

PEOPLE IN PLACES

A DOCUMENTARY CASE-STUDY WORKBOOK

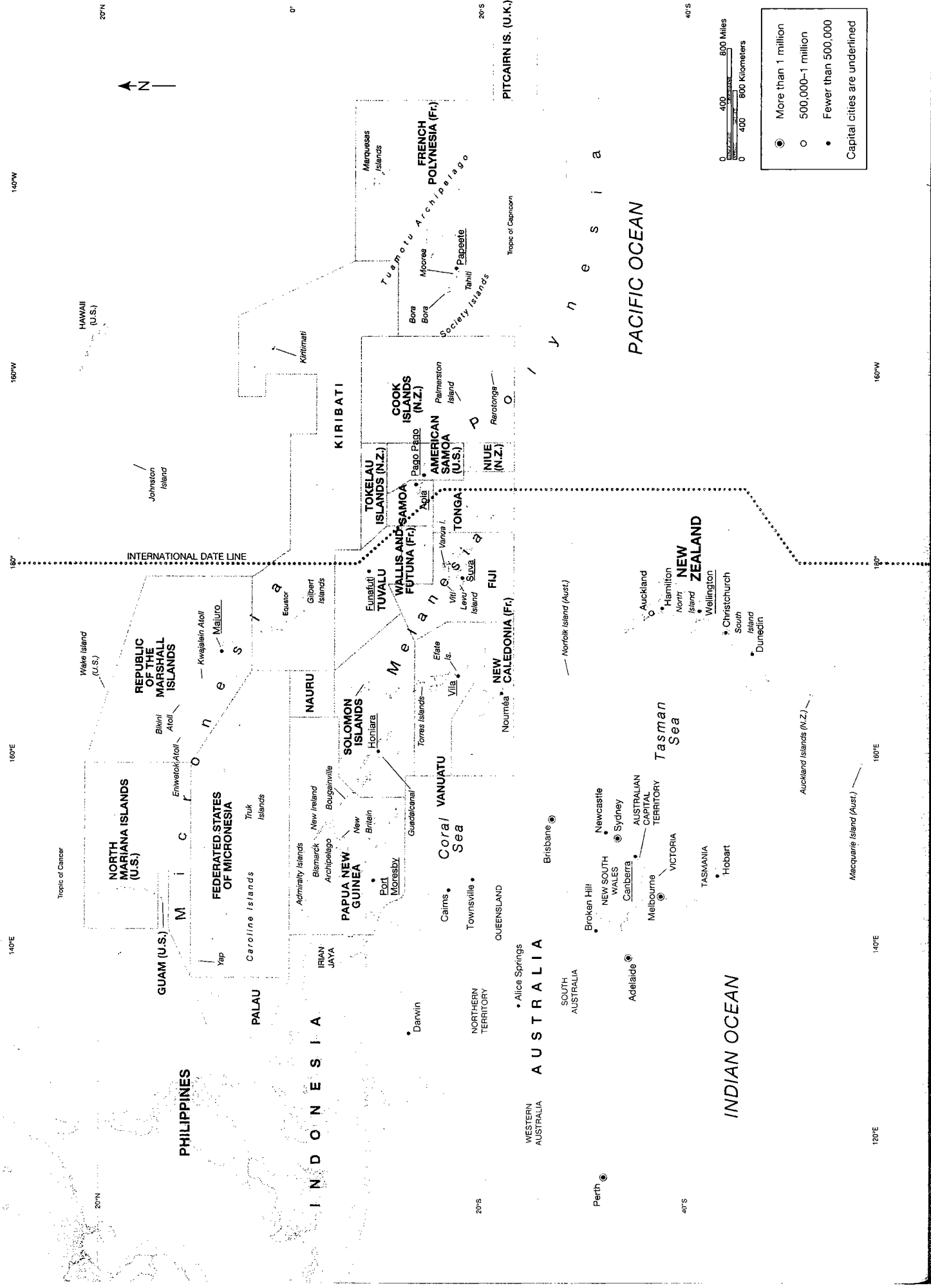
Philip E. Steinberg
Kathleen Sherman-Morris

to accompany the third edition of
Places and Regions in Global Context
Human Geography

by Paul L. Knox and Sallie A. Marston



Upper Saddle River, NJ 07458



	More than 1 million
	500,000-1 million
	Fewer than 500,000

Capital cities are underlined



PHILIPPINES

INDONESIA

AUSTRALIA

INDIAN OCEAN

PHOENIX ISLANDS

PACIFIC OCEAN

Tasman Sea

AUSTRALIAN CAPITAL TERRITORY

TASMANIA

NEW ZEALAND

Global Warming and Sea-Level Rise in Oceania

Companion to Chapter 4
Nature, Society, and Technology

The sea is rising around **Ioane Ubaitoi's** island home. As global warming melts the polar ice caps, the rising sea claims sandy beaches, homes and crops in the Republic of Kiribati, and causes havoc with water supplies. Mr Ubaitoi's Government has sent him to Hamilton [New Zealand] for four months to learn how to save his island from disappearing under the water. Waikato University is hosting a six-month programme sponsored by the South Pacific Regional Environment Programme. It started this week. For the first two months, Mr Ubaitoi, and 19 other representatives from 10 Pacific countries will learn how to assess the vulnerability of their countries. Then they will go home for two months of field research before returning for a further two months when they will draft proposals to save their homelands.



Ioane Ubaitoi learns techniques for protecting Kiribati's coastline. Source: Peter Drury/Waikato Times

Mr Ubaitoi is an agriforestry officer in the country of 80,000 people.

He said homeowners had been forced to shift, crops had been destroyed, and beaches had disappeared in the past decade as sea levels started to rise.

Pacific islands are more susceptible to damage from rising sea levels than New Zealand because they are built on coral reefs and are usually less than 3 m [10 ft.] above sea level. The land is also more likely to slump because of its coral base.

Mr Ubaitoi said sea walls could save the islands—but he hoped by the end of the course he would have an informed opinion on how best to stop the Pacific Ocean washing over Kiribati.

Source: Keri Welham, "Island Man Fights Threat to Sea," *The Waikato Times*, June 19, 1998. Copyright © 1998. Used with permission. ■

Climate Change as a Global Issue

There is mounting evidence that the average temperature on Earth is increasing, and it is projected to increase further over the next decades as a result of global climate change. Much of this climate change is attributed to the greenhouse effect: the increased presence of gases that prevent heat from escaping through the atmosphere, thereby leading to an increase in Earth's temperature (see Geography Matters box 4.3 in the textbook).

Predicting the extent and likely impacts of climate change is difficult, as scientists debate how much of presently observed change is due to long-term natural processes, how much is due to human-induced factors, and how much of what looks like long-term change is actually "noise" that results from short-term cycles of variation in temperature and precipitation that naturally occur within Earth's atmosphere. Further complicating analysis is that it appears that the impacts of linked global processes vary from place to place: If current trends continue, some areas will get more rain and some less; some may even become cooler while much of the world becomes warmer.

Nonetheless, most scientists agree that the planet's average temperature is warming at an increasing rate; average temperatures increased by about 1°C during the twentieth century and, at current rates, they will increase by as much as another 5°C during the twenty-first century. Most scientists believe that this climate change is associated with the dramatic increase in carbon dioxide and other greenhouse gases released into the atmosphere during this same period. The increase in these gases, in turn, is associated with increased burning of fossil fuels (the main source of carbon dioxide), production of certain inert gases for industrial use (the main source of fluorocarbons), and destruction of forests that historically have absorbed some of the carbon dioxide that now resides in the atmosphere.

While climate change in most parts of the world will lead to warmer temperatures, the indirect impacts likely will be more complex, and potentially more catastrophic. Global precipitation patterns are likely to tend toward extremes; in general wet areas will become wetter and dry areas will become drier. Severe storms are also likely to increase. These changes will wreak havoc on agricultural regions as species that have adapted to local conditions over the course of thousands of years (or have been nurtured by area inhabitants to meet local conditions) suddenly become incompatible with the local environment. Huge numbers of species of plants and animals will be threatened with extinction as they lose their habitats. The potential costs of these losses are unknown, as it is impossible to place a value on the loss of a species that may be of medical use, or that may provide some other as-yet-

unimagined benefit to humanity. And, as is noted in the textbook's review of social attitudes toward nature, some would argue that the very loss of a species is a terrible loss in itself, aside from the negative impacts that its extinction might have on potential human uses.

Among the various impacts of climate change, the greatest attention has been directed to global warming, and among the various impacts of global warming probably the greatest attention has been directed to the problem of rising sea level. Strong evidence shows that increased temperature already is leading to the melting of polar ice caps. This eventually may lead to a rise in sea level, which would pose an obvious flooding danger to low-lying coastal zones. Increased severity of storms, changes in fishery dynamics due to raised ocean temperatures and changed patterns of currents, and increased saltwater intrusion into coastal aquifers (when these exist as sources of groundwater) are additional ways in which global climate change would have a disproportionate impact on coastal zones. Because cultures have developed in coastal zones that depend on local, coastal ecologies, changes in coastal geophysics and biology would also impact coastal social systems.

Coastal zones are receiving the bulk of attention from climate change researchers because, besides being particularly vulnerable, a large portion of the world's population lives near the coast. Even in large countries with extensive interiors, people disproportionately live in coastal zones. In the forty-eight contiguous states of the United States, for instance, the 673 coastal counties constitute 17 percent of the nation's land area but host 53 percent of the population. In addition, fourteen of the nation's twenty largest cities and seventeen of its twenty fastest-growing counties are located along the coast.

Climate Change Hazards and Pacific Islands

Among the coastal areas vulnerable to climate change, perhaps the most endangered are the islands of the Pacific Ocean. Islands in the Pacific are of two types:

- *Volcanic islands.* These are the tops of volcanoes that have risen from the ocean floor. Examples of volcanic islands include the Hawaiian islands. There, the Pacific plate is moving over a "hot spot" in Earth's mantle that allows magma (molten rock) to well up and accumulate over centuries of eruptions and flows. These accumulations form seamounts (underwater mountains), and, if the process continues long enough, the top of the seamount rises above the ocean's surface, forming a volcanic island. Just southeast of Hawaii's "Big Island" (the southeasternmost of the Hawaiian islands) is a prominent seamount

whose top is about 1 kilometer (0.6 miles) underwater. This seamount is expected to surface, forming a new island in the Hawaiian chain, in about 10,000 to 20,000 years.

- **Atolls.** At the heart of the atoll is the coral reef. Coral is one of the oldest types of living systems on Earth. It supports some of the planet's most diverse and most fragile ecosystems, sometimes hosting as many as three thousand species of fish. Coral, found in shallow, tropical oceans, requires ocean temperatures between 23 and 25°C to stay alive. Atolls have their origins in the rings of coral reef that build on the outside of islands that are usually volcanic in origin. Once the volcano has become dormant, the island inside the reef is worn down by erosion or sinks back into the ocean (a process known as subsidence). The coral grows fast enough to keep up with the subsidence, and thus a shallow ring of dead coral remains, with only a lagoon—no island—in the middle and surrounded by a submerged reef of living coral.

Pacific islands always have been precarious environments for human (and other living) systems. Atolls, in particular, are nearly always small, isolated, and devoid of most of the resources generally considered necessary for survival. The soil is typically thin, freshwater sources are scarce or nonexistent, populations are tiny, tropical cyclones are severe, and distances to major markets or sources of raw materials frequently are enormous. Along with coconut trees and root crops that sometimes grow in the sandy soil, the main source of food is from the fish that populate the adjacent reef. The islands are blessed with idyllic weather (when there is not a storm), but most lack the resources to provide the amenities demanded by all but the most adventurous tourist, and extreme distance from major population centers also hampers their tourism potential. Some islands have turned their isolation into a resource by serving as sites for weapons testing and toxic waste disposal, although the long-term benefits of this resource use are questionable. Bikini Atoll, where the U.S. government tested nuclear weapons in the 1950s, remains partially uninhabitable, as coconuts—a major source of food—are known to contain residual radioactivity, accumulated from the soil.

Amid the precariousness of the island ecosystem, emigration has been a frequent fact of life. The people of the Pacific, while isolated on their tiny islands, remain connected across the ocean that—almost as much as the land—is their home. Many of the largest Pacific island cities are swelling with populations from outer areas of their island groups. Immigrants from smaller island groups flock to the larger islands, often crossing national borders in the process. Beyond the world of

Pacific islands, large Pacific Islander communities have formed in mainland cities around the Pacific rim, especially in Australia, New Zealand, and the West Coast of the United States. Indeed, funds sent back to small islands from emigrants (whether they are emigrants to capital cities on a country's major island or emigrants to larger cities around the Pacific rim) often constitute a major portion of local income. Pacific Islanders today debate whether this current trend of migration to distant cities represents a threat to the many distinct, isolated, atoll-based societies of the region or is simply a continuation of the maritime cosmopolitanism that always has characterized the area.

Whether or not the ocean, as opposed to the tiny land masses, is thought of as the true "home" of Pacific Islanders, the people of the Pacific require islands for survival, and these fragile environments face a host of threats from global climate change. The most obvious and direct threat is that of sea-level rise, as the overflow from melting ice caps threatens to swamp low-lying atolls. Tuvalu, for instance, is an independent country made up of nine atolls in the Pacific Ocean, about halfway between Hawaii and Australia, with a population of 11,146 and a total land area of 26 square kilometers (9 square miles). Since the highest point in Tuvalu is just 5 meters (16 feet) above sea level, the country is at risk of being washed off the map. In fact, in 2000 the government of Tuvalu appealed to Australia and New Zealand to take in Tuvaluans if rising sea levels made evacuation necessary.

Threats from global climate change, however, go beyond the fear of being swamped by rising sea levels. Sustenance on these islands typically rests on extraction of resources from fisheries that, in turn, are sustained by the coral reefs that surround almost all tropical islands. These reefs, however, are themselves endangered by a host of forces associated with climate change. Rising water temperatures have led to a process called bleaching, which kills off the coral. Increased storm activity, again at least partly a result of global climate change, also endangers reefs. More intense rain can lead to heightened erosion, which, in areas where agricultural chemicals are used, can cause plumes of chemical-rich soil to be washed out to sea, killing adjacent reefs. On land, as well, changes in the precipitation pattern tending toward extreme drought followed by extreme storms endangers the population, since people on these islands often depend on collected rainwater as their sole freshwater source.

A Global or Local Problem?

As the textbook elaborates, views of nature, society, and the relationship between nature and society vary greatly. Nature may be seen as wrapped up in one's

everyday life, a set of resources to be exploited as needed, or a sacred pristine world to be revered and preserved. Not only does one's view of nature impact how one perceives environmental problems and designs solutions; it even affects whether one sees the transformation of nature, or hardships caused by nature, as "problems" at all.

Turning to climate change, one's position on climate change and what one thinks should be done about it greatly depends on the scale at which one perceives the problem. It is by no means clear whether climate change is a local, national, regional, or global problem (or, as some would assert, whether it is a problem at all). At one level, climate change is a very local issue. Climate-changing pollutants are emitted locally and, especially because the impacts of climate change vary so much from place to place, they are experienced locally as well. Contrasting this perspective, others argue that, while climate change may be both generated and experienced locally, the sources of climate change (large, industrialized mainland regions) typically are distant from those that experience its greatest brunt (small, agricultural islands). In addition, even though the specific impacts of climate change differ from place to place, the overall experience of climate change is global. Therefore, it is often argued, climate change must be considered a global problem, to be dealt with by the world community.

Still others take a middle ground, arguing for a regional or national approach. Our society has been divided into sovereign nation-states, and only nation-state governments have the authority to mandate changes in pollutant emissions. In fact, even when a "global" treaty is signed, the signatories are actually nation-state governments who each agree to change their national laws so as to reflect the new, international mandate. Therefore, some argue, true change in environmental policy can be implemented only at the national level.

Finally, others argue that while the global scale is perhaps too crude for mandating change in environmental behavior, national borders are too artificial for organizing environmental policy, given that most environmental problems (such as airborne pollutants) easily cross national borders within a given region. Perhaps, then, a regional approach would be most effective for coping with issues like climate change.

Each of these approaches has been advocated by one participant or another in the climate change debate, and each is represented in the readings that follow. Probably the dominant voice in debates over global climate change belongs to those who say that global climate change is just that—global—and that a solution must be constructed at the global scale. This is the overall thrust of the 1997 Kyoto Protocol, an agreement sponsored by the United Nations whereby countries

agreed to reduce their emissions of greenhouse gases by specified percentages by 2012. The first reading is a statement issued in 2001 by many of the world's national academies of science, in which the signatories argue that climate change is real and global, and that efforts to stop it must be taken on the global level, beginning with the actions mandated by the Kyoto Protocol. This position is opposed in the second reading, a 2001 public letter from President Bush to four U.S. senators who had asked him to clarify his position on the Kyoto Protocol (shortly after releasing this letter, President Bush issued a statement formally announcing that any U.S. efforts to forestall climate change would occur outside the Kyoto framework because the Kyoto framework was "fatally flawed"). While President Bush expresses questions about the science of climate change and Kyoto's exemptions for developing countries, he also takes issue with the way in which the Kyoto Protocol labels climate change as a *global* concern. In his letter, President Bush considers efforts to forestall climate change in the context of existing U.S. laws, economic needs, favored regulatory mechanisms, and energy shortages. For President Bush, the problem may, in part, be global, but the solution must be national.

This position is directly contradicted in the third reading, from the environmental group Greenpeace. Greenpeace asserts that climate change is indeed a global issue demanding global solutions, and that "the world cannot wait" for the United States. The final reading on the Kyoto Protocol, from the British newspaper *The Guardian*, sums up the debate between the United States and Europe on reducing greenhouse gas emissions (and also provides a concise overview of how the Kyoto Protocol would work, albeit with a definite pro-Kyoto slant).

With the fifth reading, the perspective becomes more local, as Janita Pahalad, a climatologist from the Pacific island nation of Fiji, offers her perspective on climate change and sea-level rise. Although Pahalad experiences climate change as a local problem, she asserts that change must occur globally, since Fiji and other Pacific island states generate only a tiny percentage of greenhouse gases. In the next reading, Greenpeace Pacific tries another strategy, arguing that climate change is a *regional* concern and that Australia and New Zealand, as part of the Pacific region, should join with smaller and less powerful Pacific island countries in supporting efforts to limit climate change.

Contrasting both of these perspectives, the seventh reading is from the EnviroTruth.org website, a project of the conservative National Center for Public Policy Research, based in Washington, D.C. Elsewhere on its website, the NCPPR challenges the scientific findings that are cited by most advocates of reducing greenhouse gas emissions. The NCPPR asserts that (a) the global climate is not warming; (b) to the extent that the

global climate is warming, it is not due to increased levels of greenhouse gases; and (c) any increased levels of greenhouse gases are not due to human action. In the section of its website reprinted here, the NCPPR argues that even if polar ice caps were to melt due to global warming, it would not lead to a rise in sea level that would threaten islands or coastal regions (and, according to NCPPR, global warming is not happening anyway). Therefore, NCPPR concludes, any problems of erosion or subsidence on small islands must be due not to global climate change but to local land-use practices.

The eighth reading, a news release from 2000, announces a talk to be given by Hawaiian researcher Eileen Shea. According to this news release, Shea stresses that, among the various aspects of global climate

change, atmospheric warming is among those *least* likely to have a significant impact on Pacific islands. Therefore, she argues, attention should be directed toward other hazards, whose problems can be met through local strategies. Thus, like NCPPR, Shea focuses on local solutions.

The final reading, an abstract of a paper presented by New Zealand researcher John Hay at a conference held in Samoa in 2000, agrees with Shea that attention should be redirected away from global warming and sea-level rise, and toward other, more immediately threatening impacts of climate change. At the same time, however, Hay agrees with Pahalad that the cause of these local problems is *global* climate change, and that therefore change must be undertaken at the global scale.

Readings

from **Sixteen National Academies of Science**

The Science of Climate Change

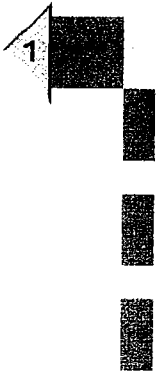
17 May 2001

A joint statement issued by the Australian Academy of Sciences, Royal Flemish Academy of Belgium for Sciences and the Arts, Brazilian Academy of Sciences, Royal Society of Canada, Caribbean Academy of Sciences, Chinese Academy of Sciences, French Academy of Sciences, German Academy of Natural Scientists Leopoldina, Indian National Science Academy, Indonesian Academy of Sciences, Royal Irish Academy, Accademia Nazionale dei Lincei (Italy), Academy of Sciences Malaysia, Academy Council of the Royal Society of New Zealand, Royal Swedish Academy of Sciences, and Royal Society (UK).

The work of the Intergovernmental Panel on Climate Change (IPCC) represents the consensus of the international scientific community on climate change science. We recognise IPCC as the world's most reliable source of information on climate change and its causes, and we endorse its method of achieving this consensus. Despite increasing consensus on the science underpinning predictions of global climate change, doubts have been expressed recently about the need to mitigate the risks posed by global climate change. We do not consider such doubts justified.

There will always be some uncertainty surrounding the prediction of changes in such a complex system as the world's climate. Nevertheless, we support the IPCC's conclusion that it is at least 90% certain that temperatures will continue to rise, with average global surface temperature projected to increase by between 1.4 and 5.8 C above 1990 levels by 2100. This increase will be accompanied by rising sea levels, more intense precipitation events in some countries, increased risk of drought in others, and adverse effects on agriculture, health and water resources.

In May 2000, at the InterAcademy Panel (IAP) meeting in Tokyo, 63 academies of science from all parts of the world issued a statement on sustainability in which they noted that "global trends in climate change ... are growing concerns" and pledged



themselves to work for sustainability—meeting current human needs while preserving the environment and natural resources needed by future generations. It is now evident that human activities are already contributing adversely to global climate change. Business as usual is no longer a viable option.

We urge everyone—individuals, businesses and governments—to take prompt action to reduce emissions of greenhouse gases. One hundred and eighty-one governments are Parties to the 1992 UN Framework Convention on Climate Change, demonstrating a global commitment to ‘stabilising atmospheric concentrations of greenhouse gases at safe levels’. Eighty-four countries have signed the subsequent 1997 Kyoto Protocol, committing developed countries to reducing their annual aggregate emissions by 5.2% from 1990 levels by 2008–2012.

The ratification of this Protocol represents a small but essential first step towards stabilising atmospheric concentrations of greenhouse gases. It will help create a base on which to build an equitable agreement between all countries in the developed and developing worlds for the more substantial reductions that will be necessary by the middle of the century.

There is much that can be done now to reduce the emissions of greenhouse gases without excessive cost. We believe that there is also a need for a major co-ordinated research effort focusing on the science and technology that underpin mitigation and adaptation strategies related to climate change. This effort should be funded principally by the developed countries and should involve scientists from throughout the world.

The balance of the scientific evidence demands effective steps now to avert damaging changes to the earth’s climate.

Source: Greenpeace International, 2001.

from **George W. Bush**

Letter from the President

*For Immediate Release
Office of the Press Secretary
March 13, 2001*

Thank you for your letter of March 6, 2001, asking for the Administration’s views on global climate change, in particular the Kyoto Protocol and efforts to regulate carbon dioxide under the Clean Air Act. My Administration takes the issue of global climate change very seriously.

As you know, I oppose the Kyoto Protocol because it exempts 80 percent of the world, including major population centers such as China and India, from compliance, and would cause serious harm to the U.S. economy. The Senate’s vote, 95–0, shows that there is a clear consensus that the Kyoto Protocol is an unfair and ineffective means of addressing global climate change concerns.

As you also know, I support a comprehensive and balanced national energy policy that takes into account the importance of improving air quality. Consistent with this balanced approach, I intend to work with the Congress on a multipollutant strategy to

require power plants to reduce emissions of sulfur dioxide, nitrogen oxides, and mercury. Any such strategy would include phasing in reductions over a reasonable period of time, providing regulatory certainty, and offering market-based incentives to help industry meet the targets. I do not believe, however, that the government should impose on power plants mandatory emissions reductions for carbon dioxide, which is not a "pollutant" under the Clean Air Act.

A recently released Department of Energy Report, "Analysis of Strategies for Reducing Multiple Emissions from Power Plants," concluded that including caps on carbon dioxide emissions as part of a multiple emissions strategy would lead to an even more dramatic shift from coal to natural gas for electric power generation and significantly higher electricity prices compared to scenarios in which only sulfur dioxide and nitrogen oxides were reduced.

This is important new information that warrants a reevaluation, especially at a time of rising energy prices and a serious energy shortage. Coal generates more than half of America's electricity supply. At a time when California has already experienced energy shortages, and other Western states are worried about price and availability of energy this summer, we must be very careful not to take actions that could harm consumers. This is especially true given the incomplete state of scientific knowledge of the causes of, and solutions to, global climate change and the lack of commercially available technologies for removing and storing carbon dioxide.

Consistent with these concerns, we will continue to fully examine global climate change issues—including the science, technologies, market-based systems, and innovative options for addressing concentrations of greenhouse gases in the atmosphere. I am very optimistic that, with the proper focus and working with our friends and allies, we will be able to develop technologies, market incentives, and other creative ways to address global climate change.

I look forward to working with you and others to address global climate change issues in the context of a national energy policy that protects our environment, consumers, and economy.

Sincerely,
George W. Bush

from **Greenpeace International**

The Climate Cannot Wait for Bush

But If Bush Doesn't Change, the Climate Will

7 June 2001

A World-Wide Storm of Protest

President George W. Bush's announcement in late March that the United States was abandoning the Kyoto Protocol was met by a storm of protest, both in the US and internationally. Governments, scientists, religious leaders, labour and other public figures, as well as environmental organisations, condemned the move. The US is seen as

abandoning its moral, political and legal responsibility to work internationally to address the most pressing international environmental problem of the 21st century: global climate change.

President Bush's upcoming visit to Europe threatens to be marked by outrage at the rejection by the world's worst greenhouse gas polluter of the last 12 years of international climate negotiations.

No Mandate to Wreck the Climate

Greenpeace believes that the Bush administration's isolationist policy will ultimately fail, both domestically and internationally. The recent defection of Senator James Jeffords of Vermont indicates the breadth of opposition to Bush's rejection of Kyoto, his energy policy and the rest of his hard core right wing agenda, even from moderates within his own party. George Bush does not have a mandate from the American people or the Congress to wreck the international climate negotiations. US public opinion and the US Congress are moving inexorably in the right direction. The White House will follow eventually.

Ratify the Climate Treaty With or Without the US

While this right wing drama plays out in Washington, the rest of the world must not be distracted from combating climate change, and the first step is the ratification and entry into force of the Kyoto Protocol.

US Alternative No Alternative

The United States' 'alternative', if it ever appears, is very likely to be strong on rhetoric, but very weak on targets and timetables for reducing greenhouse gas emissions, and will try to postpone the hard choices to a time in the future when they will no doubt be much harder and more expensive to take and perhaps to a time when it is too late to reverse the damage that we are doing to the world's climate system.

EU Must Lead Ratification and Implementation of the Climate Treaty

Greenpeace urges the European Union to stand firm in the face of Bush's posturing, and to recognise that the majority of the American people support international action to protect the climate. Europe must show real leadership and fulfil its promise to its own people to ratify the Kyoto Protocol, which must enter into force in time for the Rio+10 Summit in Johannesburg in September of 2002. Failure to do so will be met with the harshest criticism from the vast majority of Europeans who want to get on with the business of preventing dangerous climate change.

The EU must go on to implement the climate treaty in full, developing the next steps within the convention for further and deeper cuts in greenhouse gases, while waiting for signs that sanity is returning to Washington and a time when the US can be welcomed back into the process.

Waiting for Bush Not an Option

The Kyoto Protocol does not go far enough, it is true, but it was watered down to its present text largely as a result of US demands and corporate intervention. The EU and the rest of the world cannot wait until the political climate in Washington improves, or expect some miraculous 'alternative' from Washington. It will not come while the current administration lasts. Waiting for Bush is not an option.

Source: Greenpeace International, 2001.

from *The Guardian*

4

The Heat Is On for a Solution in Bonn

As Crucial Climate Change Talks Open, We Examine the High Cost of Inaction

Paul Brown, Environment Correspondent
Saturday July 14, 2001

What Is the Climate Change Convention?

An agreement made by more than 150 countries at the Earth Summit in Rio in 1992 to limit man-made emissions of greenhouse gases to stop the atmosphere overheating.

What Are Greenhouse Gases?

The main ones are carbon dioxide, methane, and nitrous oxide. They prevent the reflected heat of the sun's rays escaping back into space, like the glass in a greenhouse.

Are Scientists Certain About This?

Scientists agree that global warming is taking place and the vast majority believe it is man made. Burning fossil fuels releases carbon dioxide. Intensive agriculture and rubbish tips release methane. The only uncertainty is the scale of the process and whether we can adapt to it.

How Quickly Is the World Warming?

An average of up to 5C in 100 years, but more in some areas, notably in the arctic.

How Soon Will We Know?

The weather in the UK is already different, but in the arctic some effects are dramatic: some species, such as the polar bear, face extinction owing to melting ice.

What Is the Kyoto Protocol?

An addition to the Rio convention, first agreed in 1997, to give all developed countries legally binding targets for cuts in emissions from the 1990 levels by 2008–12.

The EU agreed an overall target of 8%, Japan 7%, and 6% for the US.

Why Were the Targets Different?

Some countries found it easier to make cuts than others. The UK had already started the switch to natural gas, Germany had closed many heavy industries, and Japan was already energy efficient. The US found it difficult because of an economic boom in the 90s.

The developed world was to cut its emissions by 5.2%, and it was hoped that developing countries would join in later.

How Can We Keep to the Kyoto Targets without Cutting Domestic Emissions?

There are three ways. Countries can plant forests to absorb and lock in carbon, or change agricultural practices to cut carbon emissions, such as not ploughing, or keeping fewer farm animals which produce methane.

They can install clean technology in other countries and claim carbon credits for themselves.

They can buy carbon credits from countries such as Russia, where heavy industry has collapsed and national carbon limits are underused.

But Is That Enough to Solve the Problem?

Nowhere near. There is already enough additional greenhouse gas in the atmosphere to alter the climate, but we can stave off the worst if we cut man-made greenhouse gas production by 60% to 80% as soon as possible. The temperature will then stabilise at 5C higher than now.

Kyoto was meant to be only the beginning, leading to steeper targets by 2020. We need to have cracked the problem by 2050 to avert disaster.

So What Went Wrong?

The rules for how greenhouse gas emissions are measured and how they can be cut were not finalised in Kyoto. It was not agreed to what extent we could rely on planting forests and carbon trading.

Years of wrangling ended in angry exchanges at the Hague in November, and things have gone from bad to worse since then. President George Bush repudiated the protocol, fearing that cutting the use of fossil fuel would damage the US economy.

A former oil man himself, he has been persuaded by the oil industry to dump the Kyoto deal because it will hurt profits and cost jobs.

What Can We Do Now?

The rest of the world could proceed without the US. Most of the EU wants to go it alone and keep to the targets agreed in Kyoto, but the UK and Japan are reluctant without the US. Australia and Canada are against.

Why Is There Such Reluctance?

The US emits a quarter of the world's greenhouse gases and unless this is cut, the efforts of others will not make much difference. It will also be impossible to make developing countries such as China take the problem seriously.

Could the EU Go It Alone, Show the Lead and Then Put Pressure on Mr Bush?

Yes, but it needs partners. Under the Kyoto rules, 55 countries must ratify the protocol—making it law in their own countries—to make it legally binding across the world.

A second condition is that they must include enough developed countries to make up 55% of total emissions in 1990, from when all targets are calculated.

How Do the Figures Add Up?

The US alone was responsible for 36% of developed world emissions in 1990, so all of the EU, eastern Europe, Japan and Russia are needed to reach 55%.

How Do the Alliances Work?

The EU has persuaded Russia and eastern Europe to ratify but Japan is wavering. There is confusion about the next talks in Bonn on Monday.

So What Will Happen?

The US will continue to destroy the Kyoto deal and suggest new talks. Others will try to make Kyoto easier for the US to accept.

The EU and its allies may forge ahead and ratify it, and challenge Japan to follow suit. Or the talks could collapse.

Who Are Winners and the Losers?

The world's poor countries, and poor people who cannot adapt, will suffer first. There will be flooding, drought and famine. There will be millions of environmental refugees in Africa and Asia. Some northern countries gain marginally from a longer growing season in a warmer climate but the gains will not outweigh the losses.

What Is the Worse-Case Scenario?

Huge tracts of productive land will become submerged, including major cities. Large migrations of people. More natural disasters, triggering a collapse of the insurance market, and a global crash as the world economy collapses.

What Is the Best-Case Scenario?

That man's ingenuity and technology comes to the rescue with hydrogen and solar power replacing fossil fuels to run transport and create electricity.

Does Climate Require Us to Fundamentally Change Our Lifestyles?

Not a lot in the electric hi-tech age. We need to cut fuel consumption, stop flying flowers and vegetables round the world when they can be produced locally, and recycle goods. These changes can be achieved without damaging lifestyles.

If Bonn Collapses Will It Be a Disaster?

Yes, in the diplomatic sense, and environmentally, too. So far no one has come up with a credible alternative.

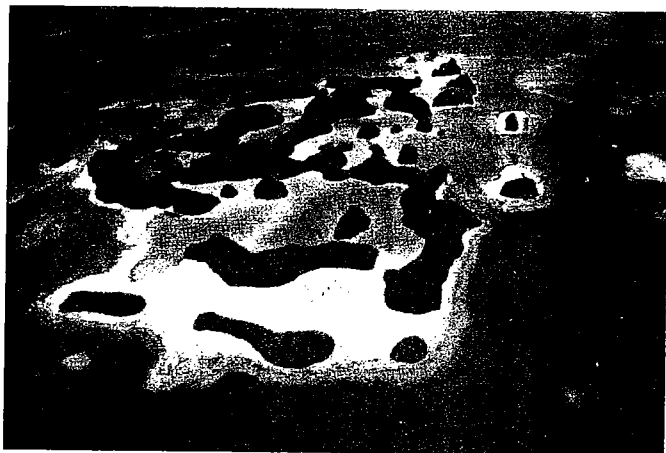
Source: Paul Brown, "The Heat is On for a Solution in Bonn," *The Guardian*, July 14, 2001. Copyright © 2001 The Guardian. Used with permission.

from South Pacific Regional Environment Programme

Climate Change and Sea Level Rise

by Janita Pahalad
July 1998

Today, climate change and sea-level rise have become household topics, especially in the Pacific region. People are intrigued by these issues, but very few understand what all the fuss is about. Some wish to learn more but few are willing to combat the effects of such phenomena. Climate change and sea-level rise are so interrelated that one cannot talk about sea-level rise without explaining the reason for it. Sea level is a measurable quantity and it can be generally defined as the results of all influences such as daily tides, meteorological, oceanographical and geological effects. For example, climate change and the movement of the earth's crust can change the sea levels significantly.



Source: Photo Researchers, Inc.

Many believe that climate change (or global warming, as it is commonly referred to) is mainly due to our desire to progress. Generally, there is a theory in science that climate change and sea-level variation are natural phenomena that occur approximately every ten thousand years or so and something which cannot be avoided. However, our excessive contribution of greenhouse gases into the atmosphere (which did not previously take place) is one of the major factors contributing to global warming. Scientists claim that by the year 2100, expected global temperatures may rise by 1–4° C and the subsequent sea-level rise may be approximately 50 centimetres, although this sea-level rise could be higher in the Pacific region. Research indicates that in the Pacific, temperature has been rising 0.1° C per decade and that sea level has been rising by 2 millimetres per year. Recent data compiled from the NTF's 11 tide gauges in the Pacific

show an accelerated sea-level rise of up to 25mm/yr—more than 10 times the global trend this century. This is thought to be related to El Niño-Southern Oscillation (ENSO) variations.

There are many low-lying atolls in the Pacific. Generally, these islands are small and the surrounding waters play a major role in their existence. A 50-centimetre sea-level rise may take away a few kilometres of coastal area from a large island, but it may completely submerge a small island country in the Pacific region. Long before that stage is reached, there may be greater loss of lives and infrastructure due to the enhanced impact of natural disasters such as tropical cyclones, storm surges, floods, tsunamis and so on. The economy of most of the Pacific island countries (PICs) is greatly dependent upon fisheries, agriculture, tourism and overseas aid, and most PICs are struggling to make ends meet.

Leaders of PICs are fully aware of sea-level rise and coastal erosion problems and they are badly in need of applicable advice on how to address the problems. Public awareness of the situation is also important, and this should be conducted in local languages. However, if we are told how to safeguard our coastlines or to reduce the emission of greenhouse gases, the question arises: who should pay the cost? If recent

global warming is a man-made problem, PICs are micro-contributors of greenhouse gases yet they are likely to be affected most. Some larger nations have blatantly shown their lack of concern on these issues and they seem to believe that their economy and well-being are much more important than the survival of the people from PICs. This sounds inhumane to us. How can we make our voice heard? Are we over-reacting? One thing is for sure: we are vulnerable.

If climate change and sea-level variation have been natural phenomena in our planet, as suggested by the geological records, do we still need to do anything to protect our future generations? Obviously, this is a difficult question. When and how can we tell with some certainty if we are in danger of losing part or all [of] our homeland? In the mean time, we have to focus upon capacity building for the Pacific community on these issues so we can catch up with current scientific information.

Note: The author, Miss Janita Pahalad, is a Senior Climatologist working at the Fiji Meteorological Services in Nadi, Fiji who visited NTF for three weeks in October 1997 to participate in the Short Term Attachment Workshop, Round III.

Source: Janita Pahalad, "Climate Change and Sea Level Rise: A Personal View from Fiji," *The South Pacific Sea Level and Climate Change Newsletter*, July 1998. Copyright © 1998 SPREP. Used with permission.

from **Greenpeace Pacific**

Sea Level Rise a Big Problem for Tuvalu, Prime Minister Says

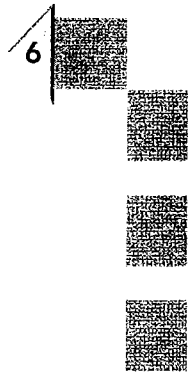
SV Rainbow Warrior, Tuesday July 22nd 1997—Sea-level rise and climate chaos caused by global warming are urgent and critical issues for Tuvalu and other low-lying countries, the Tuvalu Prime Minister Rt Hon Bikenibeu Paeniu told Greenpeace yesterday.

Mr Paeniu made these comments while visiting the SV Rainbow Warrior, the first Greenpeace vessel to ever visit Tuvalu, yesterday (Monday July 21st).

Tuvalu experienced a freak cyclone last month which devastated an outer island. A string of coral atolls no more than two metres above sea-level, Tuvalu could be annihilated by the sea-level rise which scientists predict will occur if nothing is done to slow global warming. Greenpeace campaigner Stephanie Mills, on board the Rainbow Warrior, said it was time for the developed countries, who were predominantly responsible for burning the fossil fuels that contribute to global warming, to listen to the voice of Tuvalu.

Greenpeace has been highly critical of Australia and New Zealand's position on climate change. In spite of rhetorical commitments to take action to reduce their greenhouse gas emissions, Australia has recently said it will only agree to an international convention limiting climate change if Australia is allowed to INCREASE its emissions. New Zealand has refused to commit to any target for emissions reductions and is currently increasing its carbon dioxide emissions.

"It is shameful that countries like Australia and New Zealand, which claim to be part of the South Pacific, take no responsibility to reduce their impact on the climate when their own neighbours are at risk," she said. "Australia is lobbying to be declared a special case because of its heavy dependence on the coal industry. But it is Tuvalu, Kiribati and other low-lying coral atolls that should receive the special attention of the rest of the international community, because while contributing little to the climate problem, they are the first to suffer."



Mr Paeniu also discussed the issue of shipments of high-level nuclear waste and plutonium through the Pacific with Greenpeace representatives. Several shipments of nuclear waste from Japan to France are expected to transit the Pacific every year over the next decade. Greenpeace is campaigning for a regional ban on the shipments and for an end to the international plutonium trade.

The Rainbow Warrior was visiting Tuvalu as part of a Pacific-wide education and information tour against nuclear waste shipments and for environmental protection. It will next call at Honiara in the Solomon Islands (July 29th), then Papua New Guinea, Fiji and the Cook Islands.

Source: "Sea Level Rise a Big Problem for Tuvalu, Prime Minister Says," Greenpeace Pacific, July 22, 1997. Copyright © 1997 Greenpeace. Used with permission.

from **National Center for Public Policy Research**

Myth #6: Sea Level Is Rising Quickly and It Will Get Worse If the Polar Ice Caps Melt Due to Global Warming

Coastal Settlements and Low-Lying Islands Will Be Submerged

The Envirotruth: Sea level has been rising naturally since the end of the last ice age and this has not accelerated recently. The total rise has been over 120 metres and is still proceeding at a rate of about 18 cm per century. We don't see an increase in this rate during the strong warming that took place between 1900 and 1940 nor did the rate decrease when the climate cooled between 1940 and 1975.

According to Dr. Fred Singer, President of The Science & Environmental Policy Project, Distinguished Research Professor at George Mason University and Professor Emeritus of environmental science at the University of Virginia, ongoing sea level rise is due to the slow melting of Antarctic ice sheets that have been gradually disappearing for about 18,000 years, the date of the last glacial maximum. As far as we can tell from geological data, only temperature variations on a millennial time scale can affect this rate. Climate fluctuations lasting decades or even centuries are too short to affect this rate of melting appreciably. Our best estimate is that these ice sheets will continue to melt for another 5,000 to 7,000 years until they disappear. So unless another ice age commences in the meantime, sea level is bound to keep on rising and there is probably nothing that humans can do about this.

It is also important to understand that, just as the melting of ice cubes in a glass of water does not cause the glass to overflow, the melting of polar sea ice will not result in ocean level changes. Only if massive quantities of inland Antarctic and Greenland glaciers melted would sea levels raise enough to submerge coastal settlements. Dr. Patterson and University of Hawaii Professor of Earth Science Dr. Charles Fletcher maintain that this did not happen 5,500 years ago, when the Earth was three degrees warmer. They also explain that sea level was only two meters higher 120,000 years ago, when temperatures were almost six degrees warmer than now.

Ordinarily, small island-nations like the Maldives and Barbados are not threatened by such a rise. This is because these countries are built entirely on coral and coral fragments. This coral is continually, and quickly, growing upward and, unless something



very bad happens to the natural environment in a region, no sea level rise is fast enough to get ahead of coral growth. The Maldivian reefs have been coping with increasing sea level for the past few thousand years and were even able to keep up when the ocean was rising ten times faster than it is now, 10,000 years ago.

Oceanographer Klaus Schwarzer of Christian Albrechts University in Germany explains that today's problems in the Maldives are caused by two factors—local pollution that is killing the reefs (as is the case in Barbados) and inappropriate construction projects. Barriers built out into the ocean to stop the drift of sediment away from the coast are disrupting the circulation of nutrient rich water to the reefs and killing them.

As a result, the Maldives islands are sinking. This has nothing to do with climate change and is the fault of the Maldivian government, which selected a barrier design maladapted for a coral atoll (it was designed for the rock-based Mediterranean Sea coast). Yet, Ismail Shafeeu, the Maldives' Minister of the Environment, still complains, "In the next hundred years or so, what the rest of the world does is going to determine whether we are going to be around or not. We need commitment on the part of people living in countries that are causing this problem. If these countries and the people living in these countries do not change their lifestyles in a way that will allow us to survive, they will have the murder of a nation on their hands." Clearly, Mr. Shafeeu is either misinformed about the science or is engaging in propaganda.

The Barbados has lost nearly all of their reefs due to runoff from their own agriculture. Their wells are becoming more salty simply because they are extracting so much water to irrigate crops that they are actually drawing sea water into their aquifers. As in the Maldives, its problems are caused by flawed domestic practices and have nothing to do with climate change.

If the U.N. and environmental groups are genuinely interested in solving environmental problems in the Maldives and other developing countries, then they should focus on their true causes. To do otherwise virtually guarantees these problems will continue, no matter how sensational an example it provides for climate change alarmists.

Source: "Myth #6: Sea-Level is Rising Quickly and It Will Get Worse if the Polar Ice Caps Melt Due to Global Warming." Copyright © 2003 National Center for Public Policy Research. Used with permission.

from **University of Hawai'i**

Climate Changes Affecting Pacific Islands

Craig DeSilva

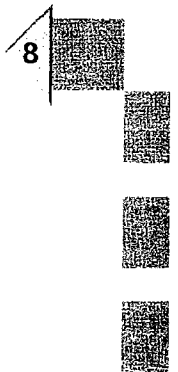
HONOLULU Hawai'i (June 27, 2000—PIDP/CPIS)—Small, isolated Pacific Islands have always been vulnerable to global climate changes and weather phenomena.

Although weather forecasters can make broad predictions, it's difficult to pinpoint exactly when or where a typhoon or hurricane will hit.

But Pacific Island countries and territories can prepare themselves in advance to minimize disastrous effects during weather-changing periods.

"By anticipating in advance, you can take some preparatory action," said Eileen Shea, an adjunct fellow of environmental studies at the East-West Center. "I think all of the Pacific Island nations are looking at adapting to climate change as well as reducing greenhouse gases."

Shea will give a talk Wednesday at the Mauna Lani Bay Hotel on the Big Island of Hawai'i on "Consequences of Climate Change: Challenges and Opportunities for Pacific Islands and Hawai'i."



Shea said Pacific Islands that are alerted to major global climate changes can prepare themselves in advance. For example, regarding the 1997–98 El Niño in the Pacific, the Federated States of Micronesia formed a drought task force before it occurred.

The FSM also developed a public awareness campaign to alert the general population to minimize the effects of the drought.

"Water conservation measures were instituted earlier rather than later," Shea said.

In the Republic of Palau, a decision was made to extend the height and width of the main island's principal dam prior to the wet season so it could hold as much rainfall as possible before drought set in.

Shea is also the Climate Project Coordinator at the East-West Center. The EWC's Pacific Islands Regional Assessment program is made up of scientists, researchers, and other officials from the United States and Pacific Islands who are working to deal with climate change issues throughout the Pacific.

The one-year program is being conducted in conjunction with the Office of the U.S. Global Change Research Program, which is looking into climate change. Shea said the Pacific Islands community will have an opportunity through public hearings to present input on a just released draft report entitled "Climate Change Impacts on the United States: The Potential Consequences of Climate Variability and Change." The public hearings end in August.

Shea said although rising sea levels have been a constant issue facing the Pacific, there are other climate changes that have just as important implications.

"For a variety of reasons, sea-level rise has had a hammerlock on discussions of vulnerability to climate change," Shea said. "What we're trying to do is expand our thinking to address other issues beyond sea level."

Some of the climate issues posing a threat to the Pacific include:

- Increase in air temperature, which can possibly increase the intensity of El Niños;
- Changes and increased intensity in tropical cyclone patterns as a result of global warming;
- Changes in ocean circulation patterns and temperatures, which affect fish stock in the Pacific. Some fish in the Pacific, such as tuna, tend to follow warmer water. "If El Niños are more frequent, tuna migratory patterns will change," she said. "That has significant impacts because that means they can move in and out of a nation's jurisdiction. And that's quite significant particularly for (Pacific) jurisdictions that might be thinking tuna fisheries are an economic source in the future."
- Warming of ocean temperatures impacting coral reefs. "The 1997–98 El Niño saw substantial bleaching of coral reefs around the Pacific," Shea said. "They were much more severe than in the past. That could lead to secondary impacts on surrounding ecosystems and tourism."

"The islands that are most vulnerable are the low-lying atolls," she said. "Any island that doesn't have mountainous relief is problematic. And it varies across the Pacific. Some islands are tectonically growing, such as the Big Island of Hawaii. But others are actually sinking because of tectonics."

Shea adds that a recent study shows that the Pacific is experiencing the same average rate of rising sea levels as the rest of the world.

"They're not seeing an enhancement in sea-level rise any more than (elsewhere) in the world," she said. "The sea-level rise issue is a long-term issue, (one) of whether you're going to have an island, because it (may) be covered over."

Source: Craig DeSilva, "Climate Changes Affecting Pacific Islands," *Pacific Islands Report*, June 27, 2000. Copyright © 2000 Pacific Islands Report. All rights reserved.

from John E. Hay



Climate Change and Small Island States

A Popular Summary of Science-Based Findings and Perspectives, and Their Links with Policy

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We are certain that human activities result in increased emissions of greenhouse gases into the atmosphere, with a consequent increase in their atmospheric concentrations and thence enhanced radiative forcing on the atmosphere. There is very high certainty that such changes lead to global warming and global sea-level rise.

Characterisations of future climate changes, and their consequences, for the small islands regions of the world have considerably less certainty. This is due, in part, to the inability of global climate models to resolve the spatial patterns consistent with the individual and combined groupings of small islands. However, the available evidence suggests that by the end of this century there will be systematic and significant changes in the mean climate and increases in sea level, resulting in substantial impacts. But these impacts are likely to be small and of less consequence than the after-effects of the more frequent extreme events and, especially for the Pacific islands region, *relative to the current ENSO-induced interannual variability in climate and oceanic conditions*. Geological processes, leading to uplift and subsidence of the land, also complicate estimates of sea-level rise.

By the end of the century mean temperatures for the small islands regions may increase by around 3 C, except for the Mediterranean where the increase is likely to be over 4 C. Observed trends in sea level show marked differences between small islands regions and substantial deviations from historic global trends. Despite this, limitations in modelling location specific sea-level rise require the continued use of projections of global sea-level rise in impact and adaptation assessments for the small island countries and regions. The 'best estimate' of global sea level rise is an increase of about 50cm by 2100. The uncertainty in this estimate still implies an increase of 1.5 to 3.5 times over the historic rate of rise.

It is now considered likely that global warming will lead to some increase in maximum tropical cyclone wind speeds and lower central pressures, leading to more damaging storm surges. Sea-level rise and storm surge effects are additive. Thus the combined effects of increases in cyclone intensities and sea-level rise are one of the major threats to the future well-being of small island countries. Model-based studies suggest that by 2080 the number of people flooded by these super storm surges in any typical year will be more than five times higher than present. The islands of the Caribbean and the Indian and Pacific Oceans face the largest relative increase in flood risk, with the number of people at risk being some 200 times higher than in most other parts of the world.

There is no substantive evidence that tropical cyclone numbers will change in a warmer world; nor is a change in regions of formation indicated. But it is possible that changes in the latter may occur in response to long-term changes in ENSO. Spatial

patterns of occurrence are unlikely to undergo major changes, except that tropical cyclones may track further polewards. There is low confidence in these projections. Such high uncertainty, along with the large natural interannual variability, makes it extremely difficult to attribute to human interference in the climate system ... to observed and projected changes in atmospheric and oceanic conditions.

A further complication is the conclusion that the interactions, feedbacks and hence indirect effects of global warming are likely to be of greatest consequence for small island countries, given the strong linkages between all natural and human systems in small island countries. One example relates to the impacts of coral bleaching on the social and economic impacts at community and national levels, including reduced supplies of seafood placing greater pressure on terrestrial food sources and the possibility of detrimental changes in land-use and land-cover. Another example relates to the relationship between direct human management of terrestrial carbon stocks and the natural responses of these stocks to climate change. A key reason for this concern is that terrestrial carbon stocks, in the forms of forest and soil carbon, may become progressively degraded as a result of climate or other global changes. Soil carbon losses increase with temperature. Increased plant growth, due to the CO₂ fertilisation effect, will saturate whereas increased respiration losses will not. Moreover, some forests are being established at the limits of their viable range and carbon losses due to forest fires are increasing.

The recently completed national greenhouse gas inventories provide quantified, conclusive evidence that, either on a collective or on a per capita basis, the inhabitants of small island states are minor contributors to elevated atmospheric greenhouse gas concentrations. But this does not mean that the small island states can, or should, sit back and rest on the reputation of being minor emitters of greenhouse gases. Small island states have many good reasons for taking concerted action now that they have more substantive information on which to base their actions. Actions may be taken to increase the efficiency of existing energy supply systems and to consider opportunities for substituting less costly fuels. Information contained in the inventories will help determine the cost effectiveness of the various options and, in turn, guide decision making related to investment and other initiatives. Such rationally based decisions and actions will help countries to achieve sustainable development.

Political factors may also influence the decision to reduce emissions. Any meaningful efforts by minor emitters to reduce emissions would provide a strong message and give impetus for other countries to take domestic action to reduce their overall emissions. The atmosphere is part of the global commons. Thus a country may well decide to act as a good global citizen and reduce its emissions, no matter how small the inventory data show those emissions to be.

As noted previously, for small island countries a variety of factors make it extremely difficult to anticipate the specific national and local impacts of climate change. These include the low resolution of, and confidence in, model-based projections and the sensitivity, complex and hence interactive nature the natural and human systems. Integrated as opposed to sector-based assessments and responses are essential under such circumstances. Moreover, especially for small island countries, policy development, planning, and implementation should be driven as much by the need to accelerate sustainable development as by the need to adapt to climate change—many adaptation responses will thus be based on “no regrets” policies. Critical to meeting the need for adaptation are both the transfer and assimilation of environmentally sound technologies, and enhancing the use of traditional knowledge and skills. Environmental technology assessment is of growing importance in small island countries.

Policy implications of the foregoing are examined from the perspectives of international negotiations and national development planning. At the international level, the United Nations Framework Convention on Climate Change seeks to prevent “dangerous interference with the climate system”. But to date there has been no success in

quantifying the specific threshold concentrations of greenhouse gases in the atmosphere that would limit the *integrated and critical* impacts of climate change to a level that avoids "dangerous interference". This is due, in part, to the current inability to anticipate the integrated impacts of climate change at national and community levels in small island countries. Thus further, targeted and integrated vulnerability research and assessments are required, not only to guide national development planning but also to inform international negotiators.

There is also a need to arrest and reverse the current trend whereby the responsibility of Annex 1 countries to reduce their emissions and enhance sinks is, in both cases, being transferred to non-Annex 1 Parties. Reliance on the enhancement of sinks through management of tropical ecosystems is risky. The present uptake of atmospheric CO₂ by the terrestrial biosphere may diminish over time, and increases in terrestrial carbon stocks may bring with it an increased risk of subsequent release of the carbon to the atmosphere. One study of risk reduction through implementation of the Kyoto Protocol has shown that the risk of a 50 cm sea-level rise, or an atmospheric concentration of CO₂ of 560 ppm (associated with a possible reduction of calcification rates in reef communities), would be reduced by less than 10%. Achievement of these thresholds would be delayed by less than a decade. It is clear that the targets in the Kyoto Protocol are incapable of arresting climate change. All Parties to the Convention must take every reasonable step to reduce the concentrations of greenhouse gases in the atmosphere, rather than abdicating responsibility to developing countries.

In national development planning, climate change is only one of many impediments to achievement of environmentally sound and sustainable development—many others are related to high population growth rates and densities, and the migration of people in-country. As with all other sources of pressure on natural and human systems, climate change must be mainstreamed in national development planning.

Five conclusions are derived from the review of science-driven policy and policy-driven science:

- The obvious and relatively well characterised consequences of global warming may not pose the greatest climate-related threat to small island countries—the less well understood extreme events, and the indirect effects of changes in mean conditions, are likely to be of far greater significance;
- International policy positions and negotiating strategies under the Convention are placing a growing emphasis on measures implemented by developing countries (e.g. reduced emissions, enhanced sinks), rather than placing the onus of the main contributors to global warming—this is unjustifiable, on both scientific and moral grounds;
- There is insufficient substantive information on which to base analysis of the sufficiency of response measures—this is due, in part, to the current inability to anticipate the integrated impacts of climate change at national and community levels in small island countries; and
- Integration is key to success in addressing climate change; at the national level, addressing climate change is only one of many policy responses required to achieve environmentally sound and sustainable development; integrated assessments and the mainstreaming of climate change policies are critical; integration at the international level can, amongst other benefits, result in synergies from compliance with the various environmental legal agreements; and
- There is a need to strengthen still further the capacity of small island developing states to address the preceding challenges, with sustainable outcomes—we already have several success stories, including CCPAC and PICCAP, along with the support of such organisations and initiatives as GEF, its partner organisations, namely the World Bank, UNDP and UNEP, UNDSO, NCSP and UNITAR.

Source: John E. Hay, "Climate Change and Small Island States" paper presented at the Second Alliance of Small Island States and posted at <http://sidsnet.org/docshare/climate/hays.doc>. Copyright © John E. Hay & Associates Ltd. Used with permission.

Review Questions

1. What, according to most scientists, is the connection between increased air pollution in industrialized countries and a rise in sea level in the Pacific?
2. What are some of the reasons the United States gives for not signing the Kyoto Protocol?
3. How does an atoll form, and why might an atoll be sinking for reasons not associated with rising sea level?
4. Why are coral reef ecosystems so important to the survival of Pacific island societies?

Discussion/Essay Questions

1. Consider the case of Ioane Ubaitoi, the man from Kiribati discussed at the beginning of this module, who went to New Zealand in 1998 to take a course in actions that might prevent the submersion of his country from global sea-level rise. Assuming that Mr. Ubaitoi's studies were paid for as development aid by the New Zealand government, was this really the best way for New Zealand to spend its money if it wanted to save Kiribati from eroding? Other possible uses of the money could have included the following:
 - Studying local Kiribati agricultural practices to see how they might be fostering erosion
 - Instructing the people of Kiribati on responding to other aspects of climate change not associated with sea-level rise
 - Lobbying the United States to sign the Kyoto Protocol and reduce emissions of greenhouse gases
 - Developing alternative energy technologies so that industrialized countries could continue to produce energy, but with lowered emissions of greenhouse gases
 - Resettling the people of Kiribati on New Zealand
 - Further studying the relationship between greenhouse gas emissions, climate change, and global warming
2. Pages 137 through 142 of the textbook present a number of religious, philosophical, and political perspectives on nature. How would each of these perspectives view global climate change? For each perspective, would climate change be seen as a "problem" to be "solved"? If so, how would the problem be framed and what kind of actions would be proposed as solutions?
3. Each of the readings differs in the scale at which climate change is seen as a problem. The readings also differ regarding the scale at which solutions should be applied. Building on some of the concepts introduced in the textbook regarding the relationship between human action and environmental change, and also facts learned from the readings about climate change and its impacts, make an argument for the scale of analysis that you think is appropriate for analyzing and impacting climate change.

Would any of these projects have been a better use for the money than the way that it was spent? Make your argument relying on one or more of this module's readings.

List of Readings

1. "The Science of Climate Change," joint statement issued by sixteen national academies of science, May 17, 2001, posted on the website of Greenpeace International, <http://archive.greenpeace.org/~climate/climatecountdown/scienceacademies.htm>.
2. George W. Bush, "Text of a Letter from the President to Senators Hagel, Helms, Craig, and Roberts," March 13, 2001, posted on the website of the White House, <http://www.whitehouse.gov/news/releases/2001/03/20010314.html>.
3. "The Climate Cannot Wait for Bush, But If Bush Doesn't Change, the Climate Will," June 7, 2001, posted on the website of Greenpeace International, <http://archive.greenpeace.org/~climate/climatecountdown/bushclimate.htm>.
4. Paul Brown, "The Heat Is On for a Solution in Bonn," July 14, 2001, posted on the website of *The Guardian*, <http://www.guardian.co.uk/theissues/article/0,6512,522651,00.html>.
5. Janita Pahalad, "Climate Change and Sea Level Rise: A Personal View from Fiji," in *The South Pacific Sea Level and Climate Change Newsletter*, July 1998, posted on the website of the South Pacific Regional Environment Programme, http://www.sprep.org/ws/newsletter/ClimateChange/nlcc0303/mf05_.htm.
6. "Sea Level Rise a Big Problem for Tuvalu, Prime Minister Says," news release from Greenpeace Pacific, July 22, 1997, posted on the website of the World History Archives, <http://www.hartford-hwp.com/archives/24/023.html>.
7. "Myth #6: 'Sea-Level Is Rising Quickly and It Will Get Worse If the Polar Ice Caps Melt Due to Global Warming: Coastal Settlements and Low-Lying Islands Will Be Submerged'," posted on the website of

- EnviroTruth.org, a project of the National Center for Public Policy Research, <http://www.envirotruth.org/myth6.cfm>.
8. Craig DeSilva, "Climate Changes Affecting Pacific Islands," news release issued jointly by the Pacific Islands Development Program of the East-West Center and the Center for Pacific Islands Studies of the University of Hawai'i, June 27, 2000, posted on the website of Pacific Islands Reports, <http://166.122.164.43/archive/2000/june/06%2D28%2D07.htm>.
 9. John E. Hay, "Climate Change and Small Island States: A Popular Summary of Science-Based Findings and Perspectives, and Their Links with Policy," abstract of a paper presented at the 2nd Alliance of Small Island States (AOSIS) Workshop on Climate Change Negotiations, Management, and Strategy, July 26–August 4, 2000, Apia, Samoa, posted on the website of the Small Island Developing States Network, <http://sidsnet.org/docshare/climate/hays.doc>.

Websites for Additional Research

1. Numerous organizations concerned with environmental policy and environmental regulations devote all or parts of their websites to positions on climate change and, more specifically, the Kyoto Protocol. For a particularly clear statement of the pro-Kyoto position, see the website for Greenpeace's climate change campaign at http://www.greenpeace.org/campaigns/intro?campaign_id=3937, or find the campaign via the Greenpeace International homepage, <http://www.greenpeace.org>. For an opposing perspective, visit the website of EnviroTruth.org's climate change campaign at <http://www.envirotruth.org> and click the link to the climate change campaign.
2. The International Institute for Sustainable Development, a Canadian nongovernmental organization, hosts a page of links to articles representing various positions on the Kyoto Protocol, at <http://www.iisd.ca/linkages/climate/ba/perspectives.html>. The page has not been updated since 1999, but it still provides a nice list of useful articles. For technical material on climate change, visit the website of the United Nations Intergovernmental Panel on Climate Change at <http://www.ipcc.ch>.
3. The United Nations sponsors a network for communication among the world's forty-three small island developing states (SIDS). The network's website, <http://www.sidsnet.org>, serves as a clearinghouse for information of concern to its members, including climate change. The SIDSNET website also hosts the official site of the Association of Small Island States (AOSIS), the organization of small island states' governments, at <http://www.sidsnet.org/aosis>.