

# Effect of Climate Change on Island Countries



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## Abstract

Climate change is one of an existing threat to the survival and sustainability of many island countries by 2100, sea-level rise could submerge some low-lying atoll nations. These island nations are found throughout the world, although most of them are located in the wider Caribbean and South Pacific regions. Ninety per cent of the islands are in the tropics. Many are seasonally affected by extreme weather events – tropical storms, cyclones and hurricanes. Climate variability, droughts and flooding are also features of their weather pattern. El Niño Southern Oscillation events also produce dramatic changes in rainfall, rising sea levels and other weather-related phenomena. Islander communities have been adapting to harsh and changing environmental conditions for centuries, and environmental hazards are generally not the direct cause of conflict. However, climate change is a threat and stress multiplier that can exacerbate existing vulnerabilities and instability. It is not just island people who are at risk from climate change: 60% of humanity live in coastal areas and therefore share vulnerability to climate change and sea level rise. Low lying coastal areas in all countries are threatened, including agriculturally productive river delta's worldwide. The warming of Pacific Ocean water of three degrees has been measured in the Pacific. Plankton – the tiny single cell plants and animals that are the basis of the ocean food web in northern latitudes and the source of at least half the oxygen we breathe – are dying. Zoo plankton in the northeast Pacific have declined by 80% since 1950. In the southern oceans, coral reefs are dying, perhaps because of ocean warming, threatening biological productivity in tropical seas. Climate Change assessed that warming of the climate system is unequivocal and that impacts on natural and human systems globally are already occurring, including sea-level rise and longer and more intense heat waves. In addition to the immediate impacts of disasters and extreme weather events, climate change is likely to affect food security, water scarcity, the frequency of disasters, sea-level rise and energy security.

**Keywords:** Climate Change, Rising Sea-Level, Plankton, Ocean Warming, Extreme Weather.

## Introduction

There are group of small Island states which is internationally recognized as Small Island developing States (SIDS). These islands are located at sea or oceans. A total of 41 SIDS are currently Parties to the UN's Framework Convention on Climate Change (UNFCCC), and 29 are also signatories to the Kyoto Protocol. Many SIDS are members of the Alliance of Small Island States (AOSIS), and 11 are listed as least developed countries (LDCs). These Island states are least responsible of all nations for climate change and they are likely to suffer strongly from its adverse effects and could in some cases even become inhabitable. Taking into considering as special case, the international community is always available to them for all help.

## Aim of the Study

There are numerous small islands which are situated in sea/oceans and are inhabited. Due to the Green house effect slowly the level of sea water is rising and these island sinking, threatening the existence of people residing on these Islands. They are facing different kind of problems which attract to carry out study on paper.

SIDS are found throughout the world, although most of them are located in the wider Caribbean and South Pacific regions. The land: sea ratios for the SIDS are largely skewed. Their Exclusive Economic Zones (EEZs) are often larger than their land area. Nauru's EEZ, for example, is nearly 15,000 times the size of its land area, whereas Samoa's is eight.

Many SIDS – the Maldives, for example – have exclusively or mostly low-lying land areas; others, such as Haiti, have a mixed terrain, including mountainous areas. Their population densities differ widely as well. 90% of the SIDS are in the tropics. Many are seasonally affected by extreme weather actions – tropical storms, cyclones and hurricanes. Climate variability, droughts and flooding are also features of their weather pattern. El Niño Southern Oscillation events also produced dramatic changes in rainfall, rising sea levels and other weather-related phenomena.

Most of SIDS depend heavily on fossil fuels. The use of fossil fuels includes not only power production and the desalination of water, but also transport, including tourists as well as to move goods; the main source of foreign exchange; and the exploitation of marine resources. Some SIDS, for example Bahrain and Trinidad and Tobago, also produce and export fossil fuels.

In spite of variations in geographical, physical, climatic, social, political, cultural and ethnic features and economic development, small island developing States share certain characteristics that underscore their overall vulnerability to climate change, climate variability and sea-level rise:

1. Generally limited natural resources, with many already heavily stressed from unsustainable human activities
2. A concentration of population, socio-economic activities, and infrastructure along the coastal zone
3. High susceptibility to frequent and more intense tropical cyclones (hurricanes) and to associated storm surge, droughts, tsunamis and volcanic eruptions
4. Dependence on water resources for freshwater supply that are highly sensitive to sea-level changes
5. Relative isolation and great distance to major markets, affecting competitiveness in trade
6. Extreme openness of small economies and high sensitivity to external shocks
7. Generally high population densities and in some cases high population growth rates
8. Inadequate infrastructure in most sectors
9. Limited physical size, effectively eliminating some adaptation options to climate change and sea-level rise
10. Insufficient financial, technical and institutional capacities, seriously limiting the capacity of SIDS to mitigate and adapt to any adverse impacts of climate change

Due to the geographic location of the SIDS and the profound influences of oceanic circulation systems, natural precipitation varies from one year to the next much more than in other countries. This can lead to various forms of extreme rainfall events, such as droughts and floods, that have a wide range of adverse impacts – including some catastrophic damages – on natural and human systems.

Climate projections suggest that significant climate change and sea-level rise are expected in all regions during the twenty-first century. Increases in

atmospheric concentrations of GHGs due to human activities over the past 100 years will continue to alter the climate and related systems on Earth in the coming century, if not for longer. Subsequently, SIDS face the certain prospect of increased challenges to their efforts to achieve sustainable development.

Indeed, an ensemble of climate model simulations for seasonal temperature and rainfall changes in the four regions by the 2050s and 2080s project the following changes:

1. Temperature increase is projected for all regions and for both seasons
2. Warming over the Mediterranean and the Caribbean Sea areas is higher during northern hemisphere winters for both time periods, whereas warming in the other two regions exhibits different seasonal patterns for the 2050s and 2080s
3. For the 2080s, SIDS in the Mediterranean area are projected to experience the highest warming, with surface air temperature rising by 3.9°C for December – February and 4.5°C for June – August
4. Projections show a dominantly increased pattern in seasonal rainfall for the four regions, with islands in the Mediterranean area getting the most increase in rainfall during northern hemisphere winters (by the 2080s, 16% higher than the 1961–1990 average level)
5. The largest decline in seasonal rainfall is projected for SIDS in the Caribbean area, with a reduction during northern hemisphere summers of nearly 20%.

These projected changes are likely to intensify the current climate-related stresses in various SIDS. High temperatures are expected to adversely affect the health of some island inhabitants who already suffer through heat waves and associated increased outbreaks of vector-borne diseases. The health of important marine species such as coral reefs will also suffer. Changes in seasonal rainfall patterns may take the form of more frequent and more intense droughts and floods for many of the already troubled SIDS.

#### **Potential Impacts of Climatic Changes on SIDS**

Climate change is likely to have far-ranging effects on the environment and the economic prospects of Small Island Developing States, as well as on the health of the people living in these areas.

#### **Water Resources**

The availability of freshwater is a major limiting factor for economic and social development in the SIDS. Many of these countries rely entirely on a single source of water supply, making them highly vulnerable to climatic and other environmental changes.

In island States where rainwater is the primary source of supply, water availability is sensitive to rainfall patterns and changes in storm tracks. A reduction in rainfall coupled with sea-level rise, changes in El Niño intensity and frequency, and changes in rainfall seasonality would decrease the volume of drinking water, reduce the size of the thin freshwater lens. Additional water management and

related challenges due to climate variability, climate change and sea-level rise include increased flood risks, impeded drainage and the presence of elevated water tables.

#### **The Coastal Environment**

The loss of land along coastlines due to sea-level rise, especially on atolls and low limestone islands, is likely to disrupt all the economic and social sectors in these countries. Coastal erosion will have profound adverse impacts on the tourism industry and on infrastructure.

Human activities such as sand mining, coastal and beach erosion is already a problem on many islands – a problem that is likely to be exacerbated by sea-level rise. Papua New Guinea reports that 25 % of its existing shoreline has already been inundated. If sea level rises by 1 metre, the Maldives will disappear entirely, and in Grenada, up to 60 % of the beaches would disappear in some areas following a 50-centimetre sea-level rise.

Coral reefs have a huge influence on the lives of people in many SIDS. They function as natural breakwaters along the coasts of many tropical islands and they represent one of the most important natural resources for food, beach sand, and building materials. They also provide habitats for marine animals and reef fish, generating significant revenues for many island economies through tourists interested in snorkeling and scuba diving. On many islands, coral reefs are already facing threats from climate change and other stresses; Dominica, for example, reports that 15% of its coral reef is showing some signs of bleaching.

Due to their narrow temperature tolerances, some species of corals currently live at or near their thermal limits. Projected increases in sea surface temperature suggest the thermal tolerance of reef-building corals will be exceeded within the next few decades. Moreover, the incidence of bleaching may rise rapidly.

Mangrove forests, another coastal resource, have diverse and important ecological and socio-economic functions, providing protection against cyclones, storms, tides, storm surges and the introduction of pests and exotic insects. They also function as nutrient sinks for animal and plant productivity, as soil stabilization forces, and as a source of wood products. However, many mangrove forests are under stress from excessive exploitation, reducing resilience to the projected rise in sea level.

#### **Agriculture and Food Security**

Existence agriculture is vital to SIDS economies, nutritional status and social well-being, particularly the low-lying atoll countries where food security is a major concern. Currently, subsistence agricultural production on some islands is already under stress from, for example, a shortage of freshwater. With climate change, the growth of subsistence root crops and vegetables is likely to be affected by heat stress, by changes in soil moisture and evapotranspiration, and by changes in extreme weather events, such as tropical cyclones, floods and droughts.

Moreover, sea-level rise and its consequent saline intrusion will have major impacts on crop production, especially in low islands and atolls in the Pacific, where all the crop agriculture is found on or near the coast.

Fisheries resources make a significant contribution to the protein intake of island populations. In tropical islands, marine ecosystems such as coral reefs, sea grass communities and salt ponds are important forage sites for a variety of fish species. The availability of fish can be affected by changes in water temperatures and the distribution of food sources they depend on. The unfavourable effects of higher carbon dioxide concentrations on these ecosystems, coupled with ongoing widespread coral bleaching, pose serious threats to the resilience and livelihood in many small island States.

#### **Human Health**

Many SIDS lie in the tropical zone, where the climate is favorable for the transmission of tropical diseases such as malaria, dengue, filariasis and schistosomiasis.

In recent years, tropical islands have experienced high incidences of vector- and water-borne diseases that were attributed to changes in temperature and rainfall patterns, which may be linked to events such as El Niño, droughts and floods. With a warming climate and disrupted water supplies and sanitation systems due to droughts and cyclones, there could be even more of an increase in the incidence of these diseases. Malaria, for instance, is associated with a temperature above 22°C.

Outbreaks of water-borne diseases such as shigellosis, cryptosporidiosis, giardiasis, and amoebiasis could increase as a result of disruption of sewage and water supply systems. With changes in temperature and rainfall, some vectors could extend their current range, so there is likely to be wider transmission of some diseases. The interior highlands of many islands are currently free of vectors that transmit malaria, dengue and other tropical diseases. They could become favorable breeding sites under climate change. An increase in the frequency and intensity in extreme weather events might also cause more physical injuries, as noted already in some Pacific island States.

In spite of the wide range of adaptation options that could be successfully implemented in the SIDS, some fundamental constraints limit the choices of options and their implementation. Broadly, these barriers fall into three categories:

#### **Inadequate Data or Information and Technical Capacity for Timely and Effective Adaptation Planning**

In most SIDS, there is a lack of baseline information for understanding the complex interplay between and within natural and human systems in small islands. There is also a considerable gap in the provision of information on likely changes in climate and human systems at the small-island scale. Consequently, most SIDS have not yet been able to undertake an in-depth, nationwide climate change impact and vulnerability assessment in an integrated manner. Without such national assessments as a

sound basis for designing and planning adaptation policies, strategies and programmes, decisions on adaptation will be problematic.

#### **Weak Institutional Capacity**

Given the complex interactions and feedbacks between natural and human systems, any decisions on adaptation strategies must take an integrated approach across different sectors. With SIDS facing a variety of pressing economic and social challenges, however, there is an urgent need for a well-structured institutional framework to address climate change adaptation issues across sectors and scales. Hence, strengthening institutional capacity remains an important prerequisite for the effective planning and implementation of adaptation strategies at national level.

#### **Limited Financial Resources**

Some of the adaptation options identified by SIDS may be costly and beyond their financial capacity. The governments of these countries will therefore need international assistance to facilitate more detailed research into traditional, natural and less intrusive (and generally less costly) forms of adaptation.

#### **Conclusion**

Since most of these islands are located in mid-sea and quiet far from main stream of civilization and slowly sinking due to global warming and are least developed nations which are severely affected by various disastrous factors directly or indirectly

threat to many lives residing on these beautiful islands. There is bigger need to control global warming and provide all the aids and support to the populace surviving on these places and save these islands.

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