erosion, which is increasing. Reforestation very often practised as a monoculture. Exotics often poorly used for reforestation. Number of forest fires increasing.	Prudently choose plant species for regreening efforts. Prefer native species of shrubs. Reforest with diversified species.	Determine and install best species to promote ecosystem stability and acceptance. Institute effective forest-management practices.
WILDLIFE MANAGEMENT	Very high diversity of flora and fauna, high number of endemics, rare ecosystems types, many fragile systems. There is a lack of effective protection policies including dangerous hunting activities.	Promote public education. Establish protected areas.	Establish rational management of terrestrial and marine protected areas. Encourage collaboration among south European countries on islands' environmental issues. Also, collaboration between scientists and island officials.
WASTE DISPOSAL	Large quantities of wastes generated, especially in the summer; many plastic objects in wastes. There is lack of waste-treatment plants, resulting in pollution of fresh and coastal waters. Public health problems incurred. There is lack of ways to collect and separate wastes.	Inform decision-makers of options for and cost of rational waste-disposal techniques. Recycle waste materials and waste water. Educate generators of waste products about costs and prevention of pollution.	Develop integrated plan for disposal of wastes including derivation of usable water and energy. Include cost-benefit analyses in developing such a plan. Take small steps in implementing waste-disposal plans.

The first of the four pilot settings was the Kerkennah archipelago in Tunisia, a flat and sandy archipelago with a semi-arid climate, situated some 20 km from the mainland town of Sfax, with a surface area of 16,000 hectares. Some 17,000 permanent residents inhabit a small number of villages that are scattered among large groves of palm trees interrupted by salty lowlands, the *sebkas*, which are periodically inundated by the sea. Fishing, dryland agriculture and more recently tourism are the main sources of livelihood (UNESCO 1981b). Data gathered at Kerkennah have become the basis of a simulation game on changing patterns of resource management and alternative development scenarios (Brigand & d'Ayala 1986). The game is designed for eighteen players, each of whom is given a budget which can be invested, for example, in buying land or in projects such as developing the fishing port, the purchase of fishing nets or establishing canning or distribution co-operatives.

The island of Gozo, the second largest in the Maltese archipelago, has more or less the same number of inhabitants (23,000) as the Kerkennah archipelago, but its resources are based on limited cottage industries. Public and private sector employees commute daily to Malta, while agriculture has expanded over the calcareous hills, which have been flattened out during centuries of patient work by the rural people. Impressive megalithic ruins as well as the medieval city of Victoria still attract flows of one-day tourists from Malta (UNESCO 1981c). A computerized management model of Gozo, developed by researchers at the University of Malta, lays emphasis on major processes that affect structural change, such as those involved in farming, fishing, out-migration, foreign settlers, tourism, transport between islands, coastal development, physical infrastructures, etc. The model has since been applied in other islands, such as Gomera in the Canary Islands.

In the Aegean islands of Greece, the mountainous islands of Skiathos and Skopelos in the northern Sporades were chosen for study on the basis of their dense covering of pine trees, significant rainfall (in Mediterranean terms), and tourism industry, which flourishes mainly in Skiathos where an airport was built in the early 1970s. Decline in the production on Skopelos of plums for export, added to the large-scale employment of the males from both islands in the Greek merchant marine, were also interesting features of these two islands, where some 3000 inhabitants are joined by about 15,000 tourists during the short summer season (UNESCO 1981d). Following an initial seminar held on Skiathos in 1978, studies encompassed environmental, economic, demographic, technological and social dimensions of island development with an experimental station being established on the island of Skiathos. Elsewhere in the Aegean, two international seminars, in September 1985 and May 1986, drew up an alternative plan for Halki, a small island to the west of Rhodes, which has involved its development as an international centre for activities relating to youth, friendship and peace, linked to an upgrading of the island's natural, social and economic environment.

Scarcity of water supplies and the medicinal potential of some fifty island plants are among the topics that have

Fixed fishing trap on the island of Kerkennah off the eastern coast of Tunisia. Fish are attracted by shade into the trap, and are directed into a wicker-collecting trap, or basket, which is emptied daily. Different ways of catching fish are among the components of a simulation game, on the economy of Kerkennah, which has proven useful as a training and information tool, enabling members of the community to appreciate the problems faced by others and encouraging concerted community involvement in local planning decisions.

Piet d'Ayala

been studied on the volcanic island of Salina off the northern tip of Sicily (UNESCO 1981a). The 2300 inhabitants live off seasonal tourism, part-time agriculture and the export of wine and capers, the building trade (construction of public works and holiday homes for tourists) and employment in public administration (there are three municipalities on the island). The demography of the island is of special interest since it reflects the historical trends and changing opportunities that have affected many parts of the Mediterranean basin (see page 48). A thirty-minute colour video film illustratig the effects of modern tourism on the island and its resources was made in 1990 by Sylvia Paggi of the Laboratory of Visual Anthropology, University of Siena, Italy, in collaboration with the UNESCO Divisions of Technical Education and of Ecological Sciences. The video film highlights the danger for small islands of over-specialization and stresses the need to reduce the effects of uncontrollable outside factors by diversification of the use of resources.

Taking advantage of lessons learned in planning the four initial projects, work also been initiated in other Mediterranean islands. In Ibiza and Formentera (Spain) a regional colloquium, in October 1985 explored policy and planning alternatives for the environmental management of islands whose economies are changing from being primarily agriculturally-based to being tourism-based. As a follow-up to the colloquium, an Experimental Environmental Station was set up on Formentera with the aim of identifying and evaluating the present and potential impact of tourism on the island. The station serves as a research, education and demonstration site for matters relating to the ecology and economies of small Mediterranean islands.

Exchange of research workers and island planners, regional technical seminars, training workshops and comparative studies are among the means used to link projects carried out within the framework of the MAB island network in the Mediterranean. A comparative study of the environmental perceptions of adolescents from Salina, Kerkennah, Gozo, Skiathos and Skopelos has used cognitive mapping combined with interviews, a method which was refined by Kevin Lynch in a UNESCO-sponsored study of urban perception in the 1970s (Lynch 1977).

The above-projects initiated by UNESCO-MAB also generated, in the mid-1980s, a four-year multidisciplinary research programme on the biogeography of the Aeolian archipelago (of which Salina is part), sponsored by the Italian Ministry for Public Education. Another set of research activities were implemented, with MAB assistance by the Centre for Island Development in the Dolmatian archipelago of Cres-Losinj.

Further insights on MAB island work in the Mediterranean are included in the volume resulting from the Puerto Rico inter-oceanic workshop on Sustainable Development and Environmental Management of Small Islands (Giavelli & Rossi 1990, Macelli 1990, Vernicos 1990).

PACIFIC

The Pacific environment, long viewed as bountiful and immutable, includes a diversity of island types scattered over enormous distances, including continent islands, andesetic-arc islands, basaltic volcanic ('hot-spot') islands, raised limestone islands and corol atolls. Though the land area in the world's great ocean is small, the region has enormous biological and cultural diversity, which is particularly vulnerable to external forces. Forward-looking studies such as that by Crocombe (1991) emphasize the crucial role of island 'gatekeepers' (leaders) in regulating those external forces and mediating their impact on Pacific islands and cultures.

Water balances and water use

Several pilot projects on hydrological balances of small islands have been sponsored by the UNESCO Regional Office in Jakarta, including studies of Marindungue Island in Philippines, Baranglompo Island in South Sulawesi, Indonesia, Cuyo Island in the Philippines, and Zhousan Island in China. A study on the water cycle and water use on Bali has been sponsored by Japan within the framework of the International Hydrological Programme (Kayane 1992). UNESCO-supported conferences and workshops on small island hydrology in the region have included those in Nanjing (China) in March 1988, in Auckland (New Zealand) in September 1991, and in Batan (Indonesia) in February 1993.

Coastal and marine resources

The South East Asia and Pacific region has been the focus for several UNESCO sponsored studies on various types of coastal and marine systems, and on particular dimensions of resource use in these physiographic units. Studies on coral reefs have related to such aspects as management practices and research and training needs (reference to March 1986 Bogor workshop), on conservation and management, including comparison with mangrove systems (reference to Okinawa 1987 workshop), and a coral reef management handbook (Kenchington & Hudson 1988). A COMAR workshop in Fiji in March 1986 compared tropical marine coastal ecosystems in the Atlantic and Pacific regions, with emphasis on community structure, ecological processes and productivity. Approaches to traditional marine resource management in the Pacific Region have been addressed in two publications of the UNESCO Regional Office in Jakarta, compiled and edited by Ruddle & Johannes (1985, 1990).

The UNESCO Regional Offices in Jakarta and Apia have devoted considerable attention to education concerning coastal, marine and small island environments. A high-school field course focussed on the assessment of conditions associated with coral atolls, has been developed over a ten-year period in association with the Jakarta International School at both the International Baccalaureate Level and for the more general 'Environmental Studies' stream. A set of tested teaching resources is available which covers five hand-books for students and teachers involving a step by step outline of the activities, including software for analysis of class data (Harger 1992a, 1992b, 1992c). A work base has been specifically designed to introduce concepts of global change through high-school curricula by gathering and analyzing local data both in 'once only class contexts' and in developing relatively long-term records (10 years or so for the Jakarta International School efforts) (UNESCO 1992c). These teaching resources have also been blended with other materials for use in two field-training workshops at the Dravuni Island Research Station (University of the South Pacific) targeting Pacific High School Teachers. The programme has also produced a 280-page reference text on the shore ecol-

ogy of the tropical Pacific (Morton 1990), which has generated considerable interest and demand by island teachers in the region.

Conservation of the natural heritage and biodiversity

Within the evolving protected areas system in Oceania (IUCN 1986), a number of island sites form part of the international network of biosphere reserves - Juán Fernandez (Chile), Archipelago de Colón (Galapagos), Atoll de Tavaro (French Polynesia), Yakushima Island (Japan), Hawaii Island Biosphere Reserve (USA) - while the Galapagos Islands and Yakushima Island are included on the World Heritage List.

Results of scientific studies on Juán Fernandez and other oceanic islands of Chile have been published by the Universidad Católica de Chile (Castilla 1987) with the support of UNESCO's COMAR programme and the Tinker Foundation. Shown here, the dwarf tree Plantago fernandezia.

Culture and society in the Pacific

Some 2000 Pacific Islanders have written and published their perceptions and experience of Pacific culture and society in association with the Institute of Pacific Studies, established in 1976. Based in Suva, the institute concentrates on the twelve member countries of the University of South Pacific, though its projects and publications cover a much wider constituency. Several publications have been supported over the years by UNESCO, particularly through the Office for the Promotion of Social Sciences in Asia and the Pacific. Some of these studies address region-wide issues such as island economies (Fairbairn 1985), education, culture and identity (Teasdale & Teasdale 1992) and decentralization in the South Pacific (Larmour 1985). Other publications focus on culture and society in particular islands and island groups, such as Cook Islands (Jonassen 1981, Kautai *et al.* 1984), Fiji (Prasad 1974, Ravuvu 1983), Kiribati (Bataua *et al.* 1985), and the Solomon Islands (Fifi'i 1989, Laraey 1989).

Education planning and development in the Pacific

In the late 1960s, on the barely-laid foundations of an infant University of the South Pacific (USP), UNESCO, in partnership with nine Pacific Island countries, mounted an ambitious regional curriculum programme. Its goals were multiple: 'islandize' what was, until then, either essentially New Zealand or British curricula; establish a regional competency profile in the core subjects which could serve as standards for entrance into USP; promote the creation and/or strengthening of national curriculum development units (CDU's); and, unofficially, establish a basis of professional trust between the Pacific States and New Zealand which eventually facilitated the introduction of the Pacific option for the Form 5 (School Certificate) and Form 6 (University Entrance) examinations.

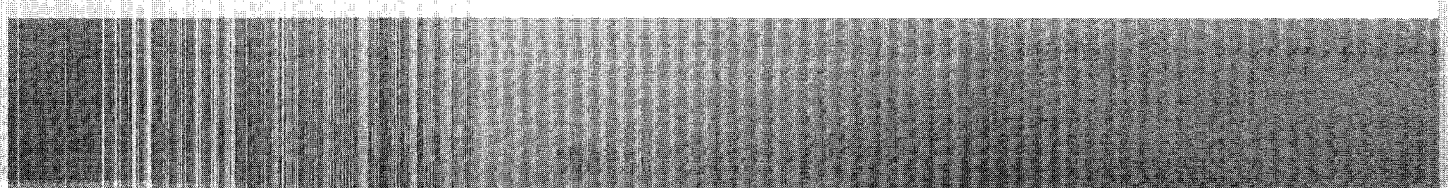
The undertaking ended, in the opinion of everyone, prematurely in 1975. Much was left in the form of prototypes which national CDU's were supposed to adapt and which some actually did. Much, however, was used unadapted and untested, and indeed much was left never done at all. One largely untouched area - with the exception of Home Economics - was that of the technical and vocational subjects, i.e. the electives. This gap came, in the next five years, to be felt increasingly as an intolerable shortcoming of Pacific States curricula. Predictably, the greatest impetus to remedy this situation came from the many countries having high school drop-out rates. These young people suddenly found themselves out of school, with no chance of returning or being accommodated elsewhere to equip them with the tools for an effective integration into society and the world of work.

Work-oriented education was thus seen as an indispensable component of general education - not, as many have mistakenly imagined, that in which with a couple of years of Commercial Studies or Industrial Arts a school leaver could lay claim to paid employment as an accountant or carpenter. Rather, including these studies in the curriculum was intended to balance the academic with the productive as a total secondary education package. By this means, school leavers would have the language, calculation, and work-readiness skills needed for subsequent task-specific training either in a post-secondary institution or on the job later on.

UNESCO subsequently responded in the early 1980's to this new demand and a regional technical and vocational curriculum project was mounted which covered ten countries. Sub-contracted to the USP Institute for Education, the project, which ran from 1983-1987, proved to be remarkable in many ways. One feature of enduring significance was its conception as a series of linked national efforts, and this left a powerful legacy which impacted on the

Pacific Ocean Islands: Current Situation, Possibilities and Recommendations for Natural Resource Management.
Source: Beller et al. 1990, page 399.

SECTOR	SITUATION	POSSIBILITIES	RECOMMENDATIONS
WATER High islands	Most islands depend upon running waters for their supply of drinking water, supplemented by water tanks. Problems include pollution of water sources as a result of forest clearing in high areas, the unregulated use of agrochemicals, and the use of rivers and streams for disposal of wastes.	Recycle and reuse water. Undertake further drilling to tap new sources of water.	Establish and protect by legislation the catchment areas necessary to sustain water supply. Inaugurate measures to conserve water including grey-water systems, and tertiary treatments.
Low islands	Largely dependent on rainwater and wells, which are an inadequate supply Dangers of contamination and overuse.	Drill for new water sources, and increase catchments and storage facilities.	Develop affordable desalination systems and appropriate storage tanks and pumping systems.
ENERGY High islands	Heavily dependent on imported fuel supplemented by hydroelectric power, and minor use of solar energy. Use of firewood still widespread, especially in rural areas. Damming of rivers for hydroelectric supply affecting regular supply of water for other uses. Use of firewood expected to increase and could result in increased deforestation.	Selectively develop hydroelectric power as well as solar energy for power. Substitute fuels other than wood for cooking.	Investigate all sources of practical electrical energy including means such as wave energy, particularly for long-term benefits. Initiate and enforce energy-conservation measures.
Low islands	Highly dependent on expensive imported fuel.	Find renewable and economical sources of electrical energy.	Explore solar means for generating electrical energy and agroforestry for producing firewood. Enforce energy conservation measures.
FISHERIES	Extensive artisanal activities with some pelagic fishing but most islands still dependent on imported canned fish. Extensive over-fishing plus damage to fish stocks from dynamiting, coral crushing and poisoning.	Develop: deep-sea fishing, e.g. commercial fishing especially in tuna; mariculture/aquaculture; local processing of fish products.	Effectively police illegal fishing practices. Encourage research into mariculture and fish-processing techniques.
TRADITIONAL AGRICULTURE	Subsistence agriculture still predominates. Shifting cultivation of land results in increased losses of forests, causing soil erosion and water pollution.	Change ways land is used, perhaps combining forestry with agriculture.	Investigate multiple uses of land, e.g. agroforestry systems.
Low islands	Narrow food base exists because of poor soils, salt atmosphere and shortage of water.	Increase variety of crops, improve fertility of soil.	Investigate and promote (1) suitable crops that are drought resistant, and (2) organic methods to improve soil fertility.
COASTAL AND MARINE MANAGEMENT	Coastal commercial and population pressures causing increasing destruction of coral and marine life. Also, in some islands there is extensive ecological damage resulting from mining and forestry activities.	Redistribute island populations to ameliorate harmful impacts on the coastal areas.	Control coastal-zone use through proper coastal-zone planning, and effective environmental-impact studies. Control interior activities to minimize discharge of hazardous materials, including sediments, into coastal and marine areas.



FORESTRY High islands	**T**he relatively few islands with extensive forest cover see its rapid depletion due to increasing demand for timber and other wood products. **I**ndiscriminate clearing of forest areas quite common, causing rapid loss of fertile soil, decrease in wildlife populations, and contamination of water supply.	**R**eforestation. **S**eek substitutes for wood products.	**L**egislate to control export of logs and unprocessed forest products. **S**et aside areas as forest reserves. **E**ncourage use of non-commercial timber species.
Low islands	**L**imited forest cover. Main wood source is coconut. Scarcity of wood for domestic use. Threat of near depletion of entire wood supply.	**R**eforest depleted areas.	**S**eek and reforest with tree species suitable for timber and fuel wood.
LAND MANAGEMENT	**I**n most islands, there is a lack of formal land-use plans, and most lands still operate under 'customary tenure'. **U**nder such tenure, land is often used for unsuitable purposes, e.g. agriculture instead of water catchment. Absence of proper land planning has given rise to overconcentration of deleterious activities in certain areas.	**E**xercise proper planning for appropriate tourism, agriculture and other developments. **D**ecentralize commercial industries.	**L**egislate for and implement adequate land-use planning techniques. **E**ducate officials and land owners on the sound use of their lands.
PROTECTED AREAS	**S**everal islands have established protected areas but there is need to establish more in order to safeguard features and resources unique to these lands.	**P**reserve unique resources for local use and pride, long-term economic returns from increased tourism.	**C**reate the institutional frameworks and pass legislation for establishing protected areas, e.g. marine parks and sanctuaries, biosphere reserves.

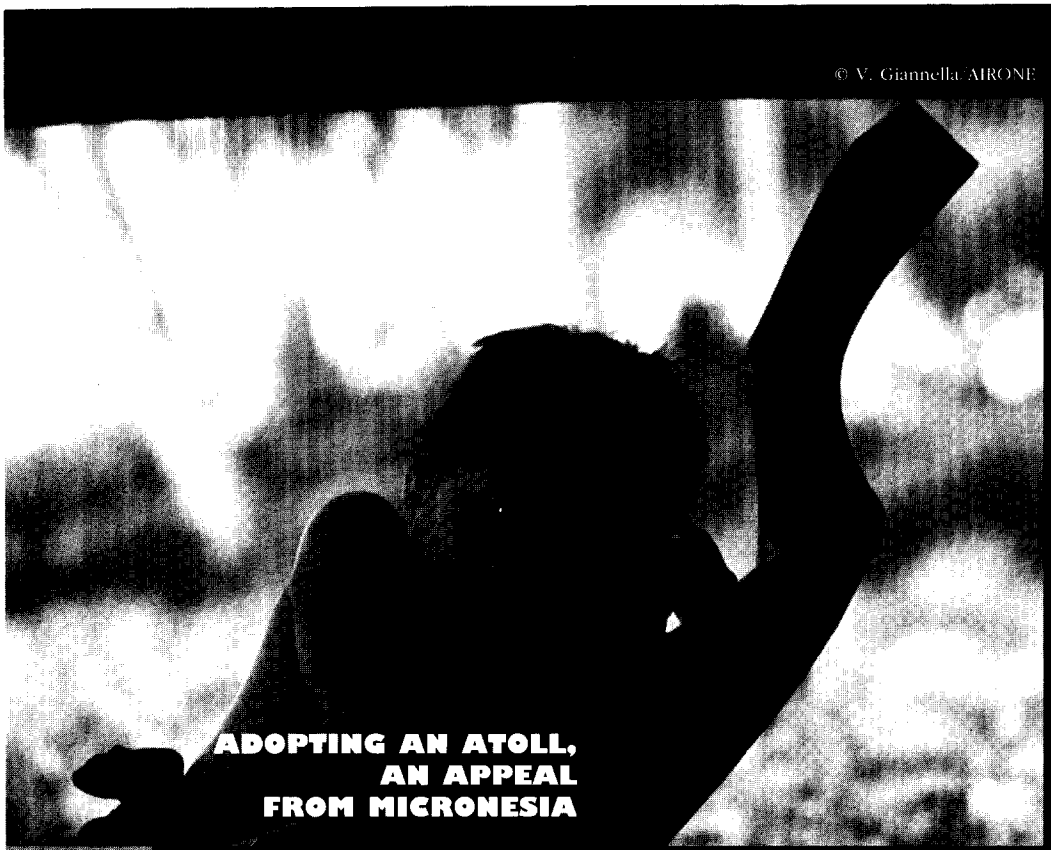
design and management of all regional education projects since that time. More recently, the need to concentrate on primary education has been stressed by a number of studies which have found that the reform of primary education is seen throughout the Pacific as being a major - many feel the *major* - overarching sector priority. The widespread inadequacies in the primary sector are having adverse effects on student retention rates, and are impacting negatively on the secondary and tertiary sectors because students lack the 'foundation' education they require. The quality and accessibility of primary education in the Pacific Islands countries is also vital when one considers that over 50% of the population in some of these countries has only primary level schooling or less.

Within such a context, a new initiative, launched in 1993, is the Basic Education and Life Skills (BELS) project, a major regional project aimed at upgrading primary teacher skills and the teaching of literacy. The countries involved are Fiji, Cook Islands, Niue, Tuvalu, Tonga, Solomon Islands, Vanuatu, Marshall Islands, Western Samoa, Kiribati, and Tokelau. The scope of the project is considerable, and it has mobilized national support as well as a high degree of multi- and bilateral aid (UNDP/ UNICEF/ AIDAB/ DANIDA/ UNESCO).

BELS covers a broad range of areas from information management to textbook production, and literacy education to the promotion of life skills-building. It consists of three modules - Primary and Literacy Education (PALE); Education Systems Planning and Management (ESPAM); and Curriculum Innovations for Life Skills (CILS).

As such, the project reflects the growing interest among Pacific Island educators to recast educational content and teaching assessment methods so that formal education addresses the concerns for improving the quality of life for Pacific Islander school leavers.

BELS moves away from top-down approaches to teacher training, and is



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Isle of Falalop, in the Atoll of Ulithi, Yap, Federated States of Micronesia

ADOPTING AN ATOLL, AN APPEAL FROM MICRONESIA

John Rulmal is the Executive Director of the Office of the Traditional Chiefs of the Ulithi Falalop Atoll, Yap, Micronesia. Addressing UNESCO and other possible partners in the Italian magazine *Airone* and in Insula's International Journal of Island Affairs, he has put forward a proposal for an original form of 'adoption'.

The tiny state of Yap, formerly administered by the United States, will cease to receive any aid as of the year 2000. Its thousand inhabitants want to take responsibility for their own development while vigorously protecting their environment and culture.

In John Rulman's words, 'Our idea is to participate in the market economy without paying for its worst consequences'. The 'worst consequences' are well known to the Ulithians who have travelled to modernized islands finding there, in their words, corruption, robbery and prostitution. ... 'There is no police on this atoll, we live here in peace and freedom'. We do not wish that our children start to adore the god dollar. However we must confront reality. With the year 2000, in six years the US contributions, supporting Micronesia since the 1986 free-association agreement will come to an end. We are obliged to plan the survival of the atoll and its more than thousand inhabitants including the 200 students of the boarding high school which receives youngsters from all small islands of Micronesia'.

A number of challenges and needs have been identified.

- **Food**. The food produced in the atoll is completely insufficient. Practically everything is important.
- **Telecommunications**. An autonomous satellite fax and telephone line also useful for tele-medicine purposes.
- **Health**. A medicine doctor is needed and the two dispensaries equipped and made functional.
- **Administration**. Completion of the chiefs office, which will host the telecommunication devices. It will also host banking services.
- **Water**. Renewal and building of rain water collecting ponds (there are actually no underground wells).
- **Gardening and horticulture**. Most of the fertile soil has been compacted during Second World War for military purposes. It cannot be recovered by hand. Appropriate equipment is needed.
- **Solar-wind energy**. Electric energy is needed. Fuel is extremely costly on the atoll and difficult to obtain.
- **Teaching**. Courses on technical matters need to be introduced in high-school curricula. Yet there are no qualified teachers nor didactic materials. The high-school library is also outdated. New books are needed, especially on other islands of the world and their problems.
- **Cold storage room**. Such a device, possibly run by solar or wind energy, is required for the 'Fishing opportunity programme', in order to supply the high-school and the population and lessen the import of canned food.
- **Co-operative**. Creating a co-operative for commercializing directly imported goods.
- **Guest-house**. Twelve equipped rooms not for inattentive tourists but a home for selected guests, in particular those who have contributed to the 'Adopt the atoll' scheme.
- **Eco-tourism**. A small resort to be built with traditional materials and design, located on a small islet of the atoll.

based on a multi-tiered delivery system in a 'cascade' configuration involving different levels of decision-makers and resource persons culminating, at the level of the school, in the primary head teacher. The main thrust of the project is to increase the effectiveness of the primary headteachers so that they can successfully assume their new roles as the central leaders and catalysts for the qualitative improvement of primary school management and classroom teaching. It is thus clearly towards this group, the largest and most scattered/isolated in the whole network, that the labours of every other component of the network are of necessity directed .

Some of the areas that headteachers will be trained in include multi-class/composite teaching, 'whole language' approach to literacy education, and 'science for all' methodology of teaching basic science.

BELS will undoubtedly have an impact over its four-year life span, but the concerns about the quality and accessability of primary education in rural and remote areas are so serious, that another approach will be necessary to complement and reinforce the project's work in these areas. Distance education, with its potential to reach out to all Pacific primary children via radio, providing consistent quality education, holds a great deal of promise. Moreover, distance education can also be used very effectively for teacher training, thus providing another support for BELS.

One recent development in this field is the establishment of the Pacific Islands Regional Association for Distance Education (PIRADE) in October 1993, with members representing all sectors of education in the Pacific. PIRADE was formed with a number of aims, namely:

- to advance and promote the practice of distance education appropriate to island countries and territories of the Pacific region;
- to promote an awareness of the potential of distance education to contribute to the development goals of the region;
- to foster communication and cooperation between distance educators in the region and form links with distance education organizations in other regions of the world.

PIRADE's establishment not only reflects the growing interest in distance education in the Pacific, but also the determination of Pacific Islanders to shape their own forms of education. This needs to be stressed because education, like communication, is the lifeblood of a nation. It is therefore vital that Pacific Islanders design their education programmes and choose delivery mechanisms they feel are appropriate to meet their own needs. This is a particularly important consideration in the current technological environment. With the rapid technological advances taking place, and the global penetration of communication and information technologies, it is inevitable that distance education will increase in the Pacific. Historically, the Pacific has relied heavily on Western expertise and technology, often simply transposed from the West with little consideration for the different social, economic, cultural and political contexts in which this expertise and technology must operate. The danger at present is that distance education models and content will be imposed on the Pacific as Western corporations and organizations expand their communications interests in the region. And while it is true that secondary and tertiary students would be the most profitable target group for these corporations, overseas education models and content will have an impact on primary education as well, as they establish norms which can differ greatly from the educational values and expectations taught in Pacific primary schools.

Further information is given in a report on *Pacific Distance Education Project* (to be published by UNESCO in 1994), which examines some of the most pressing socio-cultural and economic concerns in the Pacific (e.g. population numbers, national economies, cultural erosion, education for development) as background for making proposals on the development of distance education in the region.

'Vaka Moana - The Ocean Roads'

At the Second Sub-Regional Consultation of Pacific Member States/National Commissions for UNESCO held in Auckland in July 1991, it was decided to propose to the Director-General of UNESCO the undertaking of a large-scale interdisciplinary project in the Pacific under the auspices of the World Decade for Cultural Development.

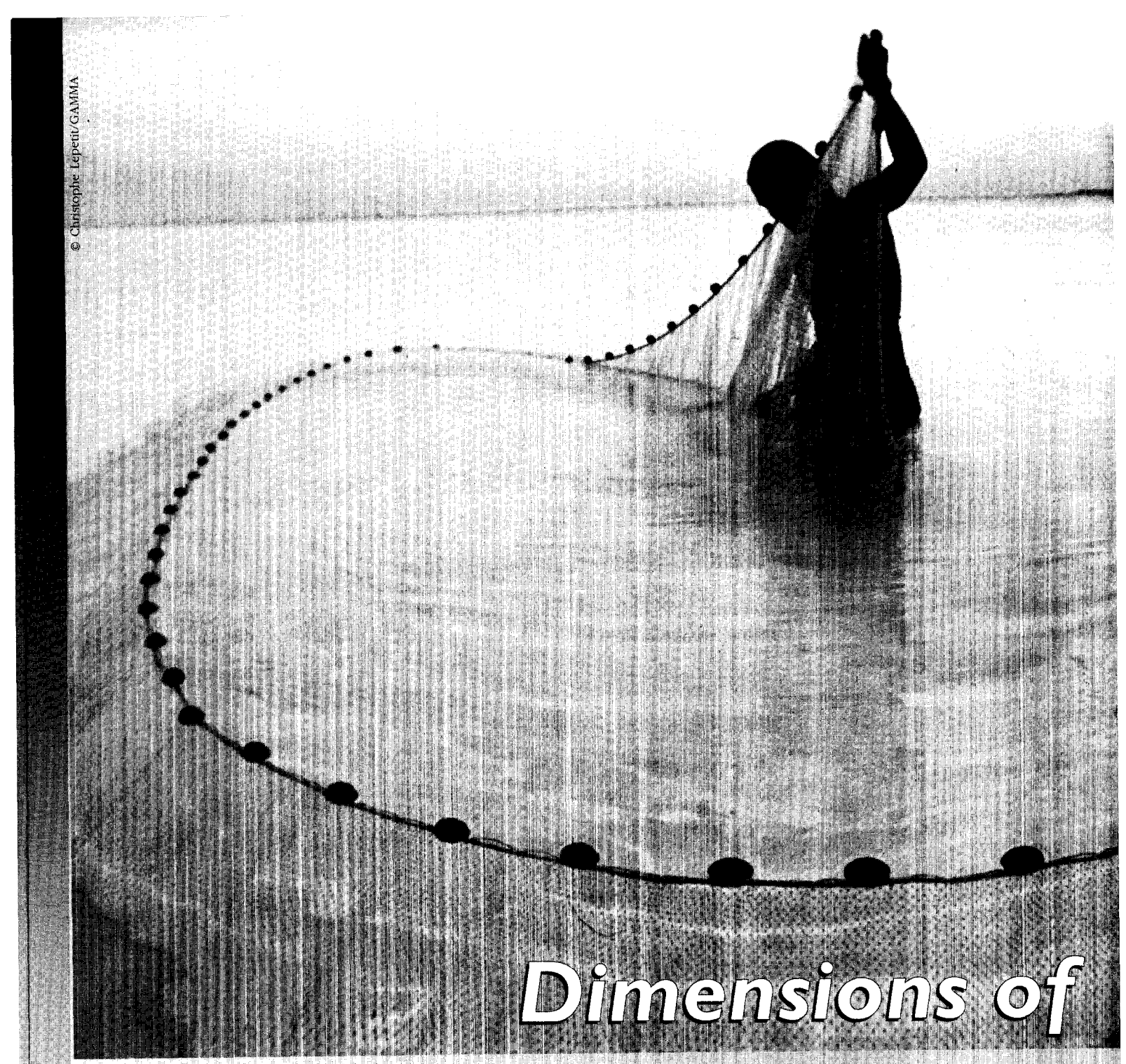
The project is entitled 'Vaka Moana - The Ocean Roads'. As noted earlier in this review (page 52), the literal English translation of Vaka Moana is ocean-going canoe - 'vaka' meaning canoe, picking up the social/cultural aspect, and 'moana' meaning ocean, the natural aspect. Thus, Vaka Moana signifies an ocean-going canoe, suggesting the idea of communication and linkages between people of an island world.

Following a draft resolution submitted to the 26th Session of the UNESCO General Conference by Australia, Cook Islands, France, New Zealand, Papua New Guinea, Samoa and Tonga, a planning meeting was held in Apia in May 1993, with an associated study tour to facilitate wider input from participating countries. The objective of these planning activities was to identify: the major components of the Vaka Moana project; the specific activities which might be undertaken within each component, together with their specific objectives and products; the possibilities for government funding of specific areas; the interests of appropriate regional organizations, NGOs, UN agencies and scholarly bodies which might be incorporated.

As a result of these discussions the operational goals of the Vaka Moana programme have been defined as follows:

- the reinforcement of links between Pacific peoples through a better knowledge of their common historical links and dependence on the ocean;
- the promotion and dissemination of all forms of knowledge, both traditional and scientific, concerning the sea and its resources;
- the conservation, management and appropriate use of these resources for the benefit of the peoples of the region;
- the promotion of all forms of art which have the common theme of the sea;
- the involvement of all peoples of the various island countries of the Pacific Ocean, including those from non-independent countries.

Vaka Moana could be considered as a kind of 'Silk Roads of the Pacific' - interdisciplinary, intercultural, and inter-agency - as reflected in its central themes of peopling of the Pacific, culture and tourism, culture and science, and contemporary Pacific societies. Activities in 1994-95 include seminars and training workshops on such subjects as collecting oral traditions (Alofi, Vanuatu, June 1994), culture and environment (Port Vila, Niue, July 1994), culture and religion (Papua New Guinea, November 1994) and cultural legislation (Rarotonga, Cook Islands, February 1995).



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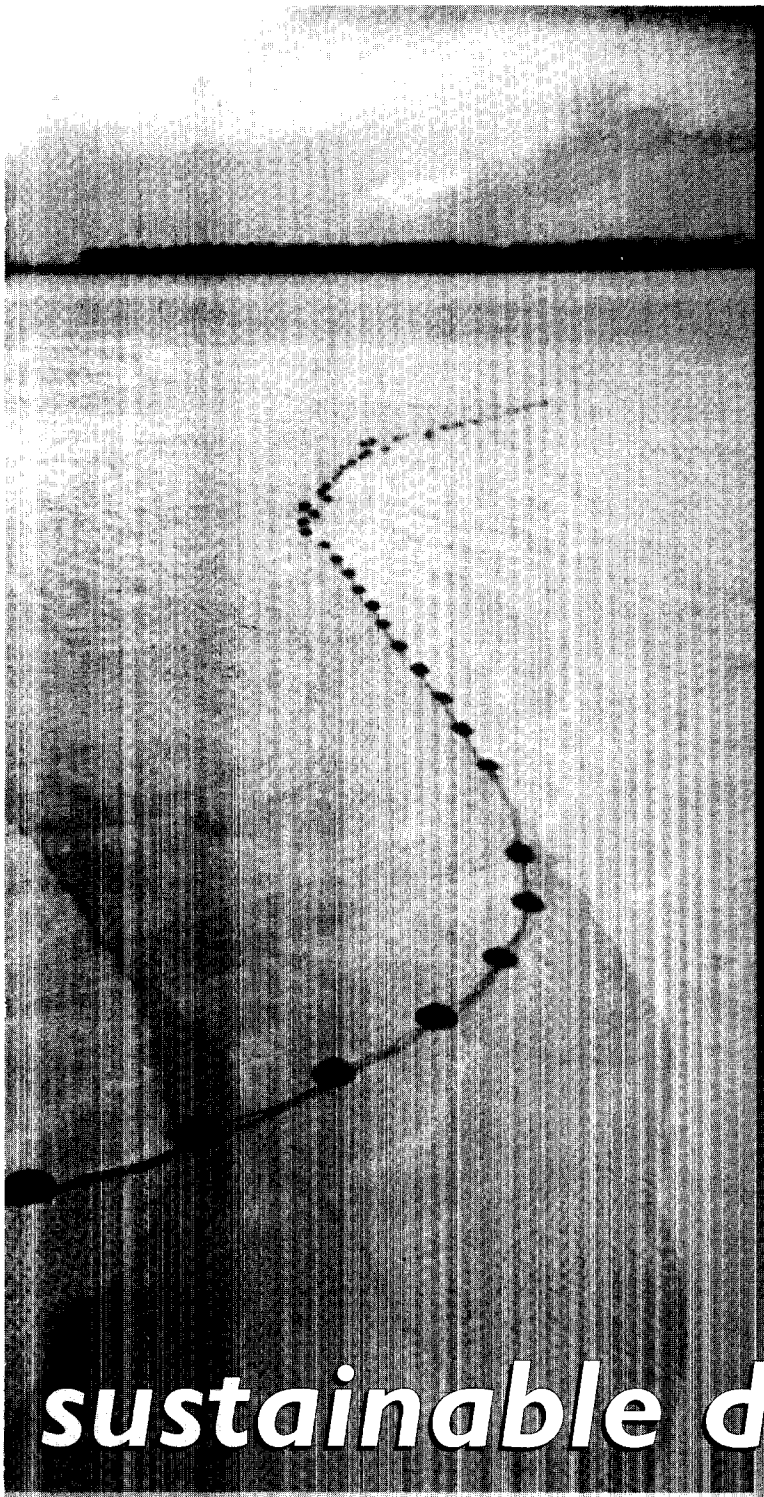
Dimensions of

Sustainability is a relative concept with many different definitions, perceptions and dimensions. General definitions on sustainable development proposed by the World Commission on Environment and Development (1987) were taken further in the Agenda 21 adopted by UN Conference on Environment and Development, of which Chapter 17 addresses the special problems of small islands. The process leading to the Global Conference on Sustainable Development in Small Island Developing States (Barbados, April 1994) has served to stimulate further reflections on the meaning of sustainability within a small island context.

The successive chapters of this review have addressed some of the constraints and opportunities facing small islands in striving towards sustainable development. A recurrent theme is that small islands have many problems different in kind from those of larger masses, even though there is considerable variation both between and within the major oceanic regions in terms of such issues as resource availability and management, vulnerability to external forces, and the extent of openness and specialization. Another recurrent theme is that though progress towards sustainability can be promoted through actions in many sectoral domains, perhaps of even greater importance is to explore new linkages (e.g. between modern technologies and traditional knowledge) and to seek out new partnerships and ways of working.

HARNESSING TECHNOLOGIES

Over the last couple of decades in particular, much of the progress in scientific knowledge and socio-economic



sustainable development

CHARACTERISTICS OF SUSTAINABLE DEVELOPMENT.

Source: World Commission on Environment and Development (1987)

'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:

- **the concept of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given; and**
- **the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs'. (p.43).**

'Sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs'. (p.9)

'We do not pretend that the process is easy or straightforward. Painful choices have to be made. Thus in the final analysis, sustainable development must rest on political will'. (p.9).

development has been driven by technological advances. Just as Leeuwenhoek's microscope opened up a whole new world in late 17th century, so recently modern technology has played a crucial driving role in such domains as genetic engineering and energy conservation. The field of information technology - electronics, telecommunications and informatics, as well as their software extensions (artificial intelligence, expert systems, etc.) - really has marked out times. Their tremendous growth in technology in the second half of the twentieth century is in line, historically, with the acquisition of spoken language, writing and printing. People have always tended to convert information signals into 'knowledge'. But the assistance to mental capacity and the power of communication offered by information technology changes the order of magnitude of the means available to act on information. Consequently, civilization is undergoing a very profound transformation which can only be regarded as a strong evolutionary push toward more complexity and awareness.

This description of information technology as the nervous system of modern society has been provided by Professor C. Danzin, Vice-President of the French National Commission for UNESCO and sometime Chairperson of UNESCO's Intergovernmental Informatics Programme (UNESCO 1989b). Failure to equip ourselves in information technology creates a considerable handicap for education and research, for agricultural and industrial productivity. It also compromises our capacity to deal with complex administrative and managerial problems.

Society is in transition towards an economy in which information is becoming the principal raw material. Energy and other raw materials are receding in

importance, in some connotations at least of the word important. This evolution of the world towards a 'cabled planet' offers many dilemmas and challenges, as well as benefits and advantages. For example, what are the implications of instant and distant communication to cultural diversity? What should be the response to existing inequalities in different parts of the world in terms of conceiving, producing and knowingly using information technology and capacities to acquire information technology equipment and make good use of that technology?

Issues such as these take on special importance for small islands in general, and small island developing states in particular. With its privileged position at the convergence of science, culture, communications and education, UNESCO has a particular responsibility and role to play in seeking effective responses to such challenges.

In terms of UNESCO's programmes, modern information technology is being used in a whole variety of ways:

- As a basic tool in distance education, as in the work in the Caribbean and Pacific regions.
- As a channel for participating scientists to exchange information rapidly and clearly, such as the electronic mail system among marine scientists.
- As a tool for conservation planning and management, through the application of geographically referenced information systems in selected biosphere reserves.
- As a means for environmental education and training, through the use of videos and interactive information systems on coastal zone planning and management.
- As an aid to decision-making and management, through the elaboration and testing of expert systems.

But there are many more aspects of modern technology that impinge of small islands, including technologies for the monitoring of pollution, for keeping track of natural disasters such as earthquakes, for more efficient energy conversion, for the harnessing of microbiological resources.

At the same time that new technologies offer immense opportunities to small islands, it must be recognized that in the past the results of transferring and applying sophisticated technologies have often been disappointing and progress short-lived, for a variety of environmental, economic and socio-cultural reasons. Whence one of the reasons for current interest in traditional approaches to the use and management of resources, which have proved their worth over the course of time. Traditional ecological knowledge refers to the knowledge base acquired by indigenous and local peoples over hundreds of years through direct experience and contact with the environment. This knowledge takes several forms: an intimate and detailed knowledge of the environment, including plants, animals and natural phenomena; the development and use of appropriate technologies for hunting, fishing, agriculture and forestry; and a holistic knowledge or 'world view', which parallels the scientific discipline of ecology.

Recent years have seen a growing appreciation of the existence of these two systems of knowledge for managing natural resources and the environment: one based on indigenous people's knowledge, and a second based on western scientific knowledge. When the systems are used in a complementary fashion, we have a powerful tool for achieving and managing sustainable development.

ON PARTNERSHIPS AND CONNECTIONS

The last twenty five years have seen significant institutional changes in the ways that society addresses the challenges of socio-economic development and scientific co-operation, particularly in the multiplication of non-governmental associations at various levels and the setting-up and strengthening of bodies at regional and sub-regional scales. Increasing interest in the problems of small islands has been reflected in a whole welter of new organizations concerned specifically with small-island issues. Recent decades have also seen major changes in the role and importance of the private sector. These various changes are reflected in the many tens of acronyms of organizations and programmes scattered throughout this review, and in the changes in the sorts of institutional arrangements made for island programmes and projects.

Illustration is provided by work in the Pacific. An early project (1969-74) on curriculum development at the University of the South Pacific represented a joint initiative of UNDP and UNESCO, with UNESCO's input being organized through its headquarters in Paris and its Regional Office in Bangkok. Another example from two decades ago concerns a UNFPA-UNESCO study on population-environment interactions in the eastern islands of Fiji (1974-76). Promoted through UNESCO's MAB Programme and the Division of Ecological Sciences at UNESCO Headquarters in Paris, the project was undertaken in close co-operation with the Australian National University, the French overseas research institution ORSTOM and researchers from several other extra-regional institutions, but with very limited involvement of national and regional researchers and with somewhat tenuous links with government departments and agencies.

Since the mid-1970s, changes have occurred in the Pacific region. Many nations have become independent. The South Pacific Regional Environment Programme has been set up, providing a focal point for environmental matters in the South Pacific. Since 1984, UNESCO has its own office for the Pacific States, based in Apia in Western Samoa. Increases in regional and institutional capacities have led to new constellations of co-operative arrangements between programmes and institutions.

These changes are reflected in the structure of such recently designed projects as that on Basic Education and Life Skills (BELS). Launched in 1993, this major four-year regional project involves eleven island countries of the region, with assistance from a consortium of bilateral (e.g. AIDAB, DANIDA) and multilateral (e.g. UNDP, UNICEF, UNESCO) organizations. The project is based on a multitiered delivery system involving regional resource people, national co-ordinators, national resource persons and national trainers, working to increase the effectiveness of the primary head teachers so that they can successfully assume their new roles as the central leaders and catalysts for the qualitative improvement of primary school management and classroom teaching.

The search of new partnerships and connections in new types of cross-cutting projects is also reflected in the Vaka Moana ('Ocean Roads') initiative in the Pacific, which has taken shape under the framework of the World Decade for Cultural Development. With

a primary thrust on culture, communication and linkages between people of an island world, the project involves a whole range of dimensions, perspectives and inputs. For example, inputs from the Science Sector of UNESCO are being organized around the theme of traditional knowledge of science and technology and its application to sustainable development, with associated programmes on island science for sustainable development and human resources for Pacific science.

The multiple dimensions of small island society and development are also reflected in the many institutional links that exist between and among the institutions of the United Nations System, the international scientific community and more finely focused associations whose specific concern is with issues and interests of small island communities.

Another sort of linkage is that with private sector companies. Such co-operation has long been a feature of work on communication infrastructures and technologies. More recent are the sorts of co-operative projects in the educational field, such as those in the Caribbean concerning the development of video-cassettes on mathematics and the 'Adopting a school' programme. These links with the private sector provide for the injection of financial and technical resources into specific programmes and projects, resources that may be lacking to government bodies and local communities. Perhaps most important are the qualitative improvements that can be wrought through partnerships with private sector concerns. An example is the identification of shortcomings in mathematics teaching in Jamaica, which was having a direct and negative affect on the employment market, affecting both employees and potential employers whose businesses require the services of persons with mathematical skills. A resulting project to produce videotapes was piloted by a committee with membership drawn from the Ministry of Education, the University of the West Indies, the Caribbean Examinations Council, the Commonwealth of Learning, UNESCO and the private sector. Synergistic links such as these were not very prominent twenty years ago. They promise to take on increasing significance in the years to come.

SETTING EXAMPLES

By seeking out new paradigms and partnerships, small islands might well be able to set an example to continental areas. In many small island societies, individuals often cover several roles. People remain polyvalent and reactive, not being able to afford the luxury of locking themselves away, totally absorbed in a single activity or project. Many island societies are a cultural cross-roads, and have an extraordinary capacity for change and adaptation. Just as island states may be showing the way to a new vision of education, so small islands might blaze a path in the integration of economic, cultural and natural resource concerns in approaches to sustainable development.

At the regional level, such initiatives might draw on such experiences as the Vaka Moana initiative, by its very nature interdisciplinary, intercultural and interagency.

At the level of individual islands or archipelagoes, countries might be encouraged to test diverse approaches to environmentally sound socio-economic development. Generic activities within such multi-faceted projects (UNESCO 1993b) might include: elaboration and implementation of a blueprint for sustainable development and integrated management; reinforcing participatory consultative processes and multisectoral implementation mechanisms; identifying opportunities for making better use of biological diversity and traditional ecological systems and practices; rehabilitating degraded land and aquatic (freshwater, brackish, marine) areas; improving tools and applying technologies, including those for harnessing renewable sources of energy; upgrading human resources and capacities; communicating information for education and informed action.

Projects such as these would enjoin a wide range of disciplines and competences (local people, government institutions, private sectors, non-governmental bodies, UN institutions). By design and nature, such projects would act as a testing ground for encouraging qualitative change in how institutions individually and collectively respond to the changing targets of environment-development issues. Partnerships such as these could contribute in providing effective response to the challenge of sustainable development.

In the words of the sometime Co-ordinator of UNESCO's environment programmes, Francesco di Castri, 'the environment and development crisis is above all a crisis of institutions, both international and national. For over a century, culture, the educational system, trades as a whole, have all been based on a sectoral approach, on the compartmentalization of knowledge and activities... Every time an attempt is made to break down institutional barriers - whether national or international, governmental or non-governmental institutions are involved - it runs into outdated forms of obstruction... It is of course indispensable to know each field of activity in depth, but problems of the environment and of development will never be solved by a single discipline... Given that it is impossible to have generalists capable of solving all the problems, why not have specialists who, besides having one main disciplinary root, would also have lateral roots, just as plants have central tap-roots and lateral roots that interact with the roots of other plants for mutual cross-fertilization?... In this way, competition would be replaced by tolerance and reciprocal exchange, both of which at present are practically non-existent' (*UNESCO Courier*, September 1992: 29).

At another level of analysis, the construction of island typologies (McElroy & Albuquerque 1990a, 1990b) could facilitate the design of appropriate management strategies consonent with identified stress levels as well as providing an agenda for detailed, policy-relevant case studies.

More basically, the sustainability of island development ultimately depends upon the abilities of island peoples and institutions to choose wisely among alternative activities and to implement choices. These abilities depend on individual skills and institutional capabilities and the information available to them. Making public participation an integral part of insular decision-making and drawing on inter-island co-operation and transfer of resource management skills and problem-solving techniques can only assist in the sustainable development and environmental management of small islands.

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ANNEX I
Preparation of this report

Inputs to this document and reviews of the text were made by UNESCO staff members from a range of disciplinary backgrounds, sectors, divisions and offices, including the following individuals: C. Arnaldo, D. Atchoarena, P. d'Ayala, M. Bonell, M. Bouamrane, H. Charles, F. Childe, S. Clarke, M. Clüsener-Godt, P. Dogsé, M. Hadley, M. Hadlow, P. Harger, P. Higginson, J. Hillig, N. Ishwaran, J. Josiah, J. Koch, B. Rouhban, T. Sankey, M.Steyaert, A. Takashima, A. Tolkychev, D. Troost, J. Visser, P. Vitta, W. Wiltshire.

The idea of preparing a cross-cutting overview of UNESCO's work on small islands arose during informal discussions of an open *ad hoc* group within the UNESCO Secretariat which met on a dozen or so occasions between July and December 1992, in the immediate follow-up to the UN Conference on Environment and Development (Rio de Janeiro, June 1992). The motivation of this informal group, which was animated and chaired by Dirk Troost, was to contribute to the challenge addressed by UNCED - that of enjoining people from different disciplines, backgrounds and sectoral affiliations to seek to address together the challenges of sustainable development.

Among the topics considered by the *ad hoc* group was that of a certain discrepancy between the long-standing involvement of UNESCO in certain fields and the lack of overviews of that work. Since its inception, UNESCO has had activities and programmes related to resource use and socio-economic development in particular types of biomes or physiographic units (coastal zones, forests, islands, urban systems, arid zones, mountains, etc.). In some cases, this involvement dates back to the early days of the organization (e.g. the Arid Zones programme of the 1950s). In several fields (e.g. coastal zones, islands), activities have been sponsored under the aegis of several sectors, programmes and administrative units. Generally, compilations and reviews of UNESCO's activities and their impact in these domains have been undertaken on a project-by-project or programme-by-programme basis, if at all. House-wide assessments are generally not available.

It was within such a perspective that suggestions took shape that an overview be prepared on UNESCO's work on small islands. Among other aims, this review would provide background on UNESCO's past, ongoing and potential contribution to the issue of sustainable development in small island situations, raised during UNCED process and subsequently in the lead-up to the Global Conference on Sustainable Development in Small Island Developing States (Barbados, April 1994). Such a review would also provide a better basis for others to take account of UNESCO's work in more substantive assessments of approaches to small island development.

In this light, an informal *ad hoc* task force met on a number of occasions during 1993, with a view to putting together a cross-sectoral overview of UNESCO's work on small islands. The task force manager was Malcolm Hadley, biologist in UNESCO's Division of Ecological Sciences.

The idea of preparing the cross-sectoral overview was subsequently discussed and endorsed by the UNESCO Committee for the Follow-up to UNCED, at its meeting in Paris in April 1993. The review then became part of UNESCO's own internal preparations for the Barbados Conference, under the aegis of the organization's Co-ordinator for Environment Programmes, Gisbert Glaser.

During the course of 1993, drafts were reviewed and complemented by interested staff members in UNESCO Regional Offices and Sub-Offices. Successive drafts were also made available in mid-1993 to UNESCO representatives attending the planning meeting for the Vaka Moana project and the regional technical meetings held in Port Vila (Vanuatu) and Port-of-Spain (Trinidad and Tobago) for the Global Conference on Sustainable Development in Small Island Developing States, as well as the preparatory session for the Barbados Conference held in New York in August-September.

The responsibility for finalizing the report, and preparing it in camera-ready form using desk top publishing facilities, was entrusted to the Division of Ecological Sciences. The report was compiled and edited by Malcolm Hadley. Text preparation was by Lydie Guillaud. Design and computer assisted layout was by Ivette Fabbri.

ANNEX 2
International connections

As reflected in the many acronyms dotted throughout this report, there are many organizations with interests in small islands, operating at various scales and levels. The sheer number of these organizations can be a source of confusion, and should not result in dispersion of effort and scarce resources. Whence the call, as part of the preparatory process for the Global Conference on Sustainable Development for Small Island Developing States, for measures to improve the availability and accessibility of information on 'who is doing what, where, and when'[1].

The following paragraphs provide an entry to the activities of a sampling of bodies related to small islands in fields related to UNESCO's own interests and programmes in the domains of education, science, culture and communications, and with which UNESCO has developed links over the years in respect to small islands.

INTERREGIONAL INTERGOVERNMENTAL BODIES

United Nations Development Programme (UNDP)

As the principal mechanism within the United Nations system for channelling development assistance, UNDP's activities relate to a very broad swathe of small island issues. Joint operations with UNESCO in small island settings have mainly concerned work in the fields of education and communications. As mentioned elsewhere in this report, collaborative projects have included the building up of such regional communication infrastructures as the Caribbean News Agency and the reinforcement of the Engineering Faculty of the University of the West Indies at St Augustine, Trinidad and Tobago, as well as more recent projects entailing a consortium of organizations, such as the Basic Education and Life Skills (BELS) project in the Pacific.

United Nations Environment Programme (UNEP)

A primary focus of UNEP's overall programme is the various action plans of the Regional Seas Programme (initiated in 1974), including the guidance and supervision of the organizational units that it has established and operates for the technical coordination of the Regional Seas action plans. UNESCO and its IOC are co-operating closely with the Regional Seas Programme, particularly in the Caribbean, Mediterranean and the South Pacific.

United Nations Fund for Population Activities (UNFPA)

From 1974-76, UNFPA, UNESCO and the government of Fiji co-operated in a field project on the interrelations between population and environment in the eastern islands of Fiji. A follow-up project on population-environment-development interactions in the eastern Caribbean was carried out from 1979 to 1981, in co-operation with the Institute of Social and Economic Research of the University of the West Indies.

United Nations Conference on Trade and Development (UNCTAD)

UNCTAD's concern with the economic development of islands is reflected in its co-sponsorship with UNESCO, the MAB Committees of the USA and Canada and the Commonwealth of Puerto Rico of the 'Interoceanic workshop on sustainable development and environmental management of small islands', which took place in Puerto Rico in November 1986.

Food and Agriculture Organization (FAO)

In April 1992, FAO convened in Christ Church (Barbados) an Inter-Regional Conference of Small Island Countries on Sustainable Development and Environment in Agriculture, Forestry and Fisheries. Working documents addressed such topics as the issues and requirements, integrated planning and management, sustainable agriculture and rural development, forest resources management, and coastal fisheries development. UNESCO has been working in close co-operation with FAO on the implementation of related marine science and MAB projects.

United Nations University (UNU)

Recent collaborative activities between UNU and UNESCO include efforts to promote South-South co-operation among humid tropical regions (Uitto & Clüsener-Godt 1993), including tropical islands. Agroforestry is a related topic that has formed part of UNU's programme since 1977, most recently under work on Global Life Support Systems. A study on agroforestry in the Pacific islands (Clarke & Thaman 1993) addresses diverse traditional systems of agroforestry in the region as well as urban agroforestry, in conjunction with monocultural cash cropping and modern agroforestry projects promoted by governments and international funding agencies.

Commonwealth Secretariat and Commonwealth Science Council

Educational development in small states is a shared concern of UNESCO and the Commonwealth Secretariat. UNESCO experience in educational planning and development in such regions as the Caribbean and the Pacific provided the basis for some of the inputs into the Commonwealth Secretariat's seminal conference on education in small states held in Mauritius in November 1985 (Commonwealth Secretariat 1986, Bacchus & Brock 1987). Improving the flow of information among Caribbean scientists was the focus of a regional workshop convened by the Commonwealth Science Council in Trinidad and Tobago in June 1992 (Strachan 1992).

REGIONAL BODIES AND PROGRAMMES

Blue Plan for the Mediterranean

Little more than twenty years ago, the Mediterranean was described as a sea which was already dead or almost so. It was not dead, only wounded by the particular intense pollution on its shores; more than anything, it had caught its sickness from the land.

It was within such a context that the countries bordering the Mediterranean came to an agreement, at a meeting held in Barcelona in 1975 under the auspices of UNEP, to develop together ways and means of working towards a better future.

1. An overview of the activities of the programmes, organs and organizations of the United Nations system relevant to the sustainable development of small island developing states is given in UN General Assembly document A/CONF.167/PC/6, dated 28 July 1993.

The Blue Plan is one of the major components of this co-operative effort. Its approach consists of exploring, from a future-oriented and systemic point of view, the evolving relationships between populations, natural resources, environment and development for the whole of the Mediterranean basin. Different scenarios assess the prospects for the economic development and sound environment of the Mediterranean Basin region for the next 40 years (Grenon & Batisse 1990). The study considers the prospects for five economic sectors - agriculture, industry, energy, tourism and transport, and their interactions with the environment, described in terms of soil, water, forests, coastlines and the sea itself. In addition the Blue Plan publishes thematic prospective studies, including one on the Mediterranean Islands (Brigand 1991). UNESCO provides office facilities for the President of the Blue Plan and takes part in the preparation of the thematic studies.

South Pacific Regional Environment Programme (SPREP)

The South Pacific Regional Environment Programme is the regional technical and coordinating mechanism responsible for environmental matters in the Pacific. It operates in partnership with the South Pacific Commission, the South Pacific Forum, UNEP and ESCAP, in providing a mechanism for its 27 members (both island states and territories and the metropolitan countries) to define common needs and to prepare and execute joint projects. The 1991-1995 Revised Action Plan for Managing the Environment of the South Pacific Region includes comprehensive programmes in the following major areas: conservation of biological diversity; global change; environment management and planning; coastal management and planning; prevention and management of pollution; planning and response to pollution emergencies; environmental information; regional environmental concerns. UNESCO's collaboration with this work is primarily through the Office for Pacific States in Apia, Western Samoa.

Regional Centre for Tropical Biology (BIOTROP)

The Regional Centre for Tropical Biology (BIOTROP) of the South-East Asia Ministers of Education Organization (SEAMEO) is a research and training centre established in 1968 to provide the SEAMEO member countries with increased capability in biological science relevant to regional economic needs. Over the years, BIOTROP and UNESCO have jointly organized a fair number of research and training activities, particularly related to tropical forest biology and tropical aquatic biology.
In the field of island studies, one such BIOTROP-UNESCO activity was a two-week regional training workshop on 'Integrated island ecology study and management', which took place in April 1991 in Los Baños, Puerto Galera, Iloilo City and other locations in the Philippines. A three-part report on the workshop (BIOTROP 1992) includes a general report and evaluation (Volume 1) and a compilation (Volume 2) of twenty-one lecture notes, addressing such topics as islands as microcosms, educational and informational needs for island development, environmental impact assessment, institutions in island planning, benefit-cost analysis, agroforestry practices relevant to island biogeography. Project assignments by workshop participants in Volume 3 discuss island development and resource use in particular island situations (Phuket, Pulau Redang, Terengganu, Krakatau, Batanes, Bali, Puerto Galera, Palawan), with a final section of field trip reports on Puerto Galera Biosphere Reserve.

INTERNATIONAL NON-GOVERNMENTAL ORGANIZATIONS

International Council of Scientific Unions (ICSU)

A wide range of links exists between the different unions and committees of ICSU and the scientific programmes of UNESCO. In terms of co-operation relating to small islands, fields addressed include the geological applications of remote sensing to volcanic hazard assessment in islands, a joint initiative of the International Union of Geological Sciences (IUGS) and UNESCO. Traditional knowledge and management of marine coastal ecosystems has been the focus of co-operation between the International Association of Biological Oceanography (IABO), the International Union of Biological Sciences (IUBS) and the COMAR programme of UNESCO (Lasserre & Ruddle 1983). In the field of oceanography, sustained co-operation between the Scientific Committee for Oceanic Research (SCOR) on the one hand and UNESCO and the Intergovernmental Oceanographic Commission on the other, dates back several decades, as reflected in the conception, planning and co-ordination of the International Indian Ocean Expedition.

World Conservation Union (IUCN)

IUCN work relating to small islands includes a review of protected areas in Oceania (IUCN 1986) and a three-volume study with UNEP on the coral reefs of the world (UNEP-IUCN 1988). IUCN was involved with UNESCO in the setting up and functioning of the Charles Darwin Foundation for the Galapagos Islands. IUCN also joined with the UNESCO-MAB and COMAR programmes and the IOC in organizing a workshop in San Francisco, aimed at refining the biosphere reserve concept for coastal regions (Price & Humphrey 1993).

International Scientific Council for Island Development (INSULA)

The aim of INSULA is to promote the sustainable development of small islands in all the regions of the world. INSULA was formally created in November 1989 at an international meeting on island territories and societies held in Brest (France) under the sponsorship of UNESCO. The need for such an organization had been recognized and endorsed by a number of international MAB meetings during the period 1986-1989, including those held in Port Cros, Puerto Rico, Gomera, Mali Losinj, Ile d'Ouessant and Hiroshima. UNESCO is supporting INSULA's activities and provides office space for its secretariat at its Paris Headquarters.
Among the Council's objectives is to encourage technical, scientific and cultural cooperation in assisting island communities in integrated planning and the judicious use of their natural and human resources. Three main lines of action have been proposed within INSULA: management of island resources, technical assistance and strategies for sustainable development.
INSULA's first interregional conference on the theme 'Islands 2000 - The World of Islands. What Development on the Eve of the Year 2000?', was held in Giardini-Naxos, Sicily (Italy) from 19-24 May 1992. The conference was organized by INSULA, in cooperation with UNESCO, the University of Messina, the Sicilian Regional Government, the Lions Club of Taormina, and the 'Lega Navale Italiana' of Agrigento. The conference brought together some 220 participants from 50 countries, many of them from small island states or island regions of continental states. A number of the conference's technical contributions have been published in INSULA's *International Journal of Island Affairs*, a journal specifically designed to cater to the needs and interests of those concerned with various aspects of island life and development (see Annex 3, page 126). A second INSULA conference will be held in Okinawa (Japan) from 22-26 June 1994, on the theme 'Island Matters: Islands Matter'.

ANNEX 3

UNESCO sponsored publications on small islands

A sampling of titles and issues[1]

Ecology and Rational Use of Island Ecosystems (1973)

One of the international project areas proposed for the Man and the Biosphere (MAB) Programme at the first session of its International Co-ordinating Council concerned the 'Ecology and rational use of island ecosystems' (MAB Project 7). An expert panel was convened in June 1973 to elaborate the scientific content, approaches and plans of study that might be adopted in co-operative work between countries on this topic. Three problem areas were considered to be of particular importance: the management of environmental resources by island populations, the impact of external forces on islands (with special reference to tourism), and the impact of alien plants and animals on island ecosystems. Other issues flagged included problems of environmental health and human biology in island situations, carrying capacity, perception of environmental quality, and the ocean-land interface.

More generally, the expert panel considered that this MAB project offered an 'almost unique opportunity to study, under relatively controlled and finite conditions, the whole range of ecological, economic and social factors that influence man/biosphere relationships. It is the interaction of these various factors that is of importance to the future well-being of island communities, and of particular significance to the analysis of more complex situations on continental areas'.

- UNESCO. 1973. *Programme on Man and the Biosphere (MAB). Expert Panel on Project 7: Ecology and Rational Use of Island Ecosystems.* Paris, 26-28 July 1973. MAB Report Series 11. UNESCO, Paris. Available on microfiche from Archives and Micrography Section.

Tourism - Passport to Development? (1979)

In December 1976 in Washington, D.C., the World Bank, as a major development institution, and UNESCO, as the UN agency concerned with cultural development, sponsored a seminar to discuss the social and cultural effects of tourism on developing countries and to suggest ways to take account of these concerns in decision-making. The ensuing book is an outgrowth of the papers presented to the seminar and the discussion that followed. In five introductory chapters, volume editor Emanuel de Kadt addresses tourism planning in the context of development theory and decision-making at the local, national, and transnational levels. A central issue is how the growth of tourism affects the social and economic welfare of the local people and how the benefits are distributed among them. Changes in values and attitudes brought about by encounters with foreign tourists are also explored, as are the effects of tourism on arts, crafts, and cultural activities.

The second part of the book contains thirteen case studies presented by specialists from a wide range of disciplines and focussed mainly on the effects of mass tourism. Several case studies are concerned with tourism in small-island situations, including Bali, Bermuda, Cyprus, Malta and the Seychelles. A final section of policy recommendations presents conclusions on distribution, planning and participation, on the encounter between tourist and host, on the cultural aspects of tourism, and on measures to encourage the local culture for the benefit of the population and the tourist alike.

- Kadt, E. de (Ed.). 1979. *Tourism - Passport to development? Perspectives on the Social and Cultural Effects of Tourism in Developing Countries.* Published for the World Bank and UNESCO. Oxford University Press, Oxford. Available on microfiche from Archives and Micrography Section.

Khabarovsk Discussions on the Ecology and Rational Use of Island Ecosystems (1983)

The XIVth Pacific Science Congress in Khabarovsk, USSR (20 August-5 September 1979) provided an opportunity for a number of participants to meet and discuss past, present and future research activities in the Pacific region under MAB Project 7 (Ecology and Rational Use of Island Ecosystems). The one-day meeting took place on 24 August 1979, with a summary of presentations, discussions and recommendations included in MAB Report Series 47. Included are overviews of research sponsored by MAB National Committees of Chile, France, Indonesia, Philippines, USA and USSR, as well as of the UNESCO-UNFPA project in eastern Fiji.

- UNESCO. 1983. *Programme on Man and the Biosphere (MAB). Expert Consultations on Project 7: Ecology and Rational Use of Island Ecosystems.* Khabarovsk, 24 August 1979. MAB Report Series No. 47. UNESCO, Paris. Available on microfiche from Archives and Micrography Section.

1. For books and reports published by UNESCO, an indication is provided at the end of each reference on the service(s) to which enquiries should be addressed, at the following address: 7, place de Fontenoy, 75352 Paris 07 SP (France); Central Fax: 33 (1) 45671690.

Traditional Knowledge and Management of Coastal Systems in Asia and the Pacific (1985)

As part of its major interregional project on Coastal Marine Systems (COMAR), UNESCO convened a regional seminar on 'Traditional management of coastal systems in Asia and the Pacific'. The seminar took place at the UNESCO Regional Office for Science and Technology in Southeast Asia in December 1983, with the primary objective of initiating a compilation and consolidation of existing published and unpublished data and oral knowledge about the traditional uses and management of coastal zones of Asia and the Pacific. An attempt was also made to specify primary research that should be done on the topic and the personnel who might undertake development of a strategy to introduce such information into the planning and educational institutions of the region.

Fourteen invited papers are grouped in a proceedings report. Case studies from Oceania are drawn from Tokelau, Solomon Islands, Kiribati and Tuvalu Atolls, Papua New Guinea, Yolngu of North Australia and the Torres Strait. Examples of traditional management from Asia include studies from coastal zones in Japan, China, Philippines, Thailand, West and Central Java, North Sumatra, South Sulawesi. A closing seminar summary addresses such issues as information needs on traditional fishing rights, boundaries and associated resource use, the linking of traditional and modern systems, enrichment of school curricula, and research and planning projects for demonstrating the practical value of using traditional knowledge in resource use management.

- Ruddle, K.; Johannes, R.E. (Eds). 1985. *The Traditional Knowledge and Management of Coastal Systems in Asia and the Pacific*. UNESCO-ROSTSEA, Jakarta. Available on microfiche from Archives and Micrography Section.

Resource Management in the Commander Islands (1987)

Moscow State University played host in March 1986 to a MAB seminar on the Commander islands, situated to the east of the Kamchatka peninsula. The seminar and resulting proceedings volume* are focused on rational resources management in the Commander Islands, the status and protection of natural communities, and problems of economic and ethno-cultural development. Contributions deal with the pioneering work of Soviet scientist S.V. Marakov in the Commander Islands, history of land use, status and prospects of resource management, possible role in global ecological monitoring, work undertaken within an interdisciplinary research programme, participation of native populations in regional development, nature protection, bird life, fish fauna, blue fox populations, northern fur seals, Macro-Lepidoptera, microbial communities, marine invertebrates, vegetation, reindeer populations, aquaculture development, economic activities, problems of tourism organization, ethnocultural development of the Aleuts, ethnolinguistics, native art, cultural and historical relicts.

- Sokolov, V.E. (Ed.). 1987. *Rational Resources Management on the Commander Islands. Status and Protection of Natural Communities, Problems of Economic and Ethno-cultural Development*. Moscow State University and USSR MAB National Committee, Moscow. (In Russian, with English abstracts).

'Ekistics' Issue on Islands (1987)

Islands and human settlements formed the focus of a special double issue of the journal *Ekistics**, prepared and compiled by guest editor Harry N. Coccossiss, in cooperation with UNESCO. Entitled 'The problems and science of human settlements: islands', the double issue dealt in essence, with planning for islands. This topic is one of central concern in many of the field projects on island systems within MAB, and findings from several such projects are reflected in this volume.

Following a substantive introduction by the guest editor, nineteen contributions address such topics as the concepts of insularity and marginality, approaches to sustainable development, emerging theoretical issues, demographic dynamics, desertification of island systems, approaches to effective environmental research, economic driving forces of island development, dilemmas in island planning and tourism development, adjusting new building to local styles and modern needs, artificial islands for oil drilling. Many of the examples are drawn from the Mediterranean region, including work at Patmos and other Aegean islands, Salina and other islands in the Aeolian Archipelago, islands of the Yugoslav Adriatic coast, Lampedusa, Crete, etc. Other examples were based on islands in the Atlantic (Canary islands. Azores) as well as peripherical regions of Europe, Hawaii, Mauritius and the Arctic.

- The Problems and Science of Human Settlements: Islands. *Ekistics*. 1987. Number 323/324, March/April-May/June 1987.

Islands, Islanders and the World. The Colonial and Post-Colonial Experience of Eastern Fiji (1988)

One of the early starting pilot projects within the MAB Programme was that on population-environment relationships in eastern Fiji. Field work was carried out from 1974 to 1976 as a collaborative venture of the Government of Fiji, UNESCO-MAB and UNFPA. The project's results were published widely in the late 1970s, with one overall account being published by UNESCO as MAB Technical Notes 13. Within the broader MAB context, the project was an important one in the overall development of work on the ecology and rational use of island systems, but also more generally in underlining the importance of the study of processes affecting environmental change and the need to consider change within an historical and temporal perspective, as well as at a range of spatial scales.

Several members of the project team returned to Fiji in 1983 (i.e. some seven years after the termination of the field work phase). This visit enabled the research team to analyse changes that had occurred in the interim and to compare them with earlier findings and forecasts, particularly in respect to decision-making on population-environment problems in the context of provincial and local development in the small islands of Fiji. A principal output of this return visit to Fiji was a book* by four of the field research team, which presented their observations on what had happened in and to eastern Fiji in the late 1970s-early 1980s, and what this might add to the sum of knowledge about the colonial and post-colonial experience of the developing world. Eleven substantive chapters take up such topics as the study of islands, people and events, the island landscape, capitalism and colonialism in the periphery, physical and economic externalities and their impact, vulnerability in a changing society, adaptation or stagnation in island situations, regional development for an island periphery. A final substantive chapter addresses the issue of island studies and geography, including the time geography of islanders and other questions related to the rational management of islands. In addition to references cited, an appendix provides a listing of publications generated by the UNESCO/UNFPA Eastern Fiji project.

- Bayliss-Smith, T.P.; Bedford, R.; Brookfield, H.; Latham, M. 1988. *Islands, Islanders and the World. The Colonial and Post-colonial Experience of Eastern Fiji*. Cambridge University Press, Cambridge.

Ekistics contains an ingenious grid index, whereby the content of each article is classified within an ekistic grid, such as that reproduced here. The position of a circle in any square of the grid indicates which of four sub-heads are being referred to: for example, in respect to society, the four sub-heads refer to 'public administration, participation and law' (top left of square), 'social relations, population trends, cultural urban patterns' (top right), 'urban systems and urban change' (bottom right), 'economics' (bottom left). A solid circle indicates primary emphasis, an open circle secondary emphasis.

Community Scale		i	ii	iii	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ekistic Units		Anthropods	Room	House	House group	Small neighbourhood	Neighbourhood	Small polis	Polis	Small metropolis	Metropolis	Small megalopolis	Megalopolis	Small eperopolis	Eperopolis	Ecumenopolis
Elements	Nature							○○ ○○	○○ ○○	○○ ○○		●● ●○				
	Anthropods															
	Society							○○ ○○	○○ ○○	○○ ○○		●● ●●				
	Shells															
	Networks							○○ ○	○○ ○	○○ ○		○● ○				
Synthesis: Human Settlements								○	○	○		●				

Sustainable Development and Environmental Management of Small Islands (1990)

Volume 5 in the Man and the Biosphere Book Series examines the effects of economic and sociological problems on the ecology of small islands, and provides guidelines for their sustainable development and environmental management. Edited by William Beller, Pierre d'Ayala and Peter Hein, the 419-page volume* comprises twenty-three individually authored chapters, grouped in two sections, with a final consolidated chapter presenting the conclusions and recommendations of an interoceanic workshop in Puerto Rico which gave birth to the book. Nine of the chapters deal with issues relating to islands in general, the other chapters comprising case studies of particular islands and archipelagoes in five ocean basins. Authors' disciplinary backgrounds include anthropology, ecology, economics, geography and sociology, and these backgrounds are reflected both in the review papers and case studies. Issues affecting island development addressed in the book include the diversity of islands, 'distortions' in island economies, transport, demographic issues, employment, the labour market and changing aspirations, decision-making and information issues, vital role of natural resources, forestry, land management, water, energy, conservation of protected areas and wildlife, coastal and marine ecosystems, fisheries and ocean-based development, agriculture and export-crop specialization, industry, tourism, other services, including military uses of islands.

- Beller, W.; d'Ayala, P.; Hein, P. (Eds). 1990. *Sustainable Development and Environmental Management in Small Islands.* Man and the Biosphere Series 5. UNESCO, Paris, and Parthenon Publishing, Carnforth. Can be purchased from UNESCO Publishing.

Traditional Marine Resource Management in the Pacific Basin: An Anthology (1990)

The intent of this volume is to contribute to the growing body of documentation on traditional systems of fisheries management. Following an introduction by the volume editors, the first seven contributions examine traditional fisheries management by various groups in the Pacific - in the Marovo lagoon in the Solomon Islands, in the Kiribati and Tuvalu atolls, among the Nenema people of northwestern New Caledonia, in Itoman of Okinawa, in Micronesia, and in Indonesia and Papua New Guinea.

The following six papers address the transition from traditional systems of marine resources management to a modern context, drawing on studies from Tokelau, the Torres Strait, Japanese coastal fisheries, Solomon Islands, Papua New Guinea and the Cook Islands. The volume concludes with two quite distinct topics, on changes in the traditional stake net fishery of Singapore, and the integrated systems of aquaculture and agriculture in pre-contact Hawaii.

- Ruddle, K.; Johannes, R.E. (Eds). 1990. *Traditional Marine Resource Management in the Pacific Basin: An Anthology.* UNESCO-ROSTSEA, Jakarta. Available on microfiche from Archives and Micrography Section.

***Prospects* Issue on Education in Small States (1991)**

A special issue of UNESCO quarterly review of education includes an editorial overview on the development of interest in education in small states, and a listing of previous articles on the topic that *Prospects** published between 1975 and 1988. An introductory article examines the growth of international interest and the emergence of a theory. Other broad articles focus on curriculum issues, post-secondary education, and cooperation between small states. Case-studies focus on Malta, the Eastern Caribbean, and the South Pacific states, as well as non-island states such as Botswana.

- Education in Small States. *Prospects.* 1991. Volume XXI(4), Number 80. Enquiries to the Editor of *Prospects.*

Hydrology and Water Resources of Small Islands (1991)

As part of its third phase (1984-1989), the International Hydrological Programme (IHP) included eighteen themes. Within Theme 4 ('Hydrology of particular regions and land area'), Project 4.6 was focused on the hydrology of small islands. The primary product of this project is a 435-page practical guide to the hydrology and water resources of small islands*.

This guide has been prepared to assist technicians, hydrologists, engineers and managers in the identification, assessment, development, management and protection of water resources on small islands. It is not intended as a textbook or manual of practice, but rather as a guide to the selection of methods and practices, appropriate to the special conditions of small islands.

The guide is presented in eight chapters: definitions and distinctions between small and very small islands, problems of small islands, types of freshwater occurrence on small islands; conditions for water occurrence in small islands including climate, geology, geomorphology, soils and vegetation; the hydrology of small islands including hydrometeorology, hydrological processes, water balance studies, groundwater hydrology, freshwater-saltwater relationships; water resources assessment and measurements in small islands (hydrometeorological parameters, surface water resources, alternative approaches for developing or enhancing freshwater resources such as desalination, importation, wastewater reuse and weather modification); uses of water on small islands and guidelines for water resources development and management; training, education, research and technical cooperation aspects of small island water resources; reference material; thirteen case studies of small islands from various parts of the world (Anguilla, Antigua & Barbuda, Bermuda, Canary Islands, Cayman Islands, Hawaiian Islands, Majuro, Mauritius, Montserrat, Scottish Islands, Seychelles, Silba, Zhoushan Islands).

- Falkland, A. (Ed.). 1991. *Hydrology and Water Resources of Small Islands: A Practical Guide.* Studies and reports in hydrology 49. UNESCO, Paris. Can be purchased from UNESCO Publishing.

Island Territories and Societies (1991)

In November 1989, the town of Brest and the University of Occidental Brittany in France played host to an international MAB conference on 'Island territories and societies: permanence, changes and prospects'. The International Scientific Council for Island Development was formally created at this conference, the 459-page proceedings volume of which was published in 1991 in the series of *Collection Recherches Internationales* of the French Secretary of State for the Environment.

In addition to foreword, welcoming addresses, conclusions and participants' list, the proceedings volume contains fifty-seven contributions, organized in three themes: studies of insularity (20 papers), human beings in insular space (21); island resources management and island development (16). Situations drawn-upon in these contributions include the sites of some long-established MAB studies (e.g. Aeolian islands, Azores, Caribbean islands, Formentera, Greek islands, Irish islands, Mali Losinj, Iles du Ponant, Ile d'Ouessant, Tabarca) as well as studies reported for the first time at an international MAB island conference (e.g. Schouwen-Duiveland in the Netherlands delta, Koster islands in western Sweden, the Melanesian archipelago of Vanuatu). Among the issues addressed are longitudinal studies of human ecology and life styles, socio-economic implications of the development of marine parks, use of geographic information systems in insular situations, land-based sources of marine pollution, advantages and disadvantages of special economic zones, constraints and opportunities in island development, the role of fishing in the identity of island communities, perceptions of island space.

- Gourmelon, F.; Brigand, L. (Eds). 1991. *Territoires et sociétés insulaires.* Actes Colloque International de Brest, 15-17 novembre 1989. Université de Bretagne occidentale, Brest. (In composite French/English - contributions in French or English with abstracts in both languages).

IHP Semi-Popular Report on Water Resources of Small Tropical Islands (1992)

The International Hydrological Programme is generating a series of illustrated non-technical reports on water-related issues and problems of the humid tropics and other warm humid regions. Following a first number on *The Disappearing Tropical Forests** two reports were published in 1992 on small tropical islands and on water and health. *Small Tropical Islands. Water Resources of Paradise Lost*, by Anthony C. Falkland, addresses such topics as the physical characteristics of small islands, freshwater resources, use and development of water on small islands, issues and problems in water resource development and management, possible effects of suggested global climate changes on small islands, needs and activities in technical cooperation.

- Enquiries to Division of Water Sciences.

Learning Package on Ocean Energy (1992)

The concept of ocean thermal energy conversion (OTEC) was first proposed by the French engineer Jacques Arsène d'Arsonval more than a century ago. He envisioned a closed-cycle heat engine using ammonia as a working fluid, but he never tested the concept. Almost fifty years passed before one of d'Arsonval's students, Georges Claude, designed and field-tested an experimental system at Matanzas Bay in northern Cuba in 1930. Although his model generated 22 kW of power, it consumed more power than it generated. Renewed interest in OTEC was prompted by the oil embargo of 1973, and has been reflected in several projects in Hawaii and elsewhere on the scientific and technical aspects of the technology.

Present understanding and future prospects are summarized in a five-hour course on ocean energy prepared for the UNESCO Energy Engineering Learning Package by the Hawaii Natural Energy Institute of the University of Hawaii. The course on ocean energy includes overviews of the historical development of OTEC and its mathematical and scientific underpinning, ocean energy systems (OTEC, tidal energy, wave energy, current energy, salient gradient energy), economic and externalities in energy conversion. One conclusion is that OTEC offers excellent potential for reducing dependence on fossil fuels in tropical regions within the next decade through the production of baseload electrical energy. Small experimental plants and pilot-scale commercial plants planned in the next few years could lead to widespread commercialization of OTEC by the year 2000.

Analysis shows that the key to commercial success of OTEC does not lie solely in the generation of electricity, but depends heavily on the development of other potential uses of clean, cold seawater. OTEC by-products such as fresh water, air conditioning and refrigeration, mariculture and agriculture, and other innovative applications offer great promise for OTEC as a total resource system, as is being demonstrated in Hawaii today.

- UNESCO. 1992. *Ocean Energy*. UNESCO Learning Package on Energy Engineering, Module R-10. Prepared by the Hawaii Natural Energy Institute, University of Hawaii. UNESCO, Paris. Enquiries to Engineering and Technology Division.

Islands' Culture and Development (1991)

From 31 July-4 August 1989, at the Mahatma Gandhi Institute in Mauritius, a seminar was held on islands' culture and development, organized by UNESCO in collaboration with the Foundation for ACP-CEE Cultural co-operation. The main objectives were to enable experts and planners from three groups of island countries (from the Indian Ocean, the Caribbean and the Pacific), to meet in order to identify, in the fields of education, science and technology, culture and communication, the areas for action where real and specific needs exist. A second objective was to provide an opportunity for an exchange of experiences and to make an assessment of co-operation between the three groups of island countries.

The main results of the seminar are reflected in the *Appel de Port-Louis en faveur des pays insulaires*. In addition to these recommendations, the resulting publication* contains the text of opening speeches, an introductory address on culture and development issues for island countries, and a final synthesis report, and eleven contributions grouped in two sections. In a first section on global, regional and national addresses, six contributions take up such topics as: the effects of islands on a range of parameters (from ecology to geopolitics); the greenhouse effect as a new challenge to island states; conditions and issues of development and dependency in Micronesia to the year 2000; constraints to unity in the Caribbean regions; emigration, development and culture (case study on Cape Verde); regional and land use planning in Reunion. Five articles on specific topics are concerned with the challenge of scale in the development of education systems in small states; from training-employment to education-culture relations as a new problem for insular states; cultural accounting in the Caribbean; new thinking on the economic development of islands in the information age; policies, programmes and activities of the Technical Centre for Agricultural and Rural Co-operation, in and for ACP (Africa-Caribbean-Pacific) island states.

- UNESCO/Fondation pour la coopération culturelle ACP-CEE/Foundation for ACP-EEC Cultural Co-operation. 1991. *Culture des îles et développement/Islands' culture and development*. Etudes prospectives/Future-oriented studies. UNESCO, Paris. Can be purchased from UNESCO Publishing.

***Sources* Issue on Islands (1992)**

'The Fragile World of Islands' is featured in the November 1992 issue of *UNESCO Sources**, the monthly magazine for the news media. Following an introductory overview by journalist Nicolas Michaux, the issue contains five short articles on islands, islanders and island issues, addressing such topics as the perceptions of islanders and the winds of change, the double-edged sword of tourism, cultural identity and insular communities, integrated approaches to island development, and the possible effects of sea-level change on low-lying islands. Woven into the articles are case studies from the Aeolian and other Mediterranean islands, the Cape Verde islands and other archipelagoes. The regular *Sources* double-page on 'Facts in Figures' contains graphics on sea level rise in the South Pacific, demographic change on three Breton islands off the northwestern coast of France, trends in tourist numbers and expenditures in the Balearic archipelago, and problems of drinking water supply on two Greek islands.

- Enquiries to Editor of *Sources*.

International Journal of Island Affairs. Inaugural Issue (1992)

Following favourable reactions to proposals to launch a journal catering to the needs and interests of those concerned with various aspects of island life and development, the International Journal of Island Affairs was launched in 1992 by the International Scientific Council for Island Development (INSULA). The journal is designed to provide a world wide forum for all those considering islands as an integral part of the human heritage, publishing material about islands from a variety of perspectives, including environment (environmental management, natural resources conservation, water, liquid and solid waste management, prevention of natural hazards), population (demographic trends, health, human geography, human resources, education and training, culture, traditional knowledge) and sustainable development (general economics, tourism and transport, agriculture and aquaculture, fishing and ocean resources, bio-technologies, industry and mining, applied communication technologies, renewable energy, international politics and policies).

Published by INSULA with the support of UNESCO and in collaboration with the Foundation for International Studies in Malta, the 52-page first issue of the journal was published in April-May 1992. An introduction on journal aims and policy by Editor Pier d'Ayala, is followed by news items from islands and the world, on Croatian Islands at war, on Japan's Remote Islands Development Act, on a development plan in the Seychelles, and on an evolving UNESCO programme on the use of satellites in monitoring sea-level rise. A dossier on global warming and sea-level rise examines the problems of atoll states and of 'science versus fear'. An interview with UNESCO Director-General Federico Mayor and a review of island saltmakers are followed by articles on culture and traditional knowledge, featuring the popular use of medicinal plants in the Maltese Islands, on the relations of 'Seamen, the Islands and the Faith' on the Brittany Island of Ouessant in western France, on traditional management systems in the Nicobar Islands, and a comparison of two 'archetypes' from the Archipelago of Finland. The issue closes with background on the creation and objectives of INSULA*, a book review section and an invitation to contributors.

Two issues of the journal were published in 1993, dealing respectively with water and waste management and with protected areas in various islands. The first issue in 1994 addresses tourism, in island situations.

- Enquiries to INSULA, c/o Division of Ecological Sciences.

Educational Planning in Small Countries (1992)

In 1987, UNESCO's Division of Educational Policy and Planning released a document entitled *A Set of Training Modules on Education Planning in Small Countries*, authored by Mark Bray of the University of Hong Kong. The preface of the document expressed the intention to improve the text through testing and experimenting. Revision, it said, would be a continuous undertaking of the Division with the co-operation of both regional and national specialists and institutions. The 1987 publication attracted considerable interest. It was a focus of a special workshop in the Caribbean in 1988, and was reviewed and discussed by the staff of the UNESCO Office for the Pacific States in Western Samoa. As well as gaining inputs through the UNESCO framework, the book has particularly benefitted from a series of activities for small countries organized by the Commonwealth Secretariat.

In the light of this process, the set of training modules was recast by Mark Bray as a broader work focussing on issues and concepts, and published by UNESCO in 1992 as a 130-page book *Educational planning in small countries*. The book has been principally written for planners in the ministries of education of small countries, and contains three main parts: contexts, approaches and structures; planning of specific components; summary and conclusions. A section on further reading provides an annotated bibliography on key words addressing development issues in small countries, before turning to the specific literature on education.

- Bray, M. 1992. *Educational Planning in Small Countries*. UNESCO, Paris. Enquiries to Educational Policies and Management Unit.

Policy, Planning and Management of Education in Small States (1993)

The International Institute for Educational Planning (IIEP) is an international centre for advanced training and research in the field of educational planning. Established by UNESCO in 1963, the IIEP is financed by UNESCO and by voluntary contributions from Member States. Reflecting burgeoning interest in issues related to issues of planning and managing education in small systems, the institute has brought together material originating from a conference held in the Centre for Multicultural Education, University of London Institute of Education, with financial support from the European Community Directorate General for Development. The conference addressed a range of themes relevant to policies and practice within educational sectors in small systems (many of them small island states) of Europe, the Commonwealth, the Africa and the Caribbean and Pacific (ACP) group of countries supported by the European Community, as well as from wider afield. It also discussed micro-systems within larger national systems.

The agenda sought to continue and to raise the international debate and discussion on the issues that were already high in national developmental fora and in the agendas of international agencies like UNESCO and the Commonwealth Secretariat. What are the distinctive features or commonalities of educational problems in small states? To what

extent are they or are they not similar to those experienced by larger systems? What are the teacher education, higher education, labour market, curriculum development and materials provision implications of planning and managing small systems? Are there specific linguistic, religious, social, class and cultural implications of planning and managing education within small multicultural societies?

The book is divided into three parts. Part I is essentially concerned with defining and mapping the intellectual terrain (four chapters), Part II (three chapters) presents case studies from a number of small system contexts, including the Pacific, Part III presents two chapters on regional cooperation. Key conceptual issues raised by editor Kevin Lillis* in an introductory chapter include definitions and conceptualization of smallness, the nature of decision-making in small systems, disadvantages and advantages of smallness, patterns of educational provision, appropriate models and alternative pathways to development.

- Lillis, K.M. (Ed.). 1993. *Policy, Planning and Management of Education in Small States.* International Institute for Educational Planning, Paris. Can be purchased from UNESCO Publishing.

Educational Strategies for Small Island States (1993)

David Atchoarena's* monograph in the Fundamentals of Educational Planning series is concerned with improving the management of education systems in small island states. There are three parts. Part one consists of a kind of detour aimed at relocating the theme of small states in a theoretical and historical perspective, presenting characteristics common to small states which constitute a set of specificities and constraints but also advantages. The second part analyses the implications of small size for educational planning with a statistical overview providing a sense of the problems that are encountered. The third part proposes a strategic reflection encompassing the key aspects of planning and management of education, within the context of how a planner handles the double challenge of simultaneously overcoming the handicaps of small size and insularity and transforming certain constraints into advantages. The empirical basis for the publication is drawn mainly from the South Pacific and the Caribbean, reflecting the author's experience at the Ministry of Finance and Planning in Saint Lucia and elsewhere in the Caribbean.

- Atchoarena, D. 1993. *Educational Strategies for Small Island States.* Fundamentals of Educational Planning series. International Institute for Educational Planning, Paris. Can be purchased from UNESCO Publishing.

UNESCO Environment and Development Brief on Coasts (1993)

The UNESCO Environment and Development Brief Series is prepared by the Bureau for the Co-ordination of Environmental Programmes, in cooperation with the various substantive divisions and programmes of UNESCO and renowned specialists in particular fields at the interface of environment and development. The aim of the series is to improve the communication to decision-makers of scientific information about environment and development, as a basis for action. The series is addressed primarily to decision-makers in government and business who need a quick, authoritative, and readable overview of global environment and development issues, presented in a policy perspective and including possible strategies for action. Each 16-page brief focuses on a single environment and development issue of global importance. The first five issues dealt with debt-for-nature swaps, ground water, new technologies of remote sensing and geographic information systems, reshaping education towards sustainable development, and disaster reduction and coping with natural hazards. Number 6 in the series, released in October 1993, is entitled *Coasts: Managing Complex Systems*.

Following an overview of the key issues at stake and the need for action, topics addressed in the brief include major impacts and consequences of coastal resource use (pollution, degraded ecosystems, declining fisheries, erosion, flooding), possible impacts of global warming on coastal regions, world population in the coastal zone, value of coastal resources. The management predicament is approached from the interlinked dimensions of complex natural systems, multiple uses, ownership and sectoral management, with figures and boxes on the impacts of dams and irrigated agriculture on coastal fisheries, the dynamics of coastal ecosystems, potentially conflicting uses of coastal resources, coastal zones in small-island settings, and principles for the sustainable development of coasts. A four-page section on integrated coastal management takes up such topics as key steps and information needs in coastal management, tools and techniques, combining broadscale and targeted approaches, legislation, regulation, administration, emergency preparedness, and coastal management across national borders. As for other numbers in the series, the final three pages (pages 14-16) provide a tabular summary of key issues and a list of useful addresses and reading materials and signpost the way forward.

- UNESCO. 1993. *Coasts: Managing Complex Ecosystems.* UNESCO Environment and Development Brief 6. UNESCO, Paris. Enquiries to the Bureau for Co-ordination of Environmental Programmes.

IMS Overview on Small Islands and UNESCO (1994)

The International Marine Science (IMS) newsletter is a quarterly newsletter published by UNESCO, in collaboration with the UN, FAO, IMO and WMO. The purpose is to inform governments and scientific institutions of international marine science activities, in particular those of UNESCO and IOC. In the first semester of 1994, a Special Small Islands Issue of the newsletter (No. 69-70) looks at representative aspects of the ensemble of the programmes of UNESCO which are relevant to the problems facing small island developing states. Following a scene-setting overview on conditions facing the environment and development of small island states, and UNESCO's overall role, the newsletter reviews two decades of research and training on coastal and marine systems, undertaken within the co-ordinated marine science programme of the organization. Insights are provided on a range of research and training activities within the framework of the Coastal Marine (COMAR) Programme and the Intergovernmental Oceanographic Commission, including an account of an IOC workshop on small island oceanography held in Martinique in November 1993. There follow introductions to other science-based activities of UNESCO relating to hydrology and water resources, the ecology of island systems, and ocean energy sources. The feature also includes information on some fields that may be less well-known to the IMS's mainly marine-science-oriented readers, reflecting the call from many public and private quarters to promote inter- or transdisciplinary approaches to issues of small island development. In this vein, information is presented on UNESCO's work in island settings in such domains as educational planning, human settlements, communications, and cultural development. Articles on islands in other UNESCO periodicals (*UNESCO Sources*, *UNESCO Courier*, *Nature & Resources*) are also flagged.

- Enquiries to the Editor, International Marine Science Newsletter.

Courier 'Greenwatch' Feature on Small Islands (1994)

The UNESCO Courier - published monthly in 32 languages and Braille - has carried a fair number of articles on small islands in its forty-seven years of publication. Some are referenced on pages 114-119 of this report. Most recently, the March 1994 issue carried a feature entitled 'Small islands : the dream and the reality'*, in its regular 'Greenwatch' section. The article touches on some of the key issues in small-island development, drawing on examples from UNESCO-sponsored programmes related to resource use, water and waste, energy, local cultures, education, conservation of the world's natural and cultural heritage. Also included are insights to such initiatives as INSULA, Archipel, Vaka Moana, and 'Adopting an Atoll'.

- Small islands: dreams and realities. *UNESCO Courier* (March 1994): 23-25. Enquiries to the Editor, *UNESCO Courier.*

ANNEX 4
Glossary of acronyms

ADB	Asian Development Bank
AIBD	Asia-Pacific Institute for Broadcasting Development (Kuala Lumpur)
AMIC	Asian Mass Communication Research and Information Centre (Singapore)
AOSIS	Alliance of Small Island States
ASPEI	Association of South Pacific Environmental Institutions
BIOTROP	Regional Centre for Tropical Biology (SEAMEO) (Bogor)
CANA	Caribbean News Agency
CARICOM	Caribbean Community
CARICOMP	Caribbean Coastal Marine Productivity Network (UNESCO-COMAR)
CARIMAC	Caribbean Institute of Mass Communication (Kingston)
CDERA	Caribbean Disaster Emergency and Relief Agency
CPTC	Creative Production and Training Centre (Jamaica)
CNRS	Centre National de la Recherche Scientifique (France)
COMAR	Coastal Marine Programme (UNESCO)
ECLAC	Economic Commission for Latin America and the Caribbean (UN)
EEC	European Economic Community
EEZ	Exclusive Economic Zone
ESCAP	Economic and Social Commission for Asia and the Pacific (UN)
FAO	Food and Agriculture Organization of the United Nations
GCOS	Global Climate Observing System
GEF	Global Environment Facility
GESAMP	Group of Experts on the Scientific Aspects of Marine Pollution
GLOSS	Global Sea-Level Observing System
GOOS	Global Ocean Observing System
IABO	International Association of Biological Oceanography (IUBS)
ICSU	International Council of Scientific Unions (NGO)
IGCP	International Geological Correlation Programme (UNESCO-IUGS)
IHP	International Hydrological Programme (UNESCO)
IICMSD	International Institute for Comparative Music Studies and Documentation (Berlin)
IIEP	International Institute for Educational Planning
IMC	International Music Council (NGO)
IMO	International Maritime Organization
INSULA	International Scientific Council for Island Development (NGO)
IOC	Intergovernmental Oceanographic Commission of UNESCO
IPCC	Intergovernmental Panel on Climate Change
IPDC	International Programme for the Development of Communication (UNESCO)
IUBS	International Union of Biological Sciences (ICSU)
IUGS	International Union of Geological Sciences (ICSU)
ITU	International Technological University
ITU	International Telecommunication Union
IUCN	World Conservation Union (formerly International Union for Conservation of Nature and Natural Resources)
MAB	Man and the Biosphere Programme (UNESCO)
NAFTI	National Film and Television Institute of Ghana
NGO	Non-Governmental Organization
PACBROAD	Pacific Broadcasting Training and Development Project (IPDC)
PACIDEV	Pacific Island Fund for Sustainable Development
PACJOUR	Pacific Journalism Training and Development of the Printed Media Project (IPDC)
PACTEL	Pacific Regional Television Survey Project (IPDC)
PACVIDEO	Pacific Video Training Project (IPDC)
PIDC	Pacific Island Developing Country
PIRADE	Pacific Island Regional Association for Distance Education
PSMSL	Permanent Service for Mean Sea Level
ORSTOM	Institut Français de Recherche Scientifique pour le Développement en Coopération (France)
RINSEAP	Regional Information Network for Asia and the Pacific (UNESCO)
SCOR	Scientific Committee on Oceanic Research
SEAMEO	South East Asian Ministers of Education Organization
SPACHEE	South Pacific Action Committee on the Human Environment and Ecology
SPC	South Pacific Commission
STREP	South Pacific Regional Environment Programme
TOGA	Tropical Oceans and Global Atmosphere
TRAMIL	Scientific Research and Popular Use of Medicinal Plants in the Caribbean (NGO)
TREDMAR	Training and Education in Coastal and Marine Sciences (UNESCO-COMAR)
UNCED	United Nations Conference on Environment and Development
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFPA	United Nations Fund for Population Activities
UNICEF	United Nations Children's Fund
UNU	United Nations University
URTNA	Union des Radios et des Télévisions Nationales en Afrique
US-AID	United States Agency for International Development
USP	University of the South Pacific
UWI	University of the West Indies
WHO	World Health Organization (UN)
WMO	World Meteorological Organization (UN)
WOCE	World Ocean Circulation Experiment
WWF	World-Wide Fund for Nature (NGO)

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