

Following many years of dispute, it is now globally recognised that climate change is not only taking place, but its effects will be experienced for many years to come. Although the Pacific region contributes less than 0.01% of global greenhouse gas (GHG) emissions, this region is one of the most vulnerable to the effects of climate change. The Pacific has no choice but to implement measures to prepare for, and adequately manage, its adverse impacts on economy, environment, society and culture.

At the core of climate change is people. Pacific islanders' behaviour, capacity and their ability to act that will ultimately determine the success of these measures. The sustainable development of the Pacific islands region hinges on the level of engagement of Pacific islanders in this critical issue.

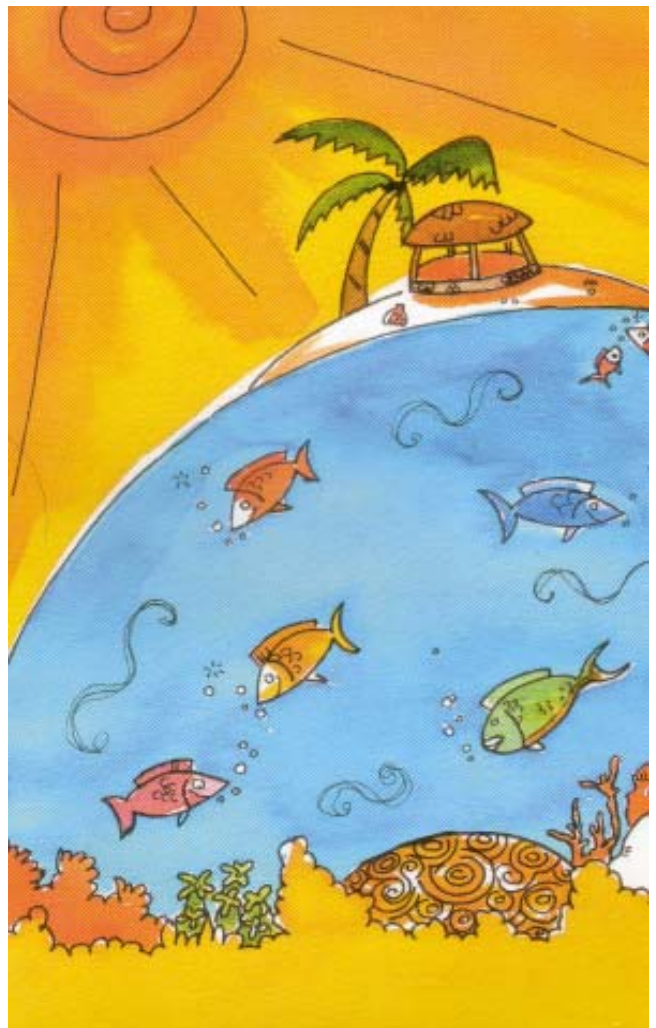
Understanding climate change

The topic of climate change is gaining more and more attention, but while the term is well known, how many of us really understand what the issues are, how it will affect our livelihoods, and how we should act?

What exactly is climate change? How many of us really understand what causes climate change, and its impacts. Why should we care? How does climate change affect our everyday lives? How is climate change different from the other issues facing the region?

Although we may not need to understand the complexities of climate change, it might be worthwhile having a solid grasp on four key areas:

1. What is *climate change*?
2. What causes climate change?
3. What are its impacts on our everyday lives in the Pacific?
4. What can we do about it?



What is climate change?

Climate change refers to 'a change in the Earth's global climate over time'. It's that simple. What's not simple to understand is what *causes* climate change, and its impacts. However, we will try and make this as easy to understand as possible.

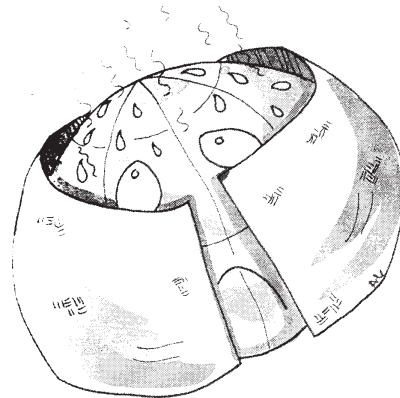
What causes climate change?

Earth is surrounded by a blanket of gases called the *atmosphere*. When the sun's rays enter the Earth, one third is reflected directly back into space. The remaining 2/3 is absorbed by the land, sea and the *atmosphere*.

By trapping this heat in the *atmosphere*, the Earth remains at a liveable temperature. This is called the *Natural Greenhouse Effect*. If the energy was not trapped in the *atmosphere*, everything on Earth would freeze and nothing would be able to survive. The gases that make up the *atmosphere* are called *Greenhouses Gases (GHGs)*.

The *atmosphere* is getting thicker as we release more GHGs into the atmosphere through burning *fossil fuels* (oil, coal and natural gas) and as we cut down forests.

The main GHG that we release into the *atmosphere* is Carbon Dioxide (Co2) that comes from burning *fossil fuels*. We burn fossil fuels for a range of things, to build new things, to produce the goods we buy, for electricity, to drive cars, and fly planes. The burning of *fossil fuels* (plus a smaller contribution from cement manufacture) is responsible for more than 75% of the CO2 emissions humans are releasing into the *atmosphere*.



The remainder is caused by changes in how we are using land, including *deforestation* (cutting down trees). Trees and plants absorb the CO₂ to produce oxygen. Stable forests can be considered CO₂ reservoirs, storing the carbon as long as trees are alive and standing. This is why forests are so important, but many countries are cutting down their forests which means that more GHGs are entering the *atmosphere*.

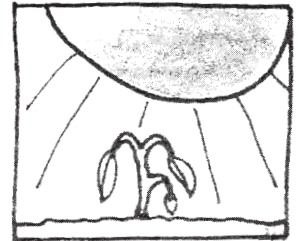
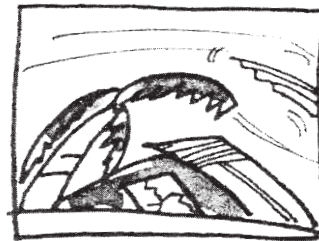
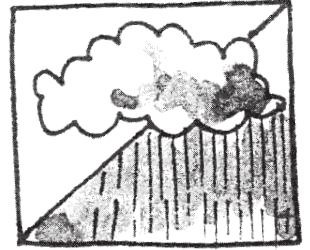
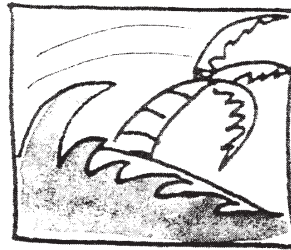
Since the industrial revolution, humans have created too many GHGs and have cut down too many trees, pushing the level of GHGs in the atmosphere to a limit not seen in more than 10,000 years! In the industrial era, the amount of CO₂ increased by 35%. This is resulting in *global warming*.

Climate trends

'Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level.

Eleven of the last twelve years (1995-2006) rank among the 12 warmest years in the instrumental record of global surface temperature (since 1850)' IPCC WG1 2007

To summarise, some of the key risks associated with climate change include the increased prevalence of droughts, higher daily maximum temperatures, more frequent and intense cyclones, more frequent and widespread flooding, storm surges, higher sea surface temperatures, and rising sea levels.



Global warming

Too much heat near the Earth's surface will drive major changes in regional weather patterns. This includes climate variability and more extreme floods and droughts. Ten of the 15 most extreme weather events reported during the past century in the Asia-Pacific regional occurred in the last 15 years and tropical cyclones have recently become more intense.

Some likely effects of global warming

Rainfall

Some countries will experience more extreme rainfall while others will experience drought.

Sea level

The sea level could rise by more than 40cm by the end of the century. There are two reasons for this. First, as water in the oceans warms, it expands. Second, ice from the polar caps and from glaciers is melting into the sea.

Sea level rise will also intensify inundation, storm surges and coastal erosion particularly in low-lying atoll countries such as Kiribati and Tuvalu. This will also damage coastal agriculture and freshwater resources.

Water

There will be less water available for irrigation and drinking because there will be less rain, and salt from rising sea levels will contaminate ground water in coastal areas. Droughts are also likely to be more frequent.



Food

As temperatures increase and rainfall patterns change, this will affect the production of food.

Disease

As temperatures increase, the areas that harbour diseases such as malaria and dengue fever will shift.

Rainforests

Higher temperatures and reduced rainfall could mean the loss of large areas of rainforest – on top of the forest that we are cutting down to clear land for agriculture. These forests currently act as a 'sink' by absorbing large amounts of CO₂ which would otherwise be released into the atmosphere.

What is the difference between weather and climate?

The **weather** is the set of all 'phenomena' (wind, cloud, rain, snow, fog and dust storms) in a given atmosphere, at a given time. The term usually refers to the activity of these 'phenomena' over short periods (hours or days), as opposed to the term climate, which refers to the average atmospheric conditions over longer periods of time.

Climate refers to the status of the entire Earth system including the atmosphere, land, oceans, snow, ice and living things that serve as the background conditions that determine weather patterns.

Projections of future climate are shaped by fundamental changes in heat energy in the Earth system, in particular the increasing intensity of the effect of too much heat near the Earth's surface, determined by the amount of CO₂ and other GHGs in the atmosphere.

Climate is defined as 'average weather', mean and variability of temperature, *precipitation* (rain), and wind over a period of time. So this is why scientists can predict the future climate, but can often not predict what the weather will be like in the next month.

The climate system evolves in time under the influence of its own internal dynamics and changes in external factors.

There are three factors that can affect the climate:

1. Solar variations
2. Volcanic eruptions
3. Human induced changes in the *atmosphere*



Pacific islands: a snapshot

Small island states in the Pacific are among the most vulnerable nations in the world to the impacts of extreme weather events. The most substantial impacts of climate change include losses of coastal infrastructure and land, more intense cyclones and droughts, failure of subsistence crops and coastal fisheries, losses of coral reefs, and the spread of certain diseases.

Pacific island countries exhibit a unique combination of geographical, physical, biological, sociological and economic characteristics found nowhere else in the world. Their combined exclusive economic zones occupy 15 million km² of the Pacific (about 1.5 times the land area of the USA), yet only 0.4% of this is land.

More than 80% of Pacific islanders live in or around coastal areas. Coastal areas are critical for Pacific islanders, cultures and economies. In the last 20 years, many coastal areas have been heavily modified and intensively developed, significantly increasing their vulnerability to natural climatic variability and extreme events and to global environmental changes.

Population growth rates of Pacific Island countries are relatively high, averaging 2.2% per annum, which, in the absence of improved environmental and resource management policies and practices, will increase environmental problems in the future. The coastal areas of islands contain the vast majority of human habitation and areas of subsistence and commercial, agricultural and fisheries activities, and are the primary targets of economic development.

On many islands, soil and freshwater resources are limited and agricultural plant diversity is low. Most of the total cultivable land is used for subsistence production. The diversity of coral reef and marine resources on the other hand, is high. Coral reef ecosystems play a central role in maintaining beach and coastal land levels against the eroding forces of storms and rising seas, and provide essential resources in terms of construction materials, habitat for marine fisheries, and, through their natural beauty and species diversity, are a central attraction for the tourist industry.



What are its impacts on our everyday lives in the Pacific?

Even if we stop burning fossil fuels and cutting down forests today, the world's climate will still warm in the years to come. There is a time lag between when the GHG emissions occur and when we begin to feel their effects, so we have yet to experience the impact of the GHG emissions from the last 30-40 years.



Sea levels will rise

The sea level could rise by more than 40cm by the end of the century. There are two reasons for this. First, as water in the oceans warms, it expands. Second, ice from the polar caps and from glaciers is melting into the sea. Rising sea levels will completely swamp some small, low-lying island states and put millions of people in low-lying areas (such as low lying atolls in the Pacific) at risk.

Extreme weather events

Climate change will intensify extreme weather events such as storms, cyclones, floods, droughts and heat waves. In the last decade, there were three times more weather-related natural catastrophes, mostly floods and windstorms, in the world than in the 1960s.

Water shortages

Rises in sea level, and storm surges will result in saltwater entering freshwater supplies (saline intrusion) which means that there will be less water available to drink and to grow plants and food.

Increases in drought

The changes in climate will lead to more extreme weather patterns, meaning that some places will receive more rainfall, and in other areas, less rainfall, or more intense rainfall but of a shorter duration which will result in droughts. Droughts for a long period can have other effects such as placing forests at high risk from fires.

Health issues

Climate change will affect the health of Pacific islanders. The changes in the climate and the effects of climate change such as the increases in temperature, flooding and contaminated water, will increase the level of waterborne and vectorborne diseases, such as cholera, typhoid, malaria and dengue.

Production of food

Tropical cyclones (its increase in frequency and intensity), flooding in low lying and coastal areas, saline intrusion, coastal erosion and increased rates of coral bleaching mean higher demands and unstable levels of food production. This will affect diet, income generating activities for communities and economies.

Affecting unique Pacific biodiversity

Biodiversity can be simply defined as the 'variety of life on Earth'. The Pacific is one of the most unique areas in the world from both marine (sea) and terrestrial (land) biodiversity perspectives. Global warming will impact on biodiversity and the functions of ecosystems, which are already under stress from unsustainable development such as land usage, overharvesting, pollution and degradation.

The impacts of climate change including cyclones and changes in temperature due to drought can lead to changes in the habitats of these plants and animals, and as they die out, may result in destructive invasive species may take their place in the ecosystem. It is also likely that there will be changes in overall tuna stocks and changes to tuna migratory patterns as was seen in 1997-98

El Nino, a decrease in other fish stocks as well as an increase in ciguatera poisoning outbreaks.

Erosion

Flooding of lowland and coastal areas, and severe coastal erosion will impact on coastal infrastructure. The increased rainfall will wash soil away if not managed carefully, limiting the food and plants that can be grown. Forestry can play an important role in watershed management and erosion control.

Future development of Pacific islands

The impacts of climate change will affect the sustainable development of the Pacific islands by affecting industries such as agriculture and tourism. Each year, millions of tourists visit the region for its 'Pacific paradise' image. The effects of climate change on tourism will likely include loss of beaches, degradation of the coastal ecosystems, saline intrusion and damage to critical infrastructure.



What can we do about it?

Globally, there are two accepted responses to climate change; adaptation and mitigation.

Adaptation

Adaptation can be defined as those actions or activities that people undertake to accommodate, cope with or benefit from the effects of climate change. This includes actions undertaken at national and community levels to reduce the impacts of climate change.

Pacific islands are in a constant process of adapting to environment, social and economic factors. The impacts of climate change may heavily affect the access to and use of natural resources that underpin Pacific life. Given this reliance on the natural resources, it is important to strengthen the environment to cope with the impacts of climate change.

Mitigation

Mitigation refers to actions aimed at preventing or minimizing climate change, through reductions in GHG emissions. This includes exploring the use of renewable energy sources (solar, wind, wave power) to reduce dependence on non-renewable sources of energy (fossil fuels).




SPREP's climate change initiatives

One of the greatest challenges to sustainable development in the 21st century is climate change.

While the international community has initiated steps under the United Nations Framework Convention on Climate Change (UNFCCC) to stabilize greenhouse gases in the atmosphere and promoted carbon trading to assist with this overall objective under its Kyoto Protocol, progress has been slow.

The Secretariat of the Pacific Regional Environment Programme (SPREP) is an intergovernmental organisation working with Pacific island countries and territories to strengthen environmental management and promote sustainable development. SPREP works with 21 Pacific countries and territories as well as Australia, France, New Zealand and USA.

SPREP members have identified four main areas of work in climate change:

1. Strengthen meteorological and climatological capacities of Pacific island countries and territories to plan and respond to climate variability and extreme weather events
 2. Strengthen understanding of climate variability, climate change and sea level rise through information, modeling and clearinghouse mechanisms. Research needs to identify and assess vulnerabilities as well as impacts.
 3. Support adaptation to climate change and mitigation options and coordination. This includes sourcing adequate assistance to assess and implement feasible options and access funds for implementation of activities.
 4. Provide technical and legal advisory services to assist Pacific island Parties implement the UNFCCC and to ensure consistency with other international processes.
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Action Plan for the Implementation of the Pacific Islands Framework for Action on Climate Change 2006-2015

In 2005 the Pacific Islands Forum Leaders endorsed the Pacific Islands Framework for Action on Climate Change, which identifies the key areas that will be impacted by climate change, and highlights six principles for action on climate change for the region:

1. Implementing adaptation measures
2. Governance and decision-making
3. Improving understanding of climate change
4. Education, training and awareness
5. Contributing to global GHG reduction
6. Partnerships and cooperation

Each principle will comprise a series of activities to be undertaken nationally and regionally, to be supported by the Council of Regional Organisation of the Pacific (CROP) and coordinated by SPREP.

Pacific Climate Change Roundtable

Framework activities will be guided and coordinated through the Pacific Climate Change Roundtable (PCCR) which will be convened in 2008. Since responsibility for the Framework's regional and international actions can and should be shared by the region's organisations, SPREP has been called upon to convene regular meetings of the PCCR inclusive of all regional and international organizations with active programmes on climate change in the Pacific region to: update Pacific island countries on regional and international actions undertaken in support of the Framework voluntarily lead or collaborate on implementing and monitoring actions relevant to their priorities and work programmes agree on mechanisms to measure progress, identify difficulties, and address actions needing special attention.

For more information contact SPREP Climate Change Advisor, Espen Ronneberg, espenr@sprep.org

Pacific Adaptation to Climate Change Project

SPREP with its member countries and territories is working to build the capacity of Pacific islanders to adapt to climate change across three sectors; water resource management, food production and food security and coastal management.

The Pacific Adaptation to Climate Change (PACC) project will be the first project in the Pacific region to focus specifically on adaptation initiatives in eleven Pacific island countries: Cook Islands, Federated States of Micronesia, Fiji, Nauru, Niue, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu. PACC will also work with key partners to integrate adaptation to climate change priorities into national policies and programmes. Through promoting regional collaboration, PACC hopes to foster information sharing about innovative approaches to mainstream adaptation to climate change.

For more information contact SPREP Climate Change Adaptation Officer, Taito Nakalevu, taiton@sprep.org

Pacific Islands Greenhouse Gas Abatement through Renewable Energy Project

The aim of this project is to reduce the growth rate of GHG emissions from fossil fuel use through the removal of the barriers to the widespread and cost effective use of feasible renewable energy technologies. SPREP with its member countries and territories is working to remove barriers to the introduction of renewable energy technologies in the Pacific. Renewable energy and energy efficiency are key factors in reducing GHG emissions. While GHG emissions in the Pacific islands are minimal on a global scale, the value of reducing GHG emissions is recognised.

For more information contact PIGGAREP Project Manager, Solomone Fifita, solomonef@sprep.org