Climate Change in Small Island Developing Countries of the South Pacific

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Abstract

This paper examines climate change in the South Pacific Island Region. It looks at the increases in atmospheric concentrations of greenhouse gases and aerosols as inferred from coupled atmosphere-ocean global climate models. The surface temperature at the end of this century is estimated to be 2.5^{o}C more than the 1990 level. Seasonal variations of projected warming are minimal. No significant change in diurnal temperature range is likely with rise in surface temperatures. An increase in mean temperature would be accompanied by an increase in the frequency of extreme temperatures. The models simulate only a marginal increase or decrease (<10%) in annual rainfall over most of the Small Island Nations. During summer more rainfall is likely while an increase in daily rainfall intensity causing more frequent and heavier rainfall events is also likely. The paper also looks at some implications of climate change in the region.

Introduction

The economy of Small Island States in the South Pacific is intrinsically linked with agricultural production, aquaculture, fisheries and tourism. The thermal stress stands a good chance of disrupting the terrestrial and marine ecosystems in Island Nations. Sea level rise poses by far the greatest threat. It could inundate many Islands of Kiribati and Tonga, increase storm damage to the remaining land and contaminate fresh water supplies in aquifers thus increasing health

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risks to local population. Rise in sea surface temperatures would significantly reduce the fish catch and would lead to bleaching of coral reefs. Higher temperatures would also affect abundance and distribution of disease vectors or disease causing microbes. An appropriate integrated assessment of the adverse effects of climate change and sea-level rise is critical for developing adaptation strategies which build resilience and capacity to address vulnerabilities in Small Island Nations of the South Pacific and to cope with their economic, social and environmental aspects of the sustainable development pathways.

Is the Earth's Climate Changing?

Climate can be considered as a valuable natural resource, which is of enormous economic and social importance, but which is usually taken for granted. When we are exposed to climate variability or consider the possibility of long-term climate change, the practical importance of climate information is recognized. This natural resource should be protected and adapted to wisely. That is why in the past three decades there has been great interest in research dealing with climate variability and climate change.

Climate is the average state of the atmosphere and the underlying land or water, on time scales of seasons and longer. Climate is typically described by the statistics of a set of atmospheric and surface variables, such as temperature, precipitation, wind, humidity, cloudiness, soil moisture, sea surface temperature, and the concentration and thickness of sea ice. The statistics may be in terms of the long-term average, as well as other measures such as daily minimum temperature, length of the growing season, or frequency of floods. Although climate and climate change are usually presented in global mean terms, there may be large local and regional departures from these global means. These can either mitigate or exaggerate the impact of climate change in different parts of the world.

Weather station records and ship-based observations indicate that global mean surface air temperature warmed between about 0.4 and 0.8°C during the 20th century. Although the magnitude of warming varies locally, the warming trend is spatially widespread and is consistent with an array of other evidences. The oceans, which represent the largest reservoir of heat in the climate system, have warmed by about 0.05°C averaged over the layer extending from the surface down to

10,000 feet, since the 1950s.

The observed warming has not proceeded at a uniform rate. As Figure 1 shows, virtually all the 20th century warming in global surface air temperature occurred between the early 1900s and the 1940s and during the past few decades. The troposphere warmed much more during the 1970s than during the two subsequent decades, whereas the Earth's surface warmed more during the past two decades than during the 1970s. Global mean temperature data indicate that the year 2002 was the second warmest on record, exceeded only by 1998 and well above the average temperature of 14^{o}C that prevailed from 1951 to 1980; Figure 2 shows the trends. Recent analyses of surface temperature data over a network of stations in the Small Island Developing States of the South Pacific also suggest that the past three years of the 21st century have continued to record higher than normal temperatures. The causes of these irregularities and the disparities in the timing are not completely understood. One striking change of the past 35 years is the cooling of the stratosphere at altitudes of ~20 kms, which has tended to be concentrated in the wintertime polar cap region.

The Intergovernmental Panel on Climate Change's[1] conclusion that most of the observed warming of the last 50 years is likely to have been due to the increase in greenhouse gas concentrations due to human activity, accurately reflects the current thinking of the scientific community on this issue.[2] There is general agreement that the observed warming is real and was particularly strong during the past 30 years. Figure 3 shows the trends in the average global temperature and atmospheric carbon dioxide concentrations. One cannot rule out that a significant part of these changes is also a reflection of natural variability. Human-induced warming and associated sea level rises are expected to continue through the 21st century. Secondary effects also include enhanced rainfall intensity and increased susceptibility of semi-arid regions to drought. The impacts of these changes will be critically dependent on the magnitude of the warming and the rate with which it occurs.

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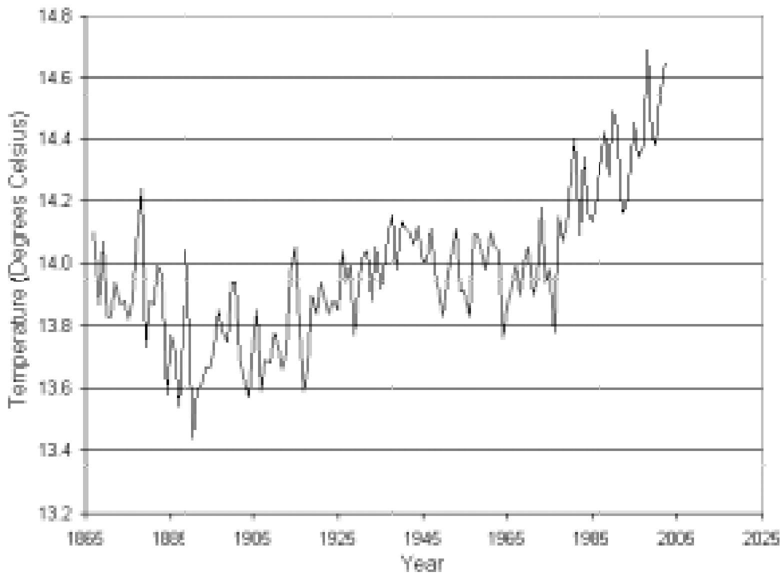
[1] IPCC, a scientific body set up jointly by United Nations Environment Programme and World Meteorological Organisation in 1988 in response to the 1987 UN General Assembly resolution following the Brundtland Commission Report to provide authoritative scientific assessment of climate change issues.

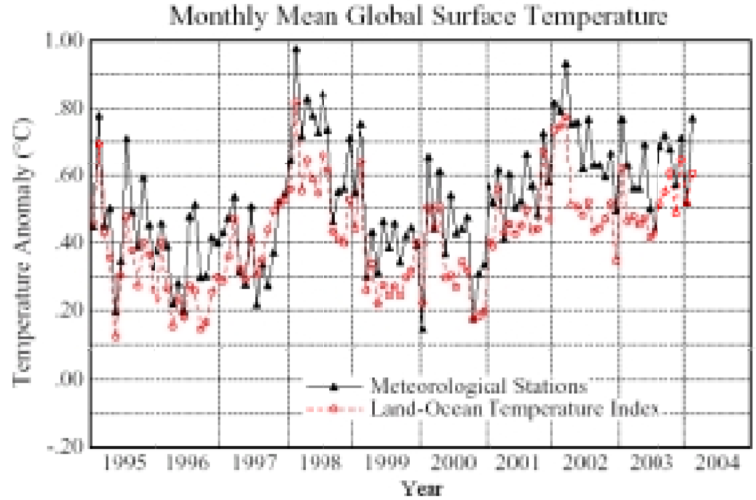
[2] Greenhouse gases absorb infrared radiation, tend to prevent this heat radiation from escaping to space, leading eventually to a warming of the Earth's surface)

Fig. 1: Average Global Temperature, 1867-2002



Source: US National Climate Data Centre

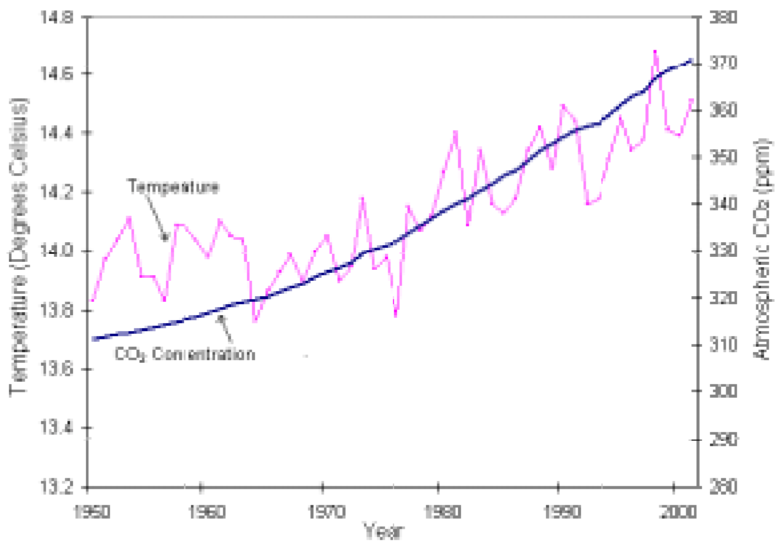
Monthly Mean Global Surface Temperature



Source: Goddard Institute of Space Studies

Fig. 2: Recent trends in global mean surface temperature anomalies

Fig. 3: Average Global Temperature and Atmospheric Carbon Dioxide Concentrations, 1950-2001



Source: Goddard Institute of Space Studies

What is the range of natural variability in climate?

The range of natural climate variability is known to be quite large (in excess of several degrees Celsius) on local and regional spatial scales over periods as short as a decade. Precipitation also can vary widely. For example, mean temperature variations at local sites exceeded 10°C in association with the repeated glacial advances and retreats that occurred over the course of the past million years. It is more difficult to estimate the natural variability of global or regional mean temperatures because of the sparse spatial coverage of existing data and difficulties in inferring temperatures from various proxy data. Nonetheless, evidence suggests that global warming rates as large as 2°C per millennium may have occurred during retreat of the glaciers following the most recent ice age.

Is Human Activity the Cause of Increased Concentrations of Greenhouse Gases?

Of the greenhouse gases that are directly influenced by human activity, the most important are carbon dioxide, methane, ozone, nitrous oxide, and chlorofluorocarbons (CFCs). Aerosols released by human activities are also capable of influencing climate. Concentrations of carbon dioxide (CO_2) extracted from ice cores drilled in Greenland and Antarctica have typically ranged from near 190 parts per million by volume (ppmv) during the ice ages to near 280 ppmv during the warmer 'interglacial' periods like the present one that began around 10,000 years ago. CO_2 concentrations did not rise much above 280 ppmv until the Industrial Revolution. By 1958, when systematic atmospheric measurements began, they had reached 315 ppmv, and they are currently ~375 ppmv and rising at a rate of 1.5 ppmv per year (slightly higher than the rate during the early years of the 45-year record) due to human activities (Table 1). The primary source, fossil fuel burning, has released roughly twice as much carbon dioxide as would be required to account for the observed increase. Deforestation and forest fires have also contributed to carbon dioxide releases during the past few decades. The oceans and land biosphere have taken up the excess carbon dioxide. The increase of global mean fossil fuel carbon dioxide emissions in the past decade has averaged ~0.6% per year.

Table 1: The Principal Greenhouse Gases Influenced by Anthropogenic Activities

Gas	CO_2	CH_4	N_2O	HFC-23	CF_4	SF_6
Preindustrial atmospheric concentration (1750-1800)	280ppmv*	0.70ppmv	270ppbv*	0	40pptv*	0
Current atmospheric concentration (2002)	375ppmv	1.79ppmv	316ppbv	17pptv	80pptv	4.2pptv
Recent rate of concentration change per year (2000)	1.5ppmv (0.6%)	4.9ppbv (0.8%)	0.8ppbv (0.25%)	0.55pptv (7%)	1.3%	1.1- 1.3pptv (7%)
Atmospheric lifetime (years)	50-200	8.6-11.2	114-120	260	50,000	3200
Global Warming Potential relative to CO_2	20 yrs →	62	290	9200	4100	16,500
	100 yrs →	24.5	320	12,100	6300	24,900
	500 yrs →	7.5	180	9900	9800	36,500

* CO_2 – Carbon dioxide; CH_4 – methane; N_2O – nitrous oxide; HFC-23 hydrofluorocarbons; CF_4 – carbon tetraflouride; SF6 – Sulphur Hexafluoride. ppmv = parts per million by volume; ppbv = parts per billion by volume; pptv = parts per trillion by volume.

Like carbon dioxide, methane (CH_4) is also more abundant in Earth's atmosphere now than at any time during the 400,000 year long ice core record, which dates back over a number of glacial/interglacial cycles. Concentrations increased rather smoothly by about 1% per year from 1978, until about 1990. The rate of increase slowed and became more erratic during the 1990s. About two-thirds of the current emissions of methane are released by human activities such as rice growing, the raising of cattle, coal mining, use of land-fills, and natural gas handling, all of which have increased over the past 50 years.

Nitrous oxide (N_2O) is formed by many microbial reactions in soils and waters, including those acting on the increasing amounts of nitrogen-containing fertilizers. Some synthetic chemical processes that release nitrous oxide have also been identified. Its concentration has increased approximately 13% in the past 200 years.

Atmospheric concentrations of CFCs rose steadily following their first synthesis in 1928, and peaked in the early 1990s. Many other industrially useful fluorinated compounds (*e.g*., carbon tetrafluoride, CF_4, and sulfur hexafluoride, SF_6), have very long atmospheric lifetimes (Table 1), which is of concern, even though their atmospheric concentrations have not yet produced large radiative forcing. Hydrofluorocarbons (HFCs), which have replaced CFCs after the Montreal Protocol, also have long atmospheric lifetimes and contribute to the greenhouse effect.

What Other Emissions are Contributing to Climate Change?

Besides greenhouse gases, human activity also contributes to the atmospheric burden of aerosols, which include both sulfate particles and black carbon (soot). Both are unevenly distributed, owing to their short lifetimes in the atmosphere. Sulfate particles scatter solar radiation back to space, thereby offsetting the greenhouse effect to some degree. Black carbon aerosols are end products of the incomplete combustion of fossil fuels and biomass burning (forest fires and land clearing). They impact radiation budgets both directly and indirectly. Recent satellite observations have revealed that black carbon aerosols from biomass and fossil fuel burning can absorb sunlight in the atmosphere, thereby increasing the warming effect of greenhouse gases. Satellite observations have also revealed that the absorption of heat by soot can evaporate cloud droplets and thus reduce the presence of clouds. However, aerosols' climatic effects cannot be simply compared to those of greenhouse gases because they are distributed in time and space far differently. For example, greenhouse gases are well mixed in the atmosphere and have a lifetime of up to 100 years. In contrast, aerosols suspended in the troposphere (lower atmosphere) last only about a week before they are removed by winds and rain. The exception is the injection of sulfates into the stratosphere, or upper atmosphere, where they can remain for a few years. The global cooling observed following large volcanic eruptions, such as that of *Mount Pinatubo* in the Philippines in 1991, provides dramatic evidence for the climatic influence of aerosols.

Temperature Changes Over the Next 100 years

A wide range of the demographic, technological, and economic driving forces of future emissions of greenhouse gases provide an array of four plausible pathways for the world with different greenhouse gas emission/concentration trajectories evolving through the 21st century (Nakicenovic *et al*., 2000). The first scenario represents the most conservative future emission of greenhouse gases. The second scenario represents one with higher rates of greenhouse gas emissions in combination with higher sulfur and other aerosol emissions. The third one represents a world of rapid economic growth and rapid introduction to new and more efficient technology. The fourth scenario represents development activities where there is emphasis on dematerialization and introduction to clean technology.

Future projections of human induced global warming are based on the premise that the growth rate of atmospheric greenhouse gases will accelerate in the future. According to most recent estimates (IPCC, 2001a), the global mean surface air temperature is projected to increase by between 1.4° and 3°C above 1990 levels by 2100 for low-emission scenarios and between 2.5° and 5.8°C for higher emission scenarios of greenhouse gases and aerosols in the atmosphere. The projected warming by the end of the 21st century will be sensitive to assumptions concerning future concentrations of greenhouse gases and aerosols. Because there is still considerable uncertainty in current understanding of how the climate system varies naturally and reacts to emissions of greenhouse gases and aerosols, current estimates of the magnitude of future warming should be regarded as tentative and subject to future adjustments (either upward or downward).

Globally, the projected warming is larger over higher latitudes than over low latitudes, especially during winter and spring, and larger over land than over sea. Globally averaged precipitation is projected to increase, but at the regional scale both increases and decreases are projected. Rainfall rates and the frequency of heavy precipitation events are projected to increase, particularly over the higher latitudes. Higher evaporation rates would accelerate the drying of soils following rain events, resulting in lower relative humidity and higher daytime temperature, especially during the warm season. Global mean sea level is likely to rise by 0.14 to 0.80 meters between 1990 and 2100.

Over the Small Island Nations of the South Pacific, the area-averaged annual mean surface temperature rise by the end of this century is projected to range between 2.5°C and 3.5°C. Table 2 contains the details on future seasonal projections of changes in surface air temperature and rainfall as simulated by the A-O GCMs. The projected temperature change is not likely to have any significant seasonal dependency. An increase of only about 3 to 7% in annual mean precipitation is simulated over the Small Island Nations of the South Pacific. Appreciable changes in spatial pattern of mean annual winter and summer rainfall are, however, likely. While year to year variability in rainfall during the summer season is not likely to change significantly in the future, more intense rainfall spells but lesser number of wet days are simulated over the Small Island Nations of the South Pacific for the future thus increasing the probability of extreme rainfall events in a warmer atmosphere. Enhanced variability in the date of commencement of summer rainfall over the region is also projected for the future.

What will be the regional consequences of climate change?

Temperature increase will be accompanied by rising sea levels, salt water intrusion and large scale inundation due to storm surges; more intense precipitation events in some regions and increased risk of drought in others; and adverse effects on agriculture, human health, fresh water resources and coastal/marine ecosystems of the Pacific Island Nations. The frequency of extreme temperatures during summer season is likely to rise in Small Island States of the Pacific thereby increasing the probability of thermal stress conditions.

Table 2: Seasonal Mean Climate Change over South Pacific in the 21st Century (as simulated* by the state-of-the-art Global Climate Models)

Models → Scenarios ↓	CCCma CGCM2	CSIRO mk2	CSM1.3	ECHAM4	GFDL R15b	MRI	CCSR-NIES	HadCM3
Temperature (°C)								
DJF – A2	2.67	2.34	2.56	2.96	3.05	2.82	3.37	2.87
JJA – A2	2.71	2.62	2.87	3.41	3.32	2.79	3.98	3.01
DJF – B2	1.94	2.22	2.20	2.27	2.30	1.96	2.91	2.38
JJA – B2	1.89	2.03	2.14	2.09	2.19	1.83	2.65	2.16
Precipitation (%)								
DJF – A2	3.24	6.71	2.08	8.73	10.01	2.78	-8.91	4.77
JJA – A2	5.40	9.43	3.12	4.76	7.64	10.15	5.76	9.46
DJF – B2	4.27	7.89	4.03	5.11	-1.42	-3.71	4.63	7.63
JJA – B2	7.14	5.47	5.96	6.54	3.68	4.19	10.17	11.38

*Data Processing: The original data took the form of a value for each box on a 0.5 degree latitude / longitude grid. The weighted mean of the values from its constituent grid boxes of aggregated changes for South Pacific Region was calculated for the summer and winter seasons (DJF and JJA). Each grid box was weighted by surface area, using the cosine of the latitude. The data are from eight state-of-the-art A-O GCMs and values are for the changes between 1961-90 and 2070-99 (30-year mean). Two SRES Marker scenarios of anthropogenic emissions of greenhouse gases and sulfate aerosols (A2 and B2) were considered.

While agriculture and forestry may benefit from carbon dioxide fertilization and an increased water efficiency of some plants at higher atmospheric CO_2 concentrations, these positive effects are likely to be negated due to thermal and water stress conditions associated with climate change. A decrease in productivity of rice, root crops and sugarcane as a result of rise in temperature is very likely. The optimal climate for crops may change, requiring significant regional adaptations. More frequent incidences of pests and diseases could be one of the major constraints to achieving higher leguminous and oil seed crop yields in tropical countries located in South Pacific with the rise in surface temperature.

In recent decades, the hydrological characteristics of the watersheds in the Small Island Nations of the South Pacific seems to have undergone substantial change as a result of extensive land use (*e.g.*, deforestation, agricultural practices and urbanization) leading to hydrological disasters, enhanced variability in rainfall and runoff, and extensive reservoir sedimentation. One of the major issues relating to rainfall is the recurrence of extreme events. More frequent heavy rainfall events are likely in a warmer atmosphere and it may cause serious flash floods. Extreme precipitation events have geomorphological significance in the mountainous terrain where they may cause widespread slope failures and land slides. The issue of the response of hydrological systems, erosion processes and sedimentation could alter significantly in some parts of the Small Island Nations due to climate change.

Climate variability in the Pacific is a combination of seasonal, multi-annual variability associated with the ENSO (El Nino – Southern Oscillation) phenomenon and decadal variability, the latter influencing the ENSO phenomenon itself. The major concern for impacts in the region is not with the mean climate changes described above; rather it is with the extremes that are super-imposed on those mean changes. Numerous studies suggest the likely intensification of rainfall when the mean change will be only a marginal increase. Global climate models currently suggest that the sea surface temperatures in the region will increase by 1^0C and the rainfall intensity in the central equatorial Pacific will be higher, affecting many Small Islands States.

Recent changes over the tropical Pacific Ocean and the surrounding land areas are related to the fact that since the mid-1970s warm episodes (El Niño) have been relatively more frequent or persistent than the opposite phase (La Niña). The ENSO phenomenon is the primary mode of climate variability on the 2 to 5 year time scale. At present, the weight of evidence from both observations and the model projections is that it is uncertain whether there will be any significant change in the amplitude or frequency of ENSO in the future. None-the-less, recent studies suggest that an increased frequency of ENSO events and a shift in their seasonal cycle in a warmer atmosphere is likely such that the maximum occurs between August and October rather than around January as currently observed. Thus, the current large inter-annual variability in the rainfall associated with ENSO is likely to dominate over other impacts attributable to global warming. Changes in intensity of tropical cyclones could result from changes in sea surface temperature linked to characteristics of ENSO events. Many recent studies do suggest a possible increase of about 10 to 20% in intensity of tropical cyclones under enhanced CO_2 conditions. Studies also suggest that during ENSO events, a tropical cyclone in the Pacific Ocean has more than a 40% chance of being a severe one (IPCC, 2001b). Any increase in sea surface temperature is likely to cause an increase in wind stress on surface waters. Thus, an increase in sea surface temperature due to climate change should lead to amplification in storm surge heights and an enhanced risk of coastal disasters including serious damage to soils and decline in the fresh water supplies in the fragile and vulnerable coastal regions. Many Pacific islands are, therefore, extremely vulnerable to climate change and will be among the first to be forced to abandon or relocate from their homes to an accelerated sea level rise.

Deforestation in Small Islands of the South Pacific has caused heavy land drainage and siltation and even resulted in the partial death of corals around them. Quarrying of massive live corals is currently being done (for manufacture of calcium carbonate) causing severe damage to the entire ecosystem. The coral reefs are also undergoing rapid destruction in terms of habitat richness in some parts of the region due to several other factors (including extreme temperatures and solar irradiance, sub aerial exposure, sedimentation, freshwater dilution, contaminants, and diseases) acting singly or in combination. Coral reefs are, thus, at risk due to destructive fishing techniques, reef mining, sedimentation and marine pollution. The future increase in atmospheric CO_2 concentration (resulting in higher $CaCO_3$ concentrations in sea water) and consequent rise in sea surface temperature is likely to have serious damaging effects on reef accretion and biodiversity. Some areas of coral reefs in this region may be so enfeebled that they may not be able to recover from bleaching events in the future. For the low-lying atolls, the economic disruption could be catastrophic.

The Small Islands of the South Pacific have more rare, endangered and threatened species per capita than anywhere else in the world. In addition, this region is the centre of origin for many crop and fruit-tree species that are important sources of genes for the wild relatives. Biodiversity is being lost here because of human activities, especially land degradation and the exploitation of resources. Up to 50% of the region's total biodiversity is at risk due to climate change.

It is likely that with one meter rise in sea level the wetlands and mangroves will disappear. Many species and a large population of many other species will be exterminated as a result of the synergistic effects of climate change and habitat fragmentation.

The fishery resources of the South Pacific Ocean are fast depleting due to over fishing, use of pesticides and industrial activities. The current trend in commercial fisher activity is that there marine culture products are rising which marine fishery output is declining. The impact of global warming on fishery depends on the complicated food chain in the ocean, which is likely to be disturbed by sea level rise, change in ocean currents, and alteration of the mixing layer thickness. These phenomena are expected to reduce plankton productivity and thus contribute to a general decline in fishery production in the coastal waters of Small Island Nations in the South Pacific.

Health outcomes in response to climate change are the subject of intense debate. Climate is one of a number of factors influencing the incidence of infectious disease. Heat stress and smog induced respiratory illnesses in urban cities of the Small Island Nations would increase. Exposure to higher temperatures appears to be significant risk factor for cerebral infarction and cerebral ischemia during the summer months. Global warming will enhance the number of incidences of some diseases, such as respiratory and cardiovascular diseases.

The distribution of vector-borne infectious diseases such as malaria is influenced by the spread of vectors and the climate dependence of the infectious pathogens. Malaria, still, is one of the important diseases in many of the Small Island Nations of the South Pacific due to high summer temperature and humidity. The changes in environmental temperature and precipitation could expand vector-borne diseases such as malaria and dengue fever. Warmer sea surface temperatures along vast coastlines would support higher phytoplankton blooms. These phytoplankton blooms are excellent habitats for survival and spread of infectious bacterial diseases such as cholera. Water-borne diseases, including cholera, and the suite of diarrheal diseases caused by organisms such as giardia, salmonella and cryptosporidium could also become common with the contamination of drinking water quality. For preventive actions, impact assessments are necessary on various aspects such as nutritional situation, drinking water supply, water salinity and ecosystem damage. The risk factor of diseases will depend on improved environmental sanitation, the hygienic practice and medical treatment facilities. A better understanding of the interaction among climate change, environmental and health status in communities at regional and local scales is crucial to forge physiological acclimatization and social adaptation.

The observed trends in the mean sea level along the Island Nations of the South Pacific indicate a rising trend of about 1 cm per decade, which is close to that noticed in other parts of the globe. Observations suggest that the sea level has risen at a rate of 3.5 mm $year^{-1}$ along the coastline of Small Island Nations in the South Pacific since 1950s. A sea level rise of between 25 and 58 cm is projected by the mid-21^{st} century along the coastline of Small Island Nations in the South Pacific. The projected future sea level rise could inundate low lying areas, drown coastal marshes and wetlands, erode beaches, exacerbate flooding and increase the salinity of rivers, bays and aquifers. With higher sea level, coastal regions could be subject to increased wind and flood damage. A detailed assessment of the implications of future sea level rise to the coastlines of the Small Island Nations in the South Pacific, for example, on mangroves and fresh water aquifers needs to be worked out. A significant warming could also have far reaching implications for marine ecosystems.

In view of above, it is obvious that global warming could well have serious adverse societal and ecological impacts on the Small Island Nations of the South Pacific by the end of this century, especially if surface air temperature increases approach the upper end of the IPCC projections. Even in the more conservative scenario, the models project temperatures and sea levels that continue to increase well beyond the end of this century, suggesting that the assessments that examine only the next 100 years may well underestimate the magnitude of the eventual impacts.

What are the Specific Areas that Need to be Studied Further?

Reducing the wide range of uncertainty inherent in model projections of global climate change will require major advances in our scientific understanding on the subject in the years to come. There are a number of fundamental scientific questions relating to the buildup of greenhouse gases in the atmosphere and the behavior of the climate system. Issues that need to be addressed include (a) the future usage of fossil fuels, (b) future emission of methane, (c) the fraction of the future fossil-fuel carbon that will remain in the atmosphere and provide radiative forcing versus exchange with the oceans or net exchange with the land biosphere, (d) details of the regional and local climate change consequent to an overall level of global climate change, (e) the nature and causes of the natural variability of climate and its interactions with forced changes, and (f) the direct and indirect effects of the changing distributions of aerosols. An effective strategy for advancement in the understanding of adverse impacts of climate change in the Small Island Nations of the South Pacific will require strengthening the academic institutions to make an all out effort to (a) include appropriate environment education and awareness programmes, and (b) conduct innovative studies at the inter-regional, regional and sectoral level that also promotes analysis of the response of human and natural systems to multiple stresses. The research enterprise to deal with environmental change and the interactions of human society with the environment must also be enhanced through strengthening cooperation and partnership with international scientific communities.

What Needs to be Done now to Arrest Ongoing Climate Change?

It is now evident that human activities are already contributing adversely to global climate change. ‘Business as usual’ is no longer a viable option. On global, regional and on national scales, individuals, businesses and governments must take prompt and collective action to reduce emissions of greenhouse gases. The question of whether there exists a ‘safe’ level of concentration of greenhouse gases cannot be answered directly because it would require a value judgment of what constitutes an acceptable risk to human welfare and ecosystems in various parts of the world, as well as a more quantitative assessment of the risks and costs associated with the various impacts of global warming. In general, however, risk increases with increases in both the rate and the magnitude of climate change.

One hundred and eighty-one governments are Parties to the 1992 United Nations Framework Convention on Climate Change, demonstrating a global commitment to ‘stabilizing atmospheric concentrations of greenhouse gases at safe levels’. Eighty-four countries (Parties) have signed and 120 Parties have ratified or acceded to the subsequent 1997 Kyoto Protocol (as of November 2003), 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 stabilizing atmospheric concentrations of greenhouse gases. Provided Russia[1] ratifies the Kyoto Protocol after USA and Australia have opted out of the Treaty, the planet’s most crucial agreement will enter into force and 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 this century. The balance of the scientific evidence demands effective steps now to avert damaging changes to Earth's climate.

For almost a decade now, appropriate methods and tools to evaluate impacts of vulnerability and adaptation to climate change have been tested and are currently being used for sector specific studies in Small Island States of the South Pacific. Following the widespread drought conditions in 1998 and 2003 faced by some Island nations in this region, there has recently been an upsurge in interest and concern about adaptation linked to current climate variability and current vulnerability in addition to the concern with future climate and vulnerability. The context is also being broadened to include other en-

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[1] Russia is the world’s second largest oil exporter. It contributes to about 17 percent of the global GHG emissions.

vironmental and social stressors, and changes in socioeconomic conditions and sustainable development within the risk management decision-making framework. Small Island Developing States of the South Pacific have demonstrated their commitment to address national sustainable development in the region that takes into account the economic, social and environmental aspects. These nations are also committed to eradicating poverty and improving the livelihoods of their peoples by the implementation of strategies, which build resilience and capacity to address their uniquely disproportionate vulnerabilities. This must be facilitated by a multilateral framework that is more responsive to the financial and technical needs of the Small Island Developing Countries of the South Pacific.

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