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PREFACE

Ten years ago the United Nations Conference on the Human Environment (Stockholm, 5-16 June 1972) adopted the Action Plan for the Human Environment, including the General Principles for Assessment and Control of Marine Pollution. In the light of the results of the Stockholm Conference, the United Nations General Assembly decided to establish the United Nations Environment Programme (UNEP) to "serve as a focal point for environmental action and co-ordination within the United Nations system" (General Assembly resolution (XXVII) of 15 December 1972). The organizations of the United Nations system were invited "to adopt the measures that may be required to undertake concerted and co-ordinated programmes with regard to international environmental problems", and the "intergovernmental and non-governmental organizations that have an interest in the field of the environment" were also invited "to lend their full support and collaboration to the United Nations with a view to achieving the largest possible degree of co-operation and co-ordination". Subsequently, the Governing Council of UNEP chose "Oceans" as one of the priority areas in which it would focus efforts to fulfil its catalytic and co-ordinating role.

The Regional Seas Programme was initiated by UNEP in 1974. Since then the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources and has requested the development of regional action plans.

The Regional Seas Programme at present includes ten regions[1/] and has over 120 coastal States participating in it. It is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation and encompassing a comprehensive approach to combating environmental problems through the management of marine and coastal areas. Each regional action plan is formulated according to the needs of the region as perceived by the Governments concerned. It is designed to link assessment of the quality of the marine environment and the causes of its deterioration with activities for the management and development of the marine and coastal environment. The action plans promote the parallel development of regional legal agreements and of action-oriented programme activities[2/].

The idea for a regional South Pacific environment management programme came from the South Pacific Commission (SPC) in 1974. Consultations between SPC and UNEP led, in 1975, to the suggestion of organizing a South Pacific Conference on the Human Environment. The South Pacific Bureau for Economic Co-operation (SPEC) and the

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1/ Mediterranean, Kuwait Action Plan Region, West and Central Africa, Wider Caribbean, East Asian Seas, South-East Pacific, South Pacific, Red Sea and Gulf of Aden, East Africa and South-West Atlantic.

2/ UNEP: Achievements and planned development of UNEP's Regional Seas Programme and comparable programmes sponsored by other bodies. UNEP Regional Seas Reports and Studies No. 1. UNEP, 1982.

Economic and Social Commission for Asia and the Pacific (ESCAP) soon joined SPC's initiative and UNEP supported the development of what became known as the South Pacific Regional Environment Programme (SPREP) as part of its Regional Seas Programme.

A Co-ordinating Group, consisting of representatives from SPC, SPEC, ESCAP and UNEP, was established in 1980 to co-ordinate the preparations for the Conference. As part of these preparations, 18 "country reports" and 13 "topic reviews" were prepared identifying the environmental problems of individual countries and the region[3/].

This document is a reprint of the overview prepared on the basis of the "country reports" and the "topic reviews". It was presented to the Conference on the Human Environment in the South Pacific (Rarotonga, 8 - 11 March 1982) which adopted the Action Plan for Managing the Natural Resources and Environment of the South Pacific Region[4/].

3/ The Country Reports and Topic Reviews have been published by SPC in 1981 and are available from SPC, Noumea, New Caledonia.

4/ SPC/SPEC/ESCAP/UNEP: Action Plan for managing the natural resources and environment of the South Pacific Region. UNEP Regional Seas Reports and Studies No. 29. UNEP, 1983.

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Introduction

The South Pacific Regional Environment Programme has collected enough information through country reports and topic reviews to make a summary overview of the state of the environment in the South Pacific region. It is thus possible to examine the shared heritage of land, sea and living things that is common to all South Pacific peoples, as well as the environmental problems that are becoming widespread in the region. This overview can provide the basis for shared approaches to environmental management and problem-solving.

The environmental approach is now widely recognized and used throughout the world. The environment refers to all our surroundings, especially those affecting people or other living things. Thus, it includes the land, sea and air, the plants, animals and micro-organisms, the weather and seasons, the houses and towns that we build, and everything else made by man or nature that can have an effect on our lives. We depend on the environment for development and for our very survival. When we must look at a project and determine the value, cost and likelihood of its environmental effects or impacts, we make an environmental assessment. Man has long used and manipulated the natural world for his benefit. As we become aware of the importance of the whole environment to our well-being and our dependence on it, we must learn what actions we can take to maintain effective control of our environment and natural resources through environmental management.

Underlying the concept of the environment is the science of ecology which studies the relationships between living things and their environment. It originated as a branch of biology, but now shares many features with other sciences such as geography and anthropology. Ecology includes the study of individual organisms, of communities, and of ecosystems, which are the working ecological systems consisting of communities of living things in interaction with their physical environment.

For many people, the environment means only the conservation of nature and the prevention of pollution by harmful or offensive substances that make some part of the environment dirty or dangerous. However, the World Conservation Strategy defines conservation as "the management of human use of the biosphere (all life on the earth) so that it may yield the greatest sustainable benefit to present generations while maintaining its potential to meet the needs and aspirations of future generations". The environment itself is now seen to involve all aspects of natural resource management and the human habitat, or places where we live.

The common environmental heritage of the South Pacific

All the countries and territories in the South Pacific Commission area from Papua New Guinea to Pitcairn share a common environmental heritage as islands originating through certain common processes. Some islands in the western part of the region are based on fragments of continental rock that have broken off from larger land masses, while the remainder have volcanoes rising from the sea floor as their foundations. Limestone deposits from coral reef growth may occur on either base.

Changes in the relative sea level in past ages from the rising and falling of both the sea bottom and the ocean surface have produced the four island types characteristic of the region. The larger continental islands have complex geology and landforms. The volcanic islands built of lava and volcanic ash vary principally according to their age and the amount of weathering. Elevated reef islands are atolls or reefs raised above the sea surface, with or without overlying soil deposits from volcanic ash or other non-reef origin. Atolls and other low islands are made of sand and coral rubble accumulated on reef platforms at or near sea level. The different island types occur in many combinations throughout the region, and are often mixed on the same island.

Each island type has its particular environmental problems and susceptibilities which tend to be common to areas of that type, a fact which can facilitate the regional exchange of experience and information.

All of the region is within the area of coral reef growth, and the presence of coral reefs is one of the principal characteristics of the South Pacific marine environment. Coral reefs are one of the most ancient and highly-evolved ecosystems on earth, and as such they are complex, dynamic, and fragile if pushed beyond their limits. The Indo-Malaysian area is the centre of coral reef evolution and diversity, so that the reefs are richest to the west of the South Pacific region, and the number of species present gets smaller to the east. The coral reef ecosystem is still not well understood. For instance, recent studies have shown that corals and reef communities can change greatly in even a very short time. It will be possible to develop principles for managing the coral reef environment only by sharing information and experience from all reef areas.

The land plants and animals of islands are subject to special evolutionary pressures that make island flora and fauna unique in the world. The ocean isolates island populations from the major continents. Some continental islands have kept communities that are relics from the time when they were part of a continent in the distant past. Most islands were colonized by immigrant species that managed to cross the sea, often through a rare accident. Because islands are small and their populations restricted, a natural disaster can easily make a local species extinct. The balance of immigration and extinction depends on the size of the island and its distance from other islands and continents and determines how many kinds of plants and animals an island will have.

Because islands are small and isolated, the species that colonize them face different conditions and have less competition than in larger land areas. This leads to rapid evolution into new species with special features adapted just to that island and found nowhere else in the world. Most high islands in the Pacific have at least some such species, and some have very high levels of species found only on that island group (80% or more). These species are an important part of both the island system and the world biological heritage, and as such their preservation is of great importance. While in most instances species conservation will be a national responsibility, the experience gained in managing one species will be valuable to other countries facing similar problems.

Island species do not live in complete isolation. They make up communities and ecosystems such as a mountain forest, swamp or barrier reef in which each species depends on others for its food, its shelter, its reproduction and often its very survival. Conservation and environmental management must thus focus largely at the ecosystem level.

The Regional Ecosystems Survey of the South Pacific Area (SPC Technical Paper No. 179) estimates that there are roughly 2,000 kinds of ecosystems in the South Pacific area. Some of these occur in every country of the region, and others may be highly localized in a single valley, lake or lagoon. Many of these ecosystems are critical habitats where commercially important species live or breed, and others are essential to island resources upon which local people depend. Their conservation is necessary for the physical and economic well-being of the inhabitants.

Even where ecosystems differ from country to country, they share many common features based on ecosystem and island type which allow the development of regional approaches to their management.

While the Pacific Ocean divides the South Pacific countries, it also unites them in a single environmental system. The waves, currents and weather do not respect national boundaries, and any major alteration or contamination could have widespread effects. The resources of this regional ecosystem are shared by all the countries. Migratory species such as the tunas, sea turtles and many birds pass in and out of many countries' jurisdictions. One country may bear the responsibility of protecting a breeding area, while another benefits from the harvest. Very little is known about the ocean transport of juvenile marine life. The population balance of marine life on an island may depend on a supply of spores or larvae from other islands up the current. The more the regional ocean system is studied, the more interactions are certain to be discovered. Co-ordinated approaches to ocean resource management are therefore essential.

Environmental management is not a new concept for Pacific peoples. Wherever natural resource management was needed, the traditional cultures of the region developed practices which protected their essential interests. These included land and reef tenure systems, permanent and temporary taboos on species or places, refined and selective fishing techniques, agroforestry, terracing and irrigation, windbrakes, bush fallow, and other agricultural and soil management practices, etc. The cultural heritage of the Pacific is full of examples of sound environmental management equivalent or superior to modern methods. One of the great tragedies of the region is that this heritage is rapidly being lost just as the need for it is increasingly apparent.

The State of the Environment

The South Pacific has too often been viewed from outside as an unspoiled tropical paradise. It is true that life in the Pacific Islands is not as difficult as that in many other parts of the world, and that the climate and available resources permitted a quality of life that was traditionally higher than many other subsistence societies. However, even traditional island communities were limited by their environmental resources, and change and development have led to an increasing number of environmental problems.

The country reports and topic reviews prepared for the South Pacific Regional Environment Programme(*) indicate the priority problem areas that affect the state of the environment in the South Pacific region.

SOILS. Soil is the essential basis of agriculture and forestry, and in the islands it often limits both development and self-sufficiency. Under the bush fallow system of subsistence farming, soil fertility was largely maintained, but more intensive agriculture and the pressures to clear and use land with marginal or unsuitable soils have led to serious soil problems in some parts of nearly all countries of the region.

Over 60% of the countries report soil erosion problems, generally associated with agriculture or pasture creation on steep slopes, timber extraction in forest areas, or other land clearing and construction activities. The loss of soil fertility and organic matter and the deterioration of soil structure, both in cleared tropical forest soils and the very porous and poor soils derived from coral, are evident in the majority of countries. Since the vulnerable island soils are an essential natural resource that cannot easily be replaced, these losses represent an important permanent reduction in island productive capacity. Careful soil management is therefore necessary where the natural vegetation and soil cycle are modified. The soils are generally well characterized and mapped throughout the region (although not to a common soils classification), but the available knowledge in managing similar soils has not been well applied locally.

MINERALS. The most commonly used minerals in the islands are sand and aggregate used for construction. Supplies of these materials are often limited in the smaller islands, and more than half the countries report environmental problems associated with their extraction. Quarrying leaves pits and cuts that are difficult to restore. Sand removal from beaches leads to beach loss and coastal erosion. Dredging of sand and coral from the reef or lagoon bottom destroys productive fisheries resources and produces pollution.

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*: SPREP country reports : (1) American Samoa, (2) Australia, (3) Cook Islands, (4) Fiji, (5) French Polynesia, (6) Guam, (7) Kiribati, (8) New Caledonia, (9) Niue, (10) Papua New Guinea, (11) Pitcairn, (12) Tokelau, (13) Tonga, (14) TTPI, (15) Vanuatu, (16) Western Samoa, (17) Solomon Islands, (18) Tuvalu. SPREP Topic Reviews : (1) Mining Pollution, (2) Parks and Reserves, (3) Urbanization, (4) Managing Island Reef and Lagoon Ecosystems, (5) Mangrove resources and Management, (6) Environmental Health in Rural Development, (7) Soils, (8) Forestry, (9) Oceanic Fisheries Impact, (10) Pest and Pesticide Control, (11) Marine Pollution, (12) Activities of the IMCO relating to Marine Pollution, (13) Environmental Protection Legislations.

The need to obtain construction materials without serious environmental costs has become a major preoccupation in several South Pacific countries. Other minerals are economically important for some countries which have major mining projects for copper, nickel, phosphates, gold and other metals. Most of these projects were started at a time of little environmental concern, and have led to major problems of land degradation, mine waste and tailings disposal, and erosion. 30% of the countries in the region report problems of this sort.

WATER. Water is, of course, essential for life, and it is often one of the most limited island resources. More than 60% of the countries report some problem of water shortage. The problem has become worse as many water resources have been poorly managed in the past. Rivers and lakes have been polluted and their water quality degraded. Water catchments have been poorly managed and often cleared of vegetation. Those areas dependent on catching rain water find the supply inadequate during droughts and that catchment systems have maintenance and pollution problems. Some islands are dependent on groundwater and others are increasingly turning to their groundwater resources, requiring expensive wells and pumping. There are an increasing number of problems in the islands of groundwater pollution , and of over-use leading to contamination with seawater. Changes in land use have interfered with the recharge of groundwater reserves, and increased the risk of contamination accidents. Since water is essential for most kinds of development, increasing care will be needed to manage existing island water supplies wisely.

FORESTS. Most South Pacific islands were originally covered by tropical forest. It is the forest that maintains soil fertility, stabilizes the water supply, and provides wood and other materials for the local population. With development of the islands, most coastal and lowland forests have been converted to other uses, and there is increasing forest clearance in higher areas. Forest loss is cited as a significant problem in 70% of the country reports. The forest is cut both to clear land for agriculture and other uses, and for commercial logging. Some is also lost through fire and storm damage. With the destruction of the forest cover come problems of erosion, loss of soil fertility, soil compaction by heavy equipment, lack of adequate forest regeneration, and the expense and difficulty of reafforestation. In many countries, the forest harvest is inadequate to meet even local demand. Others export considerable volumes of unprocessed logs. There is some controversy over the economic benefits to the islands of large scale logging, with its major local impacts on land resources and coastal areas. Smaller-scale projects may be more appropriate both for island economies and cultures, and for the island environment. Several countries report problems of frequent grassland and forest fires which degrade the land and destroy forest resources. The tropical forest can either be treated as a non-renewable resource and "mined" for its immediate economic value, or managed as a sustainable resource from which the economic and environmental returns can continue indefinitely.

CONSERVATION of FAUNA and FLORA. The unique island natural heritage of plants and animals has been discussed in the first part of this report. Considerable progress has been made over the last decade to conserve some of this heritage, and over 100 parks and reserves have been created in some 15 countries of the region. However, these protected areas still include only a small proportion of the fauna, flora, unique sites, and ecosystems of the South Pacific region. Furthermore, enforcement of existing conservation laws and protected areas is often difficult. Many extinctions of unique plant, animal and bird species have already been caused by man in the islands, and more species are endangered by extinction now. Two-thirds of the countries report problems with endangered species. A much greater effort is therefore needed to ensure the survival of this unique natural heritage of world significance. Such conservation projects are important not only for resource management, but also for tourism and education. The Convention on Conservation of Nature in the South Pacific will assist regional co-operation in conservation once it comes into force.

CROPS and LIVESTOCK. While agriculture is of great subsistence and commercial importance to all the South Pacific, and soil and water problems are very important, there seem to be few environmental problems associated with the small number of kinds of crops and livestock that are commonly raised in the region. The small population of many introduced species means that they have a weak genetic base through in-breeding, requiring importation of breeding stocks from outside. On the other hand, some traditional crops have an existing diversity and adaptability to local conditions, which could be lost with agricultural modernization. Because of the great environmental problems created by certain past introductions, the countries of the region have established strict quarantine procedures to protect their vulnerable agricultural base. Introduced plants, birds and predators have raised havoc among the local flora and fauna, and require continuing expensive control efforts. On some islands, feral animals descended from escaped domestic stock have destroyed much of the vegetation and caused serious erosion problems. Some islands also report problems in controlling dogs. It has proven much easier to destroy natural ecosystems than to create new balanced systems of species useful to man.

LAND USE and LAND TENURE. Land is the most important island resource; without it a country will cease to exist. Throughout the region the peoples' attachment to their land is very strong as reflected in traditional land tenure systems. These systems tended to encourage efficient use of land resources in the past, but now have difficulty in adapting to population growth and modern development requirements. Over half the island countries report environmental problems associated with land use and land tenure. These include problems from unplanned development, such as incompatible adjacent developments and inefficient use of limited land areas.

There has been a loss of essential land resources, such as from urban expansion on good agricultural land. In some places, areas of good land are left undeveloped, while in others, fragmented land holdings make agricultural modernization difficult. The European freehold system has not adapted well to island cultures and conditions, and new approaches to land tenure and land use may be needed to achieve the best management and use of this limited resource.

COASTAL ZONE. The area between land and sea is one of the most environmentally sensitive areas in all countries. This coastal zone includes both the land along the shore within sight of the sea and the shallow coastal waters within the range of terrestrial influences. Human activities tend to concentrate in the coastal zone, and most major cities are located there. In the Pacific, all except the largest islands consist entirely of coastal zones. These areas are subject to significant conflicts in uses with development, and about half the countries report coastal zone management problems. For instance, runoff from agriculture areas can hurt coastal fisheries. Nearly one-third of the countries report problems associated with the reclamation of coastal areas. Coastal erosion is also a significant problem, particularly for the atolls that occur in one-third of the countries of the region. A major problem for governments in managing the coastal zone is in co-ordinating the many different government departments and ministries that have some jurisdiction there. Some countries have established coastal zone management bodies to resolve this problem.

MANGROVES. Mangroves have been shown to be areas of high coastal productivity with great importance to coastal fisheries. They have long been important for subsistence fishing, firewood collection, and other uses. They are important in controlling coastal erosion, and in protecting islands against storm damage. While mangroves are sensitive to pollution, particularly from oil and chemicals, work in the region has shown that they can be useful in treating urban wastes under controlled conditions. For too long mangroves have been thought of as nasty swamps, and have therefore often been the first areas to be reclaimed or lost with development. As a result, some mangrove areas have been totally destroyed or have shrunk to the point where the remainder is critically important to the coastal zone. More than half the countries report problems in managing their mangrove resources.

REEFS and LAGOONS. The coral reefs and associated lagoons that are one of the characteristics of the South Pacific islands are a major resource now subject to serious environmental pressures. The coral reef ecosystem is highly productive, fragile and easily disturbed when pushed beyond its limits. The reports suggest that there is extensive degradation of reef and lagoon resources in the Pacific: nearly half the countries report reef damage from illegal dynamiting and poisoning for fish; three-quarters report problems of reef pollution, although scientifically the impacts of pollution on reefs are still largely unknown. Siltation and smothering of corals by land erosion and dredging are reported by one-third of the countries, and construction activities on reefs have destroyed further areas. Many reefs have been damaged over the last twenty years by the crown-of-thorns starfish, Acanthaster, and while this may largely have been a natural phenomenon, the present human disturbances of reefs may slow down or prevent their recovery. While much is still not known about reef and lagoon ecosystems, there is also considerable existing knowledge that is not well applied to managing reef and lagoon resources.

FISHERIES. Fishing is an important subsistence and commercial activity throughout the region. While many traditional fisheries were based on a deep knowledge of the resource and effective management procedures, these have largely lost their effectiveness and are disappearing as fisheries are modernized. However, there is inadequate scientific knowledge to manage most tropical coastal fisheries. The improvement in boats and modernization of fishing techniques is leading to extensive over-fishing in more than half the island countries, with the resulting subsistence and economic problems for local fishermen. Ciguatera fish poisoning continues to be a problem in many parts of the region, but with recent research progress on the causes, it may eventually be possible to improve this situation. The Pacific oceanic fisheries are subject to major commercial pressures of world economic importance. While some tunas may be near the maximum catch that they can sustain, there still seem to be considerable potential for the expansion of the skipjack fisheries. Unfortunately, here too, the wide ranging fish species are far from understood scientifically, and the limits of the resources are therefore not clear.

OCEAN. The open ocean between the Pacific islands is fortunately very large with considerable pollution absorption and purification capacity. There is no present evidence of major pollution problems, although some contamination by man-made persistent chemicals has occurred, and floating plastic may be a problem locally. Given the very limited waste disposal capacity on the islands, the ability of the ocean to absorb and neutralize wastes is a useful resource that should be developed with care.

HUMAN HABITATS. More than half the countries report environmental problems associated with the places people live, whether in cities or villages. The Pacific region has been fortunate that the basic traditional quality of life has been reasonably good. However, the rural to urban migration, the increasing expectations and desire for modernization, and the deterioration of resources with over-use, have produced localized but increasing difficulties. The country reports refer to increasing water supply, sanitation and pollution problems, to some sub-standard insanitary housing, to urban development in unsuitable areas with a high risk of damage in natural disasters, to the destruction of the coastal environment near urban centres, and to other problems of the human environment. About half the countries report problems in planning their human settlements, and the few planning controls that exist are generally inadequate and difficult to enforce. Fortunately, the small size of most island communities has kept the problems within limits.

ENERGY. Many countries are concerned that their economic development has led to an increasing dependence on expensive imported energy. However, the presently available technologies for utilizing local renewable energy resources such as the sun and wind are still expensive and limited in their application. Wood and other local fuels for cooking are becoming limited in some islands with the over-exploitation of local resources.

WASTE DISPOSAL. The most important environmental problem in the region in terms of the number of countries affected is the disposal of the wastes resulting from both population concentration and imported materials. Over 60% of the countries report problems in disposing of solid wastes, particularly cars, appliances, cans, bottles, etc. Disposal sites for these non-degradable materials are limited, and are often poorly managed. The disposal of liquid wastes, particularly human wastes, is a problem in 90% of the countries. Systems for the collection and treatment of these wastes are costly and difficult to maintain. Presently used systems such as septic tanks are often inadequate due to poor design and lack of maintenance. In spite of great efforts at rural sanitation, facilities are still rudimentary or entirely lacking in many rural areas. Most Pacific urban areas have local pollution problems with their attendent health risks. There are some serious but localized industrial waste disposal problems.

TOXIC CHEMICALS. With the worldwide concern about toxic chemicals such as pesticides, herbicides, and insecticides, it is normal that this problem is raised frequently in the region. The smaller the island, the greater the risk to its essential environmental resources from a toxic chemical accident. Many small accidents have already occurred in the region, but since there is little or no monitoring of toxic chemicals, their effects have gone largely unrecognized. Drums have rusted and leaked into soil and groundwater, cyclones have destroyed and spilled agricultural stores, and chemicals have intentionally been poured into streams and lagoons to kill fish. Some countries have unwanted chemicals that they cannot safely dispose of. There have been poisonings from inadequate packaging and labelling. As toxic chemicals are used in increasing quantities in agriculture and to control disease-carrying insects, there are increasing risks of pollution and of residues in food crops. More than half the countries report environmental problems associated with toxic chemical use. It is evident that such dangerous materials must be selected, stored, and used with wisdom, with a much greater knowledge of local conditions than often exists at present.

OIL POLLUTION. While the South Pacific region is not on major tanker routes, about one quarter of the countries report existing oil pollution problems. There are small oil spills from port accidents, leaks in pipelines or storage depots, and shipwrecks. These spills have fortunately only affected small areas, extending to a few kilometres of coastline at most. Since tankers of some size do deliver oil supplies to the region, the risk of a large spill is small but present. There is little capacity in the region to control oil spills or to respond quickly in the event of a major accident. Over 80% of the countries are concerned about the effects on their resources of such a major spill, and there is therefore great interest in contingency planning for oil pollution control.

RADIOACTIVITY. The problems of radioactive pollution in the region have long been a subject of political discussion and concern. There is natural radioactivity on Niue, and residual contamination on some islands from earlier nuclear weapons testing programmes. While there is great concern about current and potential sources of contamination, especially the proposed dumping or storage of nuclear wastes near or in the region, there is little real information available to island countries about the risks of radioactive pollution. Since the greatest fear is fear of the unknown, further studies and public education would help to provide a regional basis for action.

AIR POLLUTION. The scale of human activities is very small relative to the size of the South Pacific, and therefore there is no regional air pollution problem. However, half the countries report localized air pollution, mostly in urban areas or associated with particular industries.

POPULATION. It is not possible to generalize about the human population situation in the South Pacific region. Some islands have an increasing population; others a stable or even decreasing population as a result of emigration. Within a country, the movement of people to the capital or urban centres may be depopulating the rural areas or outer islands. Nevertheless, islands, because of their small size, are limited in the number of people they can support, and over 60% of the countries report some concern about their population growth or the carrying capacity of their islands. Fortunately, actual cases of serious overcrowding are rare and localized in the Pacific region at the moment.

Development trends and their environmental consequences

As development continues in the Pacific islands, it will be important to look not only at the direct environmental effects of particular projects, but also at the interaction between different projects that may affect the same resources or the overall system. The SPREP country reports give a summary of development trends and thus give an idea of possible environmental problems to come.

AGRICULTURE. The limited land area of many islands and the distance from potential markets mean that most agricultural development is directed towards import substitution and only small-scale expansion of existing export crops. There should therefore be a slow advance in conventional agriculture for meat and food crops, with some further development of food processing industries near to the production sites. On those islands where large land resources are available for agricultural development, there is some unease that mistakes made elsewhere in developing unsuitable land or in establishing unsuitable types of agriculture should not be repeated on the Pacific's vulnerable soils. There is interest in the potential of perennial crops in the region, minimizing the need for cultivation, exposed soil surfaces, and radical changes to the soil organic cycles. The matching of crop to soil conditions will be a basic requirement for the maintenance of soil nutrients, structure and productivity. The use of agricultural chemicals such as fertilizers and pesticides is increasing, and there is concern about their effects on the small island and lagoon systems. There will probably be an increasing number of accidents with such chemicals, leading to increasing controls on their use.

FORESTRY. In those countries with significant timber resources, forests are coming under increasing pressure from external interests seeking wood as timber and as a raw material. Because of the importance of forest to conservation and to soil and water management, forest exploitation projects will need to be looked at with great care.

Bad experiences with large-scale forestry projects may lead to smaller-scale operations more suited to the island situation. The establishment of means of ensuring the balanced management of the forest resource to provide for sustainability while taking an economic crop is an urgent and critical need in the region. The control of forest clearing and reafforestation are both made complicated by land tenure systems which leave customary owners complete freedom of land use. In those countries where land is available, timber production and processing will be developed with increasing emphasis on plantation forest, often of exotic species, managed for sustained yield. There will be increasing problems of balancing land uses for forestry and for agriculture and other purposes. The responsible management of the forest resource is probably the most urgent environmental issue facing many Pacific countries at the present time.

MINING. Mining will continue to be a very important form of resource use in several countries, and some which have not previously exploited mineral resources consider that mining development is likely. Off-shore petroleum exploration can be expected to increase. While mining has brought great economic prosperity to some countries, it has had substantial and devastating local environmental effects. With increasing international interest in minerals, several countries stress the need to establish more effective means of ensuring that in future mining proposals are assessed for environmental impact and that environmental safeguards are included in development approvals. It is important that governments throughout the region should realize that the international mining industry now expects to live with stringent environmental protection requirements.

FISHING. Fishing, traditionally in-shore in the lagoons and on the reefs, is now moving into deeper water, increasing the available fish resource. Though the open ocean fishery itself probably has little environmental impact in the region, the increasing on-shore processing of off-shore catches and the in-shore catching of live bait introduce environmental issues. The management of coastal fisheries will become an increasing concern as overfishing and coastal development impacts deplete the resource. Aquaculture has so far shown little commercial promise in the region and will probably develop only slowly. There will be difficult choices involved in developing coastal areas for aquaculture or for for other uses.

RURAL DEVELOPMENT. Development in the rural areas is a widespread priority in the region. As it proceeds, there will be increasing conflicts between different land uses for agriculture, forestry, water catchment, conservation, etc. There will be an increasing need to achieve a greater degree of compatibility between the traditional land tenure systems and more effective land and resource planning. The control of forestry and mining operations, watershed management, conservation of fauna and flora, and soil conservation must be on a legal basis totally different from a country using a freehold land title system.

The alternative will be continued deterioration of essential island resources. Governments will need to develop comprehensive planning including physical plans based on inventories of critical resources. The major environmental health problems in villages will be overcome through a considerable investment in rural infrastructure.

URBANIZATION. Urban development through the movement of people from the rural areas to government and commercial centres is a major trend cited in the country reports. With continuing urbanization, there will be an increase in conditions of overcrowding, poor housing, waste disposal difficulties, and a generally poor human environment, where growth outstrips the capacity of countries to provide housing and support services. Urbanization also increases expensive energy consumption. The need to provide employment for urban dwellers leads to a concentration of industrial development and its associated pollution. The increasing population pressures in the region will largely be reflected in towns and cities. Some countries are concerned about the possible return of large numbers of overseas emigrants, and these too would tend to settle in urban centres. The continued development of infrastructure projects such as roads, ports, and airports, will have some environmental impact.

INDUSTRY. There will be further major industrial projects associated with the processing of minerals, fish, and agricultural products. Smaller-scale industries may develop for import substitution in some countries. Processing industries will have to be required to incorporate the best anti-pollution technologies available into their design, as they are required to do in many other parts of the world. OECD work has shown that such technologies are not crippling financially, especially when incorporated into the initial design and not added as an after-design requirement.

TOURISM. Tourism, with its associated accommodation, transport, and support services, is considered likely to be highly important in many parts of the region, though several countries have stipulated that such development will be cautious, gradual and carefully planned. Emphasis is placed on attracting Japanese tourists in the northwest part of the region, the Americans in the central and northeast, and the Australian and New Zealand tourists in the south. A mixing of all sources plus tourists from Europe and Southeast Asia is envisaged for the whole region. The development of tourism will require the development and protection of island amenities and tourist sites so that the industry does not destroy the very qualities that attract tourists to the region. As the competition for tourists increases, there will be an emphasis on appropriate types of tourism development, and on better planning of tourist infrastructure such as beaches and parks.

ENERGY. The high price of fossil energy is forcing attention on other forms of renewable energy, and hydro-electric development is being planned in many areas. Such projects will require careful consideration to minimize environmental costs. Energy farming based on exotic tree crops, cassava, or sugar cane for alcohol fuels is being considered seriously and could bring a new surge of development to tropical agriculture and tree cropping. Tree planting for fuel wood is also possible. Skilled and well-informed management of the land will be necessary if this is to avoid soil erosion and other deterioration. Competition with other essential land uses will also be a problem. Some smaller islands may divert copra production into coconut oil based fuels. The cutting of the existing native forests for energy is being proposed, but both the sustainability of this resource and the impact on native species should be carefully examined. There will be an increased use of solar energy where the considerable investment makes this practical. The wider use of wind, wave and ocean thermal energy must await the development of economic technologies at an appropriate scale for the region.

OCEAN POLLUTION. There are increasing pressures for the dumping in the Pacific Ocean of nuclear and other toxic wastes originating in the industrialized countries. Such dumping will create a risk of contamination, particularly through oceanic food chains. With increased oil exploration and transportation, the risk of major oil spills is also growing. A spill in the wrong place could be disastrous for an island country's marine resources. There will be potential pollution dangers from the mining of sea bottom minerals, and disruption to marine ecology from the exploitation of ocean thermal energy differences. Careful consideration will need to be given to regional ocean dumping and pollution regulations, to permit ocean disposal by island countries of non-toxic wastes they cannot dispose of on their limited land areas, while prohibiting the kinds of dumping that threaten the regional environment.

THE ISLAND SYSTEM. The greatest environmental problem facing the countries of the region will be to balance the different requirements of their island system. More than 60% of the countries are already concerned that they are approaching their carrying capacity. It is therefore essential to determine what will be the most limited resources, and to plan carefully to ensure that all the peoples' needs can be met on a sustainable basis. The coastal zone will need to be a particular focus of attention, with new legal controls and co-ordinated government action to plan and manage this vital sector of the environment. It will be necessary for governments to choose appropriate kinds of development and to be conscious that some developments may be impossible in their island situation.

The contribution of environmental management to development

The SPREP country reports indicate that environmental management is becoming increasingly integrated into governmental concerns and development plans, although the means to implement government desires in this area are far from adequate. The following section summarizes the state of the environmental management capacity of countries of the region.

An effective national programme of environmental management should include the formulation of government policy and the adoption of appropriate legislative modifications and administrative procedures to implement that policy. The government needs to know the present state of its resources and environment and what is happening to them, requiring assessment, scientific information, research and monitoring. On the basis of the available information, plans need to be adopted or modified and the planning process itself developed, and actions need to be undertaken through development, control and conservation projects. The whole process requires education of the general public, the training of personnel and/or the use of outside experts, and the development of facilities and equipment.

POLICY. The country reports reflect a high degree of policy commitment to environmental protection and enhancement, but a good deal of concern about how such policies can be implemented. Most countries are mindful of the relevance of environmental issues in development planning, but have real difficulty in expressing environmental policy in terms of economic development plans. As in most other countries, the reconciliation of sustainable economic advancement with social compatibility and environmental protection and enhancement is a critical process which is difficult to attain - perhaps this is especially so in many Pacific countries because anticipatory policies are needed more than curative policies.

There is a traditional feeling for wise environmental management among most Pacific peoples. Because islands are small-scale fragile ecosystems, many village customs and unwritten rules of behaviour have been based on inbuilt concern for environmental protection. These traditions can be readily incorporated in government policies, but the balancing of these against the new values of economic development and the values of other cultures is an extremely difficult political process.

Specific references in the country reports indicate a surprisingly widespread application of policy through formal planning processes. There are many references to economic development plans, to outdoor recreation plans, to coastal zone planning, and to energy planning. Some country reports indicate that these planning processes are longstanding - referring to the fourth five-year plan - and the later versions of these plans all seem to recognize environmental protection and enhancement as one of the national objectives that must be secured within the prime objective of economic development.

There is frequent reference to the relative ease of developing single objective policies, but the great difficulty is achieving the co-ordination at both formulation and implementation stages which is necessary to establish and achieve truly multi-objective policies.

The experience of Banaba has made a deep impression on some countries providing an object lesson on the ultimate effects of policies weighted substantially to economic objectives. Cultural values and traditions have been prominent in most country statements on policies which generally can be summed up as "seeking the development of natural resources with sensitivity to cultural traditions and values, and with compatibility to the protection and enhancement of the physical and social environment".

LEGISLATION. There is a great deal of environmental legislation in Pacific countries, reflecting the care which has traditionally been required to maintain environmental quality in small isolated ecosystems. Water management, especially the protection of water supply catchments and aquafers from pollution and excessive draw-off, the control of animal and plant introductions, wildlife conservation often in relation to hunting, forest protection, and park and reserve establishment - these issues are covered by legislation in many countries. Legislation for the environmental assessment of development projects and the control of pollution and toxic chemicals is less common. Some reports stated that the legislative base is adequate, if the will and ability to apply the law were stronger - and this might well generally apply to the region as a whole. For regulating environmental management in relation to pressures from within the region, existing laws complemented by traditional customs and unwritten rules of conduct may well be adequate if their application and enforcement can be improved. But there is real concern that in dealing wisely with outside pressures for the use of resources such as minerals and timber a much firmer legal base may be necessary in many countries. No country appears to have an environmental statute which completely meets its needs, probably because many have been modelled on examples only marginally relevant to their circumstances. Emphasis often lies on the aesthetics of environmental protection rather than the imperative of resource conservation.

The reports reflect a keenness to work together on legislation for environmental protection both in the field of international conventions and in the design of national laws. The effective implementation of the Regional Plant Protection Convention illustrates the value of a regional approach, and several reports have suggested that advice and assistance would be welcome in clarifying the responsibilities, advantages and disadvantages, of adherence to a range of international environmental conventions.

There is concern that legislation to control the exploitation of biological resources on land and in coastal waters is difficult to design because of inadequate knowledge of the biological processes involved, and is difficult to implement because of traditional freedoms and to police because of the large areas involved.

ADMINISTRATION. The administrative arrangements necessary to implement national environmental policies differ considerably among countries. Some countries have a council or a committee or a secretary to develop policy, and its implementation is in the hands of the operating agencies. Some regard the policy development body as "the environmental watchdog" also. Other countries have an environmental protection board which has direct control of environmental matters by regulation, permit, and classification. In some countries "conservation" is set aside as the specific responsibility of one department, with other aspects of environmental management spread throughout the government system. At this stage, the policy development activity seems to be more effective than the system for incorporating that policy into planning.

There is widespread concern about lack of effective co-ordination and almost all countries are seeking advice or guidelines in this area. Both at policy level and at the individual project level the incorporation of environmental values and the results of environmental assessments present real difficulties. The process is a complex piece of machinery of government in all countries, but it is made more difficult in Pacific countries because of the shortage of skills in environmental assessment, very limited experience in multi-objective planning, and some problems in modifying the administrative systems to receive a new input. There is also concern that a substantial additional bureaucracy might arise in incorporating environmental factors into national programmes. It should be possible to avoid this if the principles are clearly delineated and functions are clearly established and understood.

ASSESSMENT. Assessment means deciding on the value or worth of a project or activity, and must include not only economic, but also environmental and social costs and benefits. Adequate assessment is essential for sound government decision-making. Judgments of value must be made by skilled people based on information about the environment, resources and processes to be affected. Some of the necessary information is in the scientific and technical literature, but it is generally unavailable and in forms that cannot be used in the region without interpretation. Other information exists locally, but it is difficult to keep up to date. Much is simply not known at all, and will require further surveys and research. Bringing together and evaluating this information is one of the major challenges of environmental assessment.

There seems to be a general concern that there is very little expertise available in the region in environmental impact assessment or in translating environmental information into the planning process. This is to be expected, for it is a "second generation integrative function", and most of the countries of the region are still at a very early stage in developing their teams in the primary scientific disciplines. Several countries have requested guidelines for environmental assessment procedures and their incorporation into planning activities. There may be dangers in assuming that environmental impact assessments take care of environmental issues. In fact they only provide additional information for the decision-maker to take into account.

There is considerable uncertainty about the role of environmental assessment and its application to the decision-making process, because of the shortage of real expertise in both assessment and application processess. This is a "chicken and egg" situation in which recognition of assessment depends on high calibre expertise, and the availability of high calibre experts depends on recognition of the importance of their role.

In fields in which country reports indicate that assessment skills are likely to be needed in the near future, high priority is given to the effects of sedimentation and organic pollution on lagoons and reefs - an area in which the lack of basic knowledge of processes is limiting understanding. Soil deterioration consequent on unsuitable agricultural development has alerted some countries to inadequate assessment in this area, and the need for more skilful assessments in the future. The management of pesticides so that they are fully effective on their target without entering non-target areas of the environment necessarily involving development of integrated pest control techniques, is a matter of real concern in many countries. So is management of mangroves so that sufficient areas are retained in good condition to fulfill their key role in estuarine/lagoon/open sea biological systems. The control of coastal sediment movement to avoid coastal erosion also receives emphasis.

In human settlements, sewage disposal in unserviced areas, the effective disposal of non-biodegradable wastes and the avoidance of juxtaposition of incompatible land uses require assessment skills. The incorporation of tourism into island environments with the least practicable disturbance, and the minimizing and containing of the effects of mining and hydro-electric development will be major projects to be assessed in the near future.

Oil spillage from land-based installations, from off-shore exploration, and from ship and tanker accidents, is particularly serious in a coral reef/lagoon situation, and many countries have stressed the urgency of assessment and control measures. Major spills or leaks at sea would convert the open sea from a pollution-receiving sink of high capacity to a source of danger to the coastal zone on which people are so dependent. There is similar concern about the dumping of toxic materials (including nuclear wastes) in an ocean at present virtually unpolluted, and assessment skills of the highest order will be necessary if people are to have confidence in the evaluation of potential effects.

Overall, assessment of environmental impact of policies and projects in the Pacific region is well behind the basic data available, and the development of assessment skills relevant to these environments is urgent if future development is to be environmentally sound.

In those areas where knowledge is inadequate to make sound assessments, further research will need to be encouraged. Although the regional capacity for research fundamental to wise environmental management is limited, there are centres with active research programmes which provide the opportunity for co-operative work with many institutions and research workers from outside the region. The University of the South Pacific at Suva with the South Pacific Regional College of Agriculture at Alafua in Western Samoa, the University of Papua New Guinea at Port Moresby, the PNG University of Technology at Lae, and the University of Guam, all have research programmes operating in disciplines of environmental significance. Of particular relevance are the Marine Laboratory of the University of Guam, and the Atoll Research Unit of the University of the South Pacific in Kiribati.

The SPC's own research programme, ORSTOM and the Pasteur Institute in New Caledonia, and the local research programmes of government agencies add to a substantial research effort within the region. From countries peripheral to the region, universities and government agencies in Hawaii, Australia and New Zealand have many co-operative programmes, and the East-West Centre at Hawaii has a number of projects involving the region. There are some large internationally sponsored programmes operating in the area such as the SPC Tuna and Billfish Assessment Programme. There is a substantial body of information available on geology, soils, and vegetation, from surveys made over many years.

Overall, the picture is of quite extensive research activity, commanding a considerable measure of world interest and support, but based on unco-ordinated initiatives from a large number of institutions. At this stage, there seems to be a need for a reappraisal of research emphasis. For example, soil research should probably move from basic characterization towards interpretation according to the capacities and limitations of Pacific island soils, and thence to their suitability for various forms of agriculture and forestry use. On the other hand, reef and lagoon management lacks a well-documented understanding of the ecological processes taking place in this ecosystem, and if real progress is to be made, a concerted and co-ordinated effort in basic research is necessary. A well-presented programme would probably attract participation by research institutions of high standing and capacity.

The gradual extension of resource utilization into deep water fisheries is opening up new areas for research which can only practicably be carried out on a regional or international basis. The SPC Skipjack and Tuna Programmes illustrate how substantial progress can be made by a well-designed project and this could establish a pattern for future off-shore studies applied to other elements of marine resources.

A major lack is of information about the changes in the status of local resources and levels of pollution over time, as this knowledge is essential to determine the need and urgency for local corrective action. Simple monitoring programmes are needed to provide this information, particularly for forest and mangrove areas, land use, freshwater and coastal pollution, pesticide residues, endangered species, reef health and fisheries resources. Monitoring of water supplies is already carried out in most countries - mostly by public health authorities. The techniques and resources for such monitoring could perhaps be most economically co-ordinated on a regional basis.

MANAGEMENT APPROACHES. Once environmental assessments have been reviewed, decisions must be taken and implemented through a series of management actions. One of the most important areas for government action in environmental management is through comprehensive planning.

Most of the countries report on development plans which are an established element in their administration or are shortly to become so established. It is a sign of the rapid broadening of view that, though the earlier plans were solely economic, almost all of the later ones include environmental considerations, some with only a minor role, but some as a very important element of the overall plan.

As in most countries, single objective planning follows readily along established procedures, but the necessary co-ordination among government departments and other agencies is hard to achieve for multi-objective planning, such as for environmental protection and enhancement.

The standard of physical base data available to planning authorities is generally very adequate. There is good information on soils and geology, and in most areas aerial photographic cover is of a high standard. Biological data is much less available, and much less readily translated into planning terms. More work is required to develop useful planning tools such as map overlays that can help to synthesize data for planning purposes.

Though many countries have planning processes which include environmental impact procedures, in fact these are often not enforced or taken into account. The lack of local skilled and knowledgeable people, both to make assessments and to apply the information in making decisions, is a major handicap. In addition, procedures developed elsewhere are not easily scaled down to the small size of many island governments. This whole area seems to require considerable thought, consultation, and exploration, and could be suitable for regional collaboration in developing appropriate guidelines.

Action may also call for the modification of development projects, or their monitoring to ensure that decisions are respected and corrective actions taken if necessary. Where essential resources are threatened, protective measures may be in order. While some environmental measures may increae costs, it has been found that effective environmental management based on careful assessment and planning early in the conceptual stage of projects can often be more economical than unregulated development.

Reports indicate that in many places policy-makers consider environmental management to be concerned only with pollution controls and conservation measures rather than the balanced and efficient use of all natural resources. This misconception leads to a reluctance to incorporate environmental factors in management decision-making. In fact the ultimate goals of environmental management and development are the same : the improved welfare of the people on a sustainable basis.

There appears to be quite widespread doubt that present environmental procedures may be strong enough to withstand increasing pressure for rapid and sometimes unwise developments in the near future. The development of an environmental assessment process appropriate to Pacific island conditions is therefore urgent. In some countries, more rigorous planning is likely to be used - a difficult operation within the customary land tenure system. Coastal management plans, town plans, and even rural land use plans are contemplated. Disaster contingency plans are being worked on with widespread attention to plans for the control of oil spills. Regional oil spill contingency plans are advocated by many countries.

All except the largest islands are single integrated environmental systems, in which a change in forest cover or river flow, for instance, might damage a coastal fishery on the other side of the island. Government resource management approaches and planning must therefore be developed to cover the whole island system in an integrated fashion. Strengthening governments' capacity to do this will be a major priority in the years to come as resource use conflicts increase.

IMPLEMENTATION. Actions can only be carried out if there are people to do the work, and if the necessary equipment and facilities are available. Since much environmental management depends on the individual actions of many people in such things as caring for their land and disposing of their wastes properly, environmental education is important in the schools and for the general public. People skilled in monitoring, assessment, planning and decision-making are essential, either within the government, or available as outside experts when needed. The country reports have indicated the major requirements in these areas.

EDUCATION. Throughout the education system, through primary, secondary, and tertiary institutions and in the various media for public information and education, there is need for the provision of relevant basic material such as teaching aids. There is widespread concern expressed that much of the present teaching material is irrelevant to the island environment : where special material has been prepared by the SPC, it has been much appreciated, but even this does not apply to all different island situations.

It is not in fact practicable to provide individually tailored material for each country; the only solution is to improve teacher training so that this application stage can be handled more adequately.

The presence of active tertiary institutions within the region, all showing real interest in environmental questions and introducing environmental concepts in science teaching, will eventually lead to a re-focussing of teaching at all levels. But it will take time. In the interim, the supply of teaching materials, and well-presented information for radio and press seem the most effective measures to take. SPREP in itself will be a test of the effectiveness of public information and education methods in the region.

PERSONNEL. The country reports give a picture of development and change which is taking place at too fast a rate for the number of trained people available and their level of experience. There is a shortage of graduates in the area, and it seems especially difficult to retain them in the environment field.

Research, planning, assessment and management are all short of the type of people necessary to make the decisions which are now being forced on the region.

Two areas of special concern which arise from country reports are the lack of skills in environmental assessment, and a lack of comprehensive experience in environmental legislation. Both these areas are critical to orderly development planning for the region, and both merit special consideration within the SPREP framework.

OUTSIDE EXPERTS. Most countries report that they have fairly ready access to outside experts either through bilateral arrangements (government to government, or institution to institution) or through the SPC or other international agencies. Long-term bilateral arrangements have been particularly productive : shorter-term consultancies have been productive when they have been concerned with a specific problem, which has been clearly defined. The ability to recognize the problem and define it clearly is a skill which must be developed within the countries if outside expert assistance is to be used effectively and efficiently.

Some interchange of experts within the region is developing, particularly fostered by SPC. This will lead to strengthening the regional concept, a comparison and pooling of knowledge, and a stimulation of experts who might otherwise become highly localized.

FACILITIES and EQUIPMENT. Though there are some centres in the region which have a reasonable range of basic equipment and adequate operating facilities (e.g. the universities, some government departments, and the SPC), it is inevitable that small independent countries should be very restricted in what they can afford to maintain or have the staff to operate. Most of the smaller countries have equipment for basic monitoring of essential aspects of the environment (usually public health) and many have arrangements with larger neighbouring countries, sometimes facilitated by SPC, for more sophisticated monitoring when it appears necessary.

Isolation from maintenance services also limits the degree of sophistication of equipment which is possible in many countries. The expense of special visits by service men, or long down-times waiting for regular maintenance calls make much useful equipment quite uneconomic in the Pacific.

Several country reports, however, suggest that the effective usefulness of existing equipment could be increased by better co-ordination of its use within the individual countries. Acceptable ways of ensuring that equipment is available on an inter-agency basis, rather than being held for its own use by only one agency, would be one low-cost means of improving effective equipment availability.

Equipment and personnel must be matched. Additional qualified technical people will inevitably require additional equipment - without it they will be ineffective and frustrated. Sophisticated equipment without the expert to plan its use and to operate it is wasted. It is important that countries recognize the costs involved in maintaining this essential balance.

Conclusions

This brief review of the state of the environment in the South Pacific based on reports from nearly all countries of the region demonstrates the importance of regional co-operation in environmental matters through activities such as the South Pacific Regional Environment Programme. All the countries share a common natural heritage, especially of similar island types, which provides the basis for shared experience. While the environmental situation in general is far from serious, there is no room for complacency. A series of increasingly widespread problems is reducing the productive capacity of island natural resources, endangering the health and well-being of the people, and increasing the risk of accidents. It is clear that some islands at least are getting closer to the limits of certain resources and thus to their capacity to support their inhabitants. It is also apparent that some problems and risks concern the whole region. It has long been accepted that "no man is an island", but today, no island is an island either.

The governments of the South Pacific region are concerned about these problems, as illustrated by the widespread support for SPREP. They are responding within the limits of their resources, but the Pacific is vast and complex relative to the small size of its human population. Most countries lack the knowledge, personnel and material means to implement what they see as necessary and desirable. It is not possible simply to transplant the elaborate environmental procedures developed elsewhere. More appropriate alternatives are required, perhaps combining national and regional elements. The Action Plan for SPREP will help to define the next steps to take to maintain and improve the South Pacific environment for the benefit of its people.

PUBLICATIONS IN THE UNEP REGIONAL SEAS REPORTS AND STUDIES SERIES

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No. 8 FAO/UNEP: Marine pollution in the East African region. (1982)

No. 9 WHO/UNEP: Public health problems in the coastal zone of the East African region. (1982)

No. 10 IMO/UNEP: Oil pollution control in the East African region. (1982)

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No. 15 UNEP: Guidelines and principles for the preparation and implementation of comprehensive action plans for the protection and development of marine and coastal areas of regional seas. (1982)

No. 16 GESAMP: The health of the oceans. (1982)

No. 17 UNEP: Regional Seas Programme: Legislative authority. (1985)

No. 18 UNEP: Regional Seas Programme: Workplan. (1982)

No. 19 Rev. 2. UNEP: UNEP Oceans Programme: Compendium of projects. (1985)

No. 20 CPPS/UNEP: Action Plan for the protection of the marine environment and coastal areas of the South-East Pacific. (1983)

No. 21 CPPS/UNEP:Sources, levels and effects of marine pollution in the South-East Pacific. (1983) (In Spanish only)

No. 22 Rev. 2. UNEP: Regional Seas Programme in Latin America and Wider Caribbean. (1985)

No. 23 FAO/UNESCO/IOC/WHO/WMO/IAEA/UNEP: Co-ordinated Mediterranean Pollution Monitoring and Research Programme (MED POL) - Phase I: Programme Description. (1983)

No. 24 UNEP: Action Plan for the protection and development of the marine and coastal areas of the East Asian region. (1983)

No. 25 UNEP: Marine pollution. (1983)

No. 26 UNEP: Action Plan for the Caribbean environment programme. (1983)

No. 27 UNEP: Action Plan for the protection and development of the marine environment and coastal areas of the West and Central African region. (1983)

No. 28 UNEP: Long-term programme for pollution monitoring and research in the Mediterranean (MED POL) - Phase II. (1983)

No. 29 SPC/SPEC/ESCAP/UNEP: Action Plan for managing the natural resources and environment of the South Pacific region. (1983)

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No. 32 UNEP/ECE/UNIDO/FAO/UNESCO/WHO/IAEA: Pollutants from land-based sources in the Mediterranean. (1984)

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No. 54 UNIDO/UNEP: Contingency planning for emergencies associated with industrial installations in the West and Central African region. (1985)

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No. 55/ Annex FAO/IUCN/IWC/UNEP: Marine mammals: global plan of action. (1985)

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No. 58 UNEP: Co-operative programmes sponsored by UNEP for the protection of the marine and coastal environment in the wider Indian Ocean region. (1985)

No. 59 UNEP: Environmental problems of the marine and coastal area of India: National Report. (1985)

No. 60 IUCN/UNEP: Management and conservation of renewable marine resources in the Indian Ocean region: Overview. (1985)

No. 61 UNEP: Action Plan for the protection, management and development of the marine and coastal environment of the Eastern African region. (1985)

No. 62 IUCN/UNEP: Management and conservation of renewable marine resources in the South Asian Seas region. (1985)

No. 63 IUCN/UNEP: Management and conservation of renewable marine resources in the Kuwait Action Plan region. (1985)

No. 64 IUCN/UNEP: Management and conservation of renewable marine resources in the Red Sea and Gulf of Aden region. (1985)

No. 65 IUCN/UNEP: Management and conservation of renewable marine resources in the East Asian Seas region. (1985)

No. 66 IUCN/UNEP: Management and conservation of renewable marine resources in the Eastern African region. (1985)

No. 67 UN/UNEP: Coastal erosion in West and Central Africa. (1985)

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No. 69 UNEP: Environment and resources in the Pacific. (1985)

No. 70 UNESCO/ROPME/UPM/UNEP: Proceedings of the Symposium/Workshop on oceanographic modelling of the Kuwait Action Plan (KAP) region. (1985)

No. 71 IUCN/ROPME/UNEP: An ecological study of the rocky shores on the southern coast of Oman. (1985)

No. 72 IUCN/ROPME/UNEP: An ecological study of sites on the coast of Bahrain. (1985)

No. 73 SPC/SPEC/ESCAP/UNEP: Ecological interactions between tropical coastal ecosystems. (1985)

No. 74 UNEP: Environmental problems of the marine and coastal area of Sri Lanka: National Report (1986)

No. 75 UNEP: Environmental problems of the marine and coastal area of Bangladesh: National Report (1986)

No. 76 UNEP: Environmental problems of the marine and coastal area of Maldives: National Report (1986)

No. 77 UNEP: Environmental problems of the marine and coastal area of Pakistan: National Report (1986)

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No. 81 UNEP: Action Plan for the conservation of the marine environment and coastal areas of the Red Sea and Gulf of Aden. (1986)

No. 82 UNEP: Environmental problems of the South Asian Seas region: An overview. (1986)