



**SPREP  
OCCASIONAL PAPER SERIES**

**LAST COPY  
DO NOT  
REMOVE**

**NO. 4**

**THE GREENHOUSE EFFECT  
AND ITS RELEVANCE TO THE  
PACIFIC BASIN.**

A paper by the Rt Hon Geoffrey Palmer,  
Deputy Prime Minister and Minister for the  
Environment of New Zealand given at  
Pacific Maritime Collegium, East-West Center, Hawaii,  
November 1988

**South Pacific Commission  
Noumea, New Caledonia**

SOUTH PACIFIC REGIONAL ENVIRONMENT PROGRAMME

(SPREP)

SOUTH PACIFIC COMMISSION

NOUMEA, NEW CALEDONIA

SPREP OCCASIONAL PAPER SERIES

NO. 4

THE GREENHOUSE EFFECT  
AND ITS RELEVANCE TO THE  
PACIFIC BASIN.

A paper by the Rt Hon Geoffrey Palmer,  
Deputy Prime Minister and Minister for the  
Environment of New Zealand given at  
Pacific Maritime Collegium, East-West Center, Hawaii,  
November 1988

The author has kindly given permission for the South Pacific Regional Environment Programme (SPREP) to re-produce this paper for use in the SPREP OCCASIONAL PAPER SERIES. This enables us to disseminate valuable information to the region in a speedy and cost-effective manner.

## THE GREENHOUSE EFFECT AND ITS RELEVANCE TO THE PACIFIC REGION

by

The Rt Hon Geoffrey Palmer  
Deputy Prime Minister and  
Minister for the Environment of New Zealand

### THE ISSUES

This meeting place of East and West is a logical forum to bring an issue of tremendous importance to New Zealand, and the Pacific region. I want to talk about the greenhouse effect, its causes, and its consequences.

Global warming directly threatens the survival of Pacific people. This places a great responsibility on industrial nations around the world to prevent the causes of the greenhouse effect.

How effectively we respond will be a measure of our commitment to protecting the global environment. If the developed nations fail to avert the disaster facing Pacific Island nations, the future of the whole world must be in doubt.

New Zealand is right in the middle of this issue.

We are a Pacific nation. The first New Zealanders crossed the Pacific Ocean from Hawaiki over 1000 years ago. Our Polynesian heritage is a dynamic part of our social, cultural and political life. We have close political ties with several Pacific Islands, particularly Tokelau, Niue and the Cook Islands. Many Pacific Islanders live in New Zealand, helping to make Auckland the largest Polynesian city in the world.

If the Pacific is our doorstep, then Antarctica is our back yard. Antarctica has a crucial role in the world's climatic systems.

New Zealand has close links with Antarctica, based on our long history of involvement in exploration and research. We have a strong concern for the security and stability of the region, and for the protection on the Antarctic environment.

New Zealand is a vigorous supporter of the Antarctic Treaty System. Since December 1959 when it was signed, the Treaty and its protocols have maintained Antarctica as a zone of peace, science, conservation and environment.

Geographically New Zealand lies between the Antarctic and the Pacific. Economically we are a developed nation. Historically, we have close ties with Britain. Politically and culturally, we identify more and more strongly with the small nations of the Southwest Pacific. Our unique position gives New Zealand an important role as a catalyst for action on the greenhouse effect.

Studies are being done in many countries, to help decide how to respond to the threats, and in some cases, the opportunities associated with the greenhouse effect.

New Zealand has begun a climate change program. It is already clear that there will be significant impacts on our economy. Sea level rises may cause flooding, erosion and the loss of roads and buildings around our shores. Patterns of agriculture, horticulture, and forestry may have to adjust to changes in climate zones. Our tourist industry may have to cope with losing skifields and scenic

areas.

As one of the larger nations of the Southwest Pacific, we have various options. Many smaller Pacific Island countries do not. My aim today is to impress on you the seriousness of the situation they face.

Unless the developed countries act urgently, some of the smallest nations of the world may be doomed. If the worst happens, the greenhouse effect will annihilate them as effectively as a nuclear bomb.

Their languages, cultures and lifestyles could vanish forever. Their homelands will become uninhabitable. There will be little sign that they ever inhabited the Pacific. And the process will be no less painful for being slow.

And yet there is almost nothing they can do to influence the problem, except through the support and cooperation of larger industrialized nations.

This awful responsibility constitutes a crisis for the developed world - a moral crisis. The challenge is to recognize the danger to the Pacific and take effective collective action.

Failure to respond to the needs of our neighbours is as much a threat as the greenhouse effect itself. If we are unable to transcend national and regional interests, our own future looks as bleak as theirs.

We all have a responsibility to act. Everyone who understands the situation is obliged to talk about it, to promote international awareness and understanding, and to search for solutions.

As innocent victims, Pacific Island nations carry great moral authority. The task of small nations is to ensure the issue gets on the priority agenda of large industrial nations.

## THE CAUSES

Part of our difficulty is that the greenhouse effect is a subtle and a complex problem. The earth's atmosphere is something we mostly take for granted.

But this thin global envelope plays a much more complex role than simply providing the air that we breathe. Trace gases which account for less than one per cent of the atmosphere determine the climate that we have.

This is achieved in two important ways. First, ozone in the stratosphere filters out much of the ultra-violet light from the sun. Secondly, greenhouse gases warm the earth by trapping the sun's energy.

The amount of ozone in the atmosphere is very small indeed. Even in what we call the "ozone layer", the ozone is sparsely scattered.

Above New Zealand the ozone layer extends from 12 to 45 kilometres [about 8 to 28 miles] above the earth's surface, and varies with the seasons. Yet, if we were to be able to bring the ozone in the layer down to ground level it would be only 3mm [1/8 inch] thick.

Despite its thinness this layer is absolutely essential. If the harmful ultra-violet rays from the sun were to reach the earth's surface, human health could suffer drastically. UV-B radiation is believed to cause cataracts and skin cancers. It is also believed that the human immune system may be adversely affected.

There may also be severe environmental and economic repercussions. Many agricultural crops provide lower yields if exposed to increased UV-B radiation. Experiments also show that increased UV-B radiation is likely to reduce reproduction, growth and survival rates of small aquatic organisms such as larvae, plankton and shrimps. The implications for the entire marine food chain are enormous.

The second way in which the atmosphere determines the climate is through certain trace gases in the lower atmosphere. These greenhouse gases include carbon dioxide, water vapor and clouds as well as smaller amounts of methane, tropospheric ozone and nitrogen oxides.

The ultra-violet and visible solar radiation which does reach the earth is re-radiated from the surface as infra-red light. The greenhouse gases absorb this radiation and release heat. They act like a blanket, preventing solar energy escaping into space. Without the greenhouse gases the average global temperature would be around 35 degrees celsius (63 degrees fahrenheit) colder than we know it.

Under natural conditions the ozone layer and the greenhouse gases are regulated and kept in balance. Over the past century or two, human activity has altered this balance. But it's only in recent years that we have realized how badly we have upset things. On the one hand the ozone layer is being depleted and on the other the amount of greenhouse gases is being increased.

### Ozone Depletion

Depletion of the ozone layer has been clearly linked with chlorofluorocarbons.<sup>1</sup> CFCs as they are known, are used for refrigeration, foam plastic production and as aerosol propellants.

It has been calculated that a spray<sup>2</sup> can containing CFCs is capable of destroying 3 tonnes of ozone.<sup>2</sup> Alternative propellants are available.

The United States has led the world in cutting down on CFC consumption. American spray products have not contained CFCs for over a decade.

However, recent measurements over Antarctica have revealed what we call the ozone hole. The ozone hole is of great concern, for it may signal a faster deterioration of the ozone layer than was previously anticipated.

Reduced levels of stratospheric ozone have also been detected over southern New Zealand.<sup>3</sup> My country already has a very high incidence of skin cancer.<sup>3</sup> It could become much worse.

CFCs take many years, even decades, before reaching the stratosphere. Even if we were to stop using all ozone depleting substances immediately, what has already been released may continue to affect the ozone layer for well over a century.

New Zealand's economy is heavily dependent on agriculture and fishing. Two thirds of our exports come from the primary sector. A major increase in ultra-violet radiation could be disastrous for the food chains we rely on.

### Greenhouse Gases

Meanwhile, greenhouse gases have been poured into the atmosphere

at increasing rates since the industrial revolution.

The major cause of the greenhouse effect has been the burning of fossil fuels which produces carbon dioxide. Deforestation has also contributed to the problem. Vegetation absorbs carbon dioxide during growth and decaying or burning plant matter gives off carbon dioxide.

It is believed that present levels of carbon dioxide in the atmosphere are 25 per cent greater than before the industrial revolution.

I understand that the study of greenhouse gases has benefited greatly from data collected over more than 30 years, at the Mauna Loa observatory on the island of Hawaii.

But carbon dioxide is not the only greenhouse gas. So are methane, oxides of nitrogen, and chlorofluorocarbons.

In fact CFCs, already identified as a major culprit in reducing ozone, are very efficient greenhouse gases.<sup>5</sup> Furthermore, depletion of the ozone layer increases incoming radiation which adds to the problem.

These trace gases are increasing even more rapidly than carbon dioxide. If present rates of emission of all greenhouse gases are extrapolated, pre-industrial levels will effectively have doubled by the year 2030. That is only just over four decades away.<sup>6</sup>

If this happens, average temperature around the globe will probably increase by between 1.5 and 4.5 degrees celsius, [between about 3 and 7 degrees fahrenheit].<sup>7</sup>

These figures are mentioned commonly today. But please be warned! These changes will not suddenly stop. 2030 is simply a convenient baseline. The process will continue if greenhouse gases continue to be emitted. Similarly, depletion of the ozone layer is likely to be cumulative for some time yet, even with the present restrictions.

## THE CONSEQUENCES

The warming of the atmosphere is not where the problem stops. It is likely that whole climatic systems will change. In certain areas prevailing winds will come from different directions, rain may be more or less frequent, and extreme weather events may happen more often and with greater intensity.

United States farmers have suffered greatly from one of the worst droughts in American history. This event, which is consistent with the greenhouse effect, may be a result of it. We don't know.

It is not yet possible to distinguish current events that are consistent with the greenhouse effect from the normal range of climatic variations. But the four warmest years in the past century have occurred this decade. At home in Wellington, last September was the warmest since records have been kept.

The New Zealand Government is concerned at the implications of sea level rise and climate change, for our country and for the world. We have initiated a New Zealand Climate Change Programme coordinated by our Ministry for the Environment.

Three working parties have been set up. The first, which consists mostly of atmospheric scientists and climatologists, will predict the likely changes in radiation, temperature, winds, rainfall and ocean levels that will affect New Zealand, and judge how reliable

those predictions are.

The second group is an interpretation committee which will assess the consequences of the predicted changes for our natural and physical systems, and New Zealand's economy and society. Their findings will be used by the third committee which is charged with developing policy advice by mid-1990.

Policy options will cover both contingency measures to minimize the impacts of inevitable changes, and preventative action which we can take domestically and internationally.

The New Zealand Government will tackle both the causes and the results of the greenhouse effect. I am told that New Zealand's climate change program could be the model for similar programs in Australia and Canada.

There are still large gaps in scientific knowledge of climatic processes. Some data have not been collected over a long enough period for trends to be clear. So we can't yet make confident predictions of climate changes.

In the meantime scientists and planners use scenarios as a guide. This 'picture of the future' uses whatever information is available, and we speculate to fill the gaps.

The scenario for global climate change is still far from complete. But there is even greater uncertainty over the implications for climate at the regional or local level.

For instance it is believed that higher latitudes will become warmer at a greater rate than lower latitudes. That could alter the atmospheric circulation which prevailing winds are based on.

That will affect local or regional rainfall patterns, which in many places are determined by the direction of prevailing winds. The occurrence of extreme events such as tropical cyclones or droughts may also be affected.

There is a great need for further work to be carried out at regional levels to fill in these details. Most Pacific Island nations do not have available the technology and the expertise necessary to undertake their own studies.

A major problem is that numerical models of climate change are extremely expensive to run. Hundreds of billions of calculations may be necessary to predict future climatic conditions.

Our scenario already shows that climate change could have major impacts on New Zealand.<sup>9</sup> The effects on Pacific Island nations are less clear.

Even applying the facts that are generally accepted for the whole world, the threat to small Pacific islands looks acute.

New Zealand is an agricultural country and horticultural, arable and pastoral production are our major export earners. Agriculture is very sensitive to changes in temperature and rainfall.

Some crops will be able to grow further south and at higher altitudes than previously. Some tropical or subtropical species may become feasible - will pineapples, mangoes and papaya be grown commercially in our far north? (We may compete for markets with Hawaii!)

But other crops require cold conditions or winter chilling before developing in the spring. New Zealand's internationally renowned kiwifruit industry based in the north island may find itself shifted further south. The same may apply to our wine industry which is

presently gaining considerable international acclaim.

Little is known of the likely response of Pacific Island agricultural systems. With depletion of the ozone layer plant growth may be stunted by ultra-violet radiation. Increased rates of evapotranspiration may increase the likelihood of drought in areas that are already dry.

In the Pacific, the people are largely dependent on the food they grow themselves. The possibility of serious agricultural impacts is extremely disturbing.

Our ecology will also be affected. Warmer conditions may allow predators and pests to establish themselves in new areas.

A large number of New Zealand's plants and birds are found nowhere else. Over 50 bird species have become extinct since humans first arrived in New Zealand. 35 more are listed as rare or endangered - one in nine of the world's threatened birds.

Many only survive on small offshore islands that are free of introduced predators. Because their range is so limited, changes in temperature and vegetation would spell doom for some of these.

We have also been warned that extreme climatic incidents may increase in frequency and intensity. Atolls are marginal environments. Studies have indicated that two of the most important factors dictating their habitability are the likelihood of droughts and tropical cyclones.

Tropical cyclones are particularly threatening to atoll communities as they are often accompanied by a rising of the sea-level, known as a storm surge. Extremely heavy seas whipped up by the ferocious winds can completely wash over atolls.

As a result gardens carefully cultivated on the central and highest points are destroyed by the saline conditions left in the cyclone's wake.

Earlier this year New Zealand was hit by Cyclone Bola, a tropical cyclone that had already caused havoc in the south Pacific. Our Government responded swiftly to assist the victims of this event. The cost of relief measures and reconstruction of the Government's own assets exceeded \$NZ100 million dollars [\$US60 million]. We can be sure that an equivalent amount was absorbed by the victims themselves.

Tropical cyclones form over warm ocean surfaces. As the global warming will raise temperatures in higher latitudes, the zone of tropical cyclones may also extend further south than it does at present.

This zone will probably not reach New Zealand, but extra-tropical cyclones, such as Bola, could become more common. If so, the economic and human costs of this aspect of climate change alone will become very high indeed.

Our scenario also indicates that wet areas and seasons will become wetter, and dry areas and seasons will become drier. Presently, one of New Zealand's most important areas of mixed cropping and sheep production in the South Island is in the throes of an extended drought.

If the same happens to the numerous atoll communities with low rainfall levels already, they are likely to become deserts by the year 2100.<sup>10</sup>

But the atolls are faced with an even more frightening possibility, that of sea-level rise. Warming of ocean waters will



lead to their expansion, and melting of polar ice sheets and glaciers may contribute extra water to the oceans.

Predictions of sea-level rise vary more widely than those temperature change. There is considerable debate as to what mechanisms will come into play. Unlike climate changes which may vary greatly from place to place, sea-levels will rise more or less evenly around the globe.<sup>11</sup>

Even a small rise in sea-level may make the impact of a tropical cyclone more devastating. Increased incidence of tropical cyclones is amongst the scenarios that have been developed.

Atolls only rise a few feet above sea-level. If predictions of sea-level rise are correct, some atolls are endangered, and some may actually be permanently inundated.

In our neighbourhood are many small nations, including sovereign states of less than 10,000 people. Fourteen countries or territories in the Pacific region have populations of less than 100,000. The 22 countries and territories that comprise the region have a combined population of only 5.5 million people, smaller than some cities in the United States.

Like all nations they are rich in history, culture and language. They stand in equal status alongside the other nations of the world in the United Nations.

Their main purpose is to provide for the welfare and wellbeing of their people. There are several nations in the Pacific region that are made up totally of atolls. It is absolutely intolerable that the entire land base of these vital, unique and important countries may one day be physically destroyed.

But not only atoll communities are likely to be badly affected by sea-level rise. Pacific Island countries are exposed to the sea on all quarters (with the exception of Papua New Guinea).

If the sea level is to rise as a result of global warming, then all Pacific countries, not only those comprised of atolls, are likely to suffer much more than many of the industrial, and larger nations.<sup>12</sup>

A high proportion of villages and gardens are located on the coastal strip of high Pacific islands. If sea-level rise is significant, some of these coastal areas may become permanently inundated. Others may be exposed to periodic coastal flooding and erosion as a result of storm conditions.

The possibility that not just communities, but entire nations will have to be relocated, is almost beyond comprehension. But it is indeed a possibility that parts of the Pacific may have to face.

Relocation of communities in the Pacific region is not new. Volcanic eruptions, atoll decay, nuclear testing and phosphate mining have forced Pacific people to abandon their homelands in the past.<sup>13</sup>

Communities that have been cut off from their ancestral homelands often suffer from severe grief and homesickness. The desire to return one day is the hope that sustains them. It is difficult to imagine what would be the impact on a community whose home no longer physically existed!

A recent study of atoll dwellers relocated in the North Solomons referred to the frightening aspects of the new environment that the people had to face - the thick bush, tall trees, roads and snakes.

The people did not move far from their houses except on Sundays. Then they risked the walk through the bush to the beach, where they

gazed across the ocean towards the atolls where they came from.<sup>14</sup>

For refugees to countries outside the Pacific, cultural dislocation is likely to be even greater.

It will be most important to accommodate the needs of Pacific Islanders within any global resettlement plan. Some of the most densely populated areas in the world, the deltas of Asia, may also be at risk from the greenhouse effect. Our small neighbours must not be overlooked.

## THE PACIFIC RESPONSE

Pacific Island countries are in an invidious position. The consequences of rising sea levels are so severe that they cannot afford to ignore the threat. At the same time there is a natural reluctance to prepare for the worst.

They cannot afford to relocate villages, gardens, water supplies, cultural sites and so on, if dire predictions come to nothing. Their cultures and economies are generally precarious, and could hardly sustain the cost of such upheavals.

Nevertheless, Pacific political institutions have addressed the issue and begun to respond.

I was at the Pacific Forum in Tonga last September, where the matter was taken up. The Forum is the political association of the independent Pacific countries. This regional grouping includes the Cook Islands, the Federated States of Micronesia, Fiji, Kiribati, the Marshall Islands, Nauru, Niue, Western Samoa, the Solomon Islands, Tokelau, Tonga, and Tuvalu. Australia, New Zealand and Papua New Guinea are the largest member nations.

Several Pacific Island leaders recalled the impassioned plea by Mr. Gayoom, the Prime Minister of the Maldives Islands in the Indian Ocean. He spoke about the greenhouse effect to the Commonwealth Heads of Government Meeting in Canada last year.

Kiribati is a similar nation of low-lying atolls. At the Pacific Forum, the President of Kiribati, Mr Ieremia Tabai, expressed grave concern at Kiribati's bleak prospects if predicted sea level rises were accurate.

He was supported by other leaders. Some felt that attention should be drawn to the seriousness of the situation, while others pointed out that alarmist predictions could lead to unnecessary anxiety. Although sea level rises predicted in the past had not eventuated, it was also felt that by the time changes in sea level were noted, it would be too late to do anything.

Clearly, much more detailed information is needed by Pacific Governments to help them decide on contingency measures. There was strong support at the Forum for an Australian proposal to investigate the establishment of a network of stations to monitor sea levels.

Meanwhile a regional study of the greenhouse effect and resulting climate changes and sea level rises has begun. This is being coordinated through SPREP - the South Pacific Regional Environment Programme.

SPREP was established under the guidance of the United Nations Environment Programme, in conjunction with the political associations of the Pacific. SPREP is part of UNEP's Regional Seas programme.

A proposal for a wide-ranging investigation into the greenhouse

effect followed a preliminary study and report. This outlined some of the possible consequences, which I have mentioned already. The proposal for further study was endorsed by an intergovernmental meeting of technical experts in June and July of this year.

The regional climate change studies being undertaken by SPREP will help to predict the level of damage. This will help the leaders of Pacific Island countries to decide how to respond.

However, Pacific nations on their own can do nothing to prevent global warming. The people of the Pacific region have contributed very little to the atmospheric changes that have taken place in recent decades.

The islands of the Pacific have a total population of around 5.5 million. That is only 1 person for every 900 on the globe.

They account for an even smaller proportion of the global consumption of energy - a mere one-two thousandth of all commercial energy consumed in the world.

Every man, woman and child in North America uses 35 times as much commercial energy as does the average citizen of Papua New Guinea or the Solomon Islands, and almost 20 times as much as a Fijian.

These figures do not tell us how much energy comes from fossil fuels. But the vast difference in rates of use, and the very low total consumption of energy by the region indicates what a small role its people and industries are playing in increasing the greenhouse effect.

But while the people of the Pacific have contributed very little to the cause of global change, it appears that they may reap a disproportionate share of its consequences.

#### THE RESPONSE OF DEVELOPED NATIONS

Developed nations are also gathering information to help them deal with the greenhouse effect. Climate change is a crisis, in that there is danger and also opportunity.

In New Zealand, our capacity to mitigate its effects by forward planning is recognized. Major waterfront developments and marinas, for instance, can be designed and built now to cope with future sea level rises.

No doubt certain commercial, and even national, interests perceive potential gains from the greenhouse effect. Growing seasons may lengthen in sub-polar regions. New technology and processes may help minimize the negative effects of increased ultra-violet light - new dyes, screening products or plant varieties, for instance.

Developed nations, like New Zealand, are not confined to coping with the consequences. We can attack the causes of the greenhouse effect.

Here lies the fundamental moral question. Will the developed nations give priority to effective action against the causes of the global problem? Or will they pursue short-term selfish goals by trying to insulate themselves from the inevitable results?

This is a life-and-death question for Pacific Island countries. We must take action to alter some of the processes that have given developed countries the advantages they enjoy today.

Can we seriously expect such a turnaround? Where will the developed world find the political will? And even if change is

wanted, how will it be organized?

But we should never despair of finding a solution. Let me quote to you an old Maori proverb.

Tama tu, tama ora  
Tama noho, tama mate.

He who stands up, lives  
He who sits back, dies.

There are certainly hopeful signs. In the United States, legislation has been introduced to slow down the emission of greenhouse gases.

The draft law requires a 20% reduction in emissions of carbon dioxide over the next twelve years. It also seeks to reduce fossil fuel consumption and promote the use of renewable energy sources.

In Australia a bill has been introduced to cut consumption of ozone-depleting substances by 96%. The state of Tasmania has already imposed strict controls on the use of CFCs. No doubt many other countries are considering domestic legislation as well.

In New Zealand, a voluntary agreement will see CFCs phased out of aerosol manufacture by 1989, with no need for legislation.

There are also a number of international agreements aimed at reducing atmospheric changes.

In 1985 the Vienna Convention for the Protection of the Ozone Layer was signed. New Zealand is among the 20 countries which have ratified the Convention. The way is now clear for the Vienna Convention to become part of international law.

Then in 1987 a conference was called in Montreal to consider limiting the consumption of CFCs and halons which also attack the ozone layer. The outcome was the Montreal Protocol under which nations have agreed to cut back consumption of CFCs to half of present levels by 1998.

New Zealand was one of a group of countries which wanted a stronger regime than the present protocol establishes. We did argue successfully that the protocol should limit both production and consumption of ozone-depleting substances. The United States was the first country to ratify the Protocol and, in July of this year, New Zealand became the sixth.

The Montreal Protocol does allow for regular scientific assessment of the ozone layer and for increasing the rate and extent of the reductions of CFC consumption. Many scientists consider that a fifty per cent cut is inadequate. The amount of CFCs released will still grow, though at around 2 per cent per year instead of five as at present. Nevertheless, even a 2 per cent annual increase will double the amount within 35 years!

New Zealand believes the restrictions in the protocol should be increased and the timetable accelerated to ensure it is effective. An international meeting of atmospheric scientists in The Hague two weeks ago confirmed the need for stronger measures.

Just one month ago the United States Environmental Protection Agency called for a total ban on CFCs after receiving a report on the danger.

Another protocol has been drafted which aims to cut emissions of

nitrogen oxides. The UN Economic Commission for Europe wants signatories to freeze emissions by 1995, and then start reducing them. President Reagan has announced that the United States has decided to sign this protocol.

Another group of nations has signed an agreement to limit sulphur dioxide emissions.

## STRATEGIES FOR THE FUTURE

New Zealand strongly supports all these moves. The fact that countries can reach agreements, indicates that cooperation to reduce the causes of the greenhouse effect is achievable.

Now, having looked around the world, into the corridors of national legislatures and the labyrinth of international politics, let us come back to the Pacific.

Put yourself on an atoll that barely rises above the surface of the largest ocean in the world. You have one question: Will the present measures work?

I regret to say that I don't think so. In New Zealand's experience, an ad hoc, incremental, piecemeal approach to environmental management doesn't get results.

Take hazardous substances management, an issue of great importance in the Pacific. Recently we investigated the management of hazardous substances in New Zealand.

The committee doing the job found 42 different laws affected their work. There was a plethora of control agencies responsible for different aspects. Coordination was a nightmare. Accidents were inevitable.

The environment suffered, not because we didn't care, but because our legal and institutional and procedural arrangements were inadequate.

In the last three years New Zealand's environmental administration has been completely overhauled. Up until then responsibility for the environment was allocated by function.

Anything to do with forestry was the job of the Forest Service. This included operations with conflicting aims, such as profitable management of commercial forestry, employment creation in depressed areas, and the protection of indigenous forests.

The Forest Service also acted in several roles. For instance it ran a commercial forestry operation, regulated New Zealand's forestry industry (in which it was an actor), and provided Government with policy advice on forestry.

It didn't work. Each organization had to know what they were there for. They needed clear goals, and clear roles. And they needed structures to suit.

Now we have several small ministries whose job is to advise the Government on policies, and to set clear rules for the operating agencies to follow. So we have a Ministry of Forests, and a Ministry for the Environment.

We also have State-Owned enterprises responsible for making a profit from the Government's commercial assets, like farms and forests. They are structured along business lines.

We also now have a Department of Conservation, to maintain and conserve the Crown's protected estate. Its role is clearly to

advocate the cause of conservation, of forests, wildlife, and historic places.

This gives us a much better national administrative framework for the New Zealand environment. The Government is now reviewing our resource management laws, and restructuring the regional and local bodies responsible for administering these laws.<sup>15</sup>

We want resource management that is comprehensive, integrated, coordinated, streamlined, and equitable. We want a broad perspective to guide environmental management. We need to be able to see the overall picture.

When decision-making procedures are clear and responsive, public participation is encouraged. Everyone can concentrate on the results they want for the environment, instead of getting bogged down in bureaucracy.

I believe that progress internationally will also depend on having suitable institutional arrangements.

The world needs a comprehensive, integrated approach to global environmental issues such as the greenhouse problem. At present we seem to be tackling it gas by gas, each covered by a separate series of international agreements. Somehow all the different measures taken so far need to be brought together.

I understand the East-West Center is studying the Law of the Sea as a possible model for an international agreement to control atmospheric change. Such studies are vital. Rigorous analysis will tell us whether the institutional and legal frameworks we adopt are capable of giving us the results we want. I would be interested to hear the results of your work.

Meanwhile Malta has proposed a draft resolution to the United Nations General Assembly. New Zealand supports the underlying objectives of Malta's draft resolution. But we would like to see integrated international action on the greenhouse effect.

There is a pressing need for better coordination, rather than a proliferation of decision-making bodies. Clearly the United Nations is the obvious body to do this.

Specifically the UN Environment Programme, UNEP, has a history of involvement in the greenhouse effect, and the potential to link this with other global environmental issues.

Malta's draft resolution proposes a separate administration for the greenhouse problem. I believe that in the long run this approach creates confusion and administration problems.

Right now in New Zealand we are rationalizing the plethora of local authorities we have created over the years. Single-purpose bodies will be superseded by a manageable number of multi-purpose councils.

Therefore New Zealand also supports any move to bolster the role of UNEP. This will help to cut down on duplication of effort, and waste.

UNEP'S role is to monitor environmental issues, and to catalyze, coordinate and facilitate action by member countries of the United Nations. It provides an umbrella under which all nations can collaborate if they wish. Individual countries should not expect UNEP to assume their responsibilities.

For UNEP to be effective, members of the United Nations will need to be fully committed to its work. New Zealand is presently

investigating how we can better work with UNEP.

We would like to be able to take a more active role. We believe our unique geographical, historical and political position may be useful in greenhouse programs.

In the Pacific, our efforts will be coordinated with SPREP. We will share the results of all our climate change studies with SPREP, and through SPREP, the nations of the Pacific.

I have also instructed the staff of the Ministry for the Environment to consult with SPREP on other ways of supporting SPREP's greenhouse program.

A comprehensive, integrated and coordinated approach to global environmental issues is consistent with the findings and recommendations of the World Commission on Environment and Development in the Brundtland Report.<sup>16</sup>

Our Common Future, the Brundtland report, says: "The integrated and interdependent nature of the new challenges and issues contrasts sharply with the nature of the institutions that exist today. They tend to be independent, fragmented, and working to relatively narrow mandates with closed decision processes.

"Those responsible for managing natural resources and protecting the environment are institutionally separated from those responsible for managing the economy. The real world of interlocked economic and ecological systems will not change; the policies and institutions concerned must." (p 310)

A holistic approach to the environment also characterizes 'traditional' societies. Environmental consciousness is at the core of Pacific Island cultures.

In New Zealand Maori tradition, Ranginui the sky, and Papatuanuku, the earth, are the ancestors of all creation. The fate of humanity is inseparable from our treatment of the world as we know it.

It is ironic that Pacific cultures, which could teach us so much about environmental management, are among the most threatened by the environmental crises brought on by developed nations. Their isolation has allowed them to maintain a lifestyle in close harmony with nature.

Only their ecological awareness has let atoll dwellers survive in very marginal environments. Their possible obliteration is not only a loss to the world, but another nail in our own coffin.

As the Brundtland report said, we need to adopt new attitudes and create new institutions if the world is to survive. The Pacific crisis will be an early test of our ability to adapt. If we fail our own chances of survival look grim.

Pacific nations may be among the first to be severely affected by the consequences of global warming, but not the last. Unless all countries act, especially those in the so-called developed world, everyone's future is in jeopardy.

The question is not "should we act," but "how quickly." The political will arises from public concern. It is the task of small nations to bring the gravity of the situation to the attention of the developed countries. Developed nations must respond with the urgency that the issue demands.

## FOOTNOTES

1. This linkage has most recently been confirmed by the Ozone Trends Panel, an international group of atmospheric scientists brought together by NASA. (Ozone Trends Panel, 1988).

2. Clarkson, 1988.

3. MALIGNANT MELANOMA IN NEW ZEALAND

	New Cases	Deaths	Total Population
1976	513	108	3,129,000
1984	771	161	3,299,000

4. Lowe et al, 1988. It is estimated that CO<sub>2</sub> concentrations are increasing by 0.5% per year.

5. Lowe et al (1988) claim that the CFCs in 3 spray cans have the same greenhouse effect as 1 tonne of carbon dioxide.

6. Lowe et al (1988) indicate that methane has doubled in the last 100 years. They state that "other greenhouse gases are currently at lower concentrations than carbon dioxide. However, they are increasing at such a rate that their contribution to the greenhouse effect will be equal to that of carbon dioxide within 50 years."

7. These global averages were decided upon at the Villach workshop in late 1987. (Jaeger, 1988). The workshop included a number of noted atmospheric scientists and the scenario developed has received widespread acceptance.

8. The first working party will publish its findings at the end of this year (1988). The second committee will report before the end of 1989. Copies of their reports will be available from the Ministry for the Environment, P.O.Box 10 362, Wellington, New



Zealand.

9. Our present scenario is based on the proceedings of a workshop on climate change held in Wellington earlier this year (Ministry for the Environment, 1988a). The report of the first working party of the NZ Climate Change Programme is expected to refine this scenario.
10. Association of South Pacific Environmental Institutions, 1988.
11. Sea level changes in any place may reflect tectonic movements of the land.
12. The proportion of coastline in most Pacific Islands is much greater than in other countries. If we compare the length of coast to land area we see, for example, that the United States has 470 square kilometres of land for every one kilometre of coast. The ratio for Australia is almost 300 to one. Fiji can boast only 16 square kilometres for every kilometre of coastline, and for the Solomon Islands the ratio is only five to one. Some nations in the region actually have a ratio of less than one! If we do not include Papua New Guinea, Australia or New Zealand, then the ratio of land area to length of coast is slightly more than 3.5 to one.
13. There have been many studies of 'forced' migrations in the Pacific region. \_These include Lieber (ed), 1977; Kiste, 1974; and O'Collins, 1988. The last refers to an atoll made marginal by coastal erosion.
14. O'Collins, 1988.
15. Ministry for the Environment, 1988c.
16. World Commission for Environment and Development, 1987.

## REFERENCES

- Association of South Pacific Environmental Institutions(1988)  
Potential Impacts of Greenhouse Gas Generated Climatic and Protected Sea-level Rise on Pacific Island States of the SPREP Region. Noumea, South Pacific Regional Environment Programme.
- Clarkson, T.S. (1988). The Ozone Layer, Chlorofluorocarbons and the Montreal Protocol, New Zealand Engineering, 43(4), 7-9.
- Jaeger, J. (1987). Developing Policies for Responding to Climatic Change. A summary of the discussions and recommendations of the workshops held in Villach (28 September-2 October 1987) and Bellagio (9-13 November 1987). Stockholm, Beijer Institute.
- Kiste, R.C. (1974). The Bikinians: A Study in Forced Migration. Menlo Park, Cummings.
- Lieber, M.D. (ed.)(1977). Exiles and Migrants in Oceania. Honolulu, University of Hawaii Press.
- Lowe, D.C., Manning, M.R., Betteridge, G.P., and Clarkson, T.S. (1988). Changing Atmosphere--Changing Climate. Chapter 2, in New Zealand, Ministry for the Environment (ed.).
- New Zealand, Ministry for the Environment. (1988a). Climate Change. The New Zealand Response. Proceedings of a Workshop held in Wellington, March 29-30, 1988. Wellington, Ministry for the Environment.
- New Zealand, Ministry for the Environment. (1988b). Pollution and Hazardous Substances Management. Final Report of the Inter-Agency Coordinating Committee. (Draft) Wellington, Ministry for the Environment.
- New Zealand, Ministry for the Environment. (1988c). Directions for

Change. A Discussion Paper. Resource Management Law Reform.  
Wellington, Ministry for the Environment.

Ozone Trends Panel. (1988) Executive Summary of the Ozone Trends Panel, March 15, 1988. Washington, DC, National Aeronautics and Space Administration.

World Commission on Environment and Development. (1987). Our Common Future. Oxford, Oxford University Press.

World Resources Institute. (1986). World Resources 1986. New York, Basic Books.