

Developing a Research Agenda for the Caribbean Food System to respond to Global Climate Changes 19-20 September 2002

BRIEFING PAPER

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Background

The Third Assessment Report of the IPCC notes that small island states, such as those in the Caribbean, are likely to suffer disproportionately from the enhanced effects of climate change and sea level rise. The IPCC also notes utilising state of the art coupled atmospheric-ocean general circulation models (GCMs) that there will be significant changes in the temperature and precipitation in 2050 and 2080. Tables 1,2,3 below show the possible changes in precipitation and temperature, which could occur, in the Caribbean region. The IPCC has also noted that sea levels will continue to rise throughout the 21st Century

Table 1 Mean Changes in Annual Mean Temperature and Precipitation

Year	Annual Mean Temperature Change (°C)		Annual Mean Precipitation Change	
	GHG	GHG+A*	GHG	GHG+A
2050	2.03(+/-0.43)	1.71(+/-0.25)	-5.2 (+/-11.9)	-1.3(+/-7.8)
2080	3.06(+/-0.84)	2.64(+/-0.61)	-6.8(+/-15.8)	-0.7(+/-12.3)

* Projected changes with influence of aerosols

Table 2 Projected Changes in Temperature

Year	Temperature Change (°C)			
	December-February		June-August	
	GHG	GHG+A	GHG	GHG+A
2050	2.00(+/-0.46)	1.68(+/-0.32)	2.01(+/-0.44)	1.71(+/-0.21)
2080	3.01(+/-0.87)	2.61(+/-0.66)	3.07(+/-0.86)	2.64(+/-0.61)

* Projected changes with influence of aerosols

Table 3 Projected Precipitation Changes

Year	Precipitation Change %			
	December-February		June-August	
	GHG	GHG+A	GHG	GHG+A
2050	3.4(+/-14.3)	5.9 (+/-7.4)	14.4(+/-12.2)	-6.9(+/-11.5)
2080	4.8(+/-14.6)	8.5(+/-12.9)	-19.2(+/-18.8)	-8.2(+/-17.1)

* Projected changes with influence of aerosols

The IPCC thus noted that there is an extreme vulnerability for Caribbean countries with the changing climate and increasing sea level. Characteristics of SIDs that increase their vulnerability include their small physical size relative to large expanses of ocean; limited natural resources; relative isolation; extreme openness of small economies that are highly sensitive to external shocks and highly prone to natural disasters and other extreme events; rapidly growing populations with high densities; poorly developed infrastructure; limited financial and human resources and skills. These characteristics limit the capacity of small island states to mitigate and adapt to future climate change and sea level rise. This brief attempts to give a description of the environmental issues/sectors that may be at risk from projected climate changes and suggests areas of research that would serve to better equip the region to adapt or cope with the projected changes.

Environmental issues and Climate Change

Water Resources, agriculture and soils, and fisheries

Water resources

Water availability for potable uses and irrigation schemes is of critical concern because of the limited resources, particularly freshwater lenses that may be susceptible to contamination by salt water as a result of salt water intrusion. Projected reduction in precipitation would exacerbate this situation as well as have spin off effects in other sectors such as human health. Forest and watershed management issues would also have contributory impacts on water resources.

Agriculture and soils

Concentration of agricultural activities on the coasts places an increased vulnerability this sector particularly from salinisation of soils that would be stressful for many staple crops. Contamination of freshwater resources (aquifers and surface water) by salt water intrusion would also put a strain on the viability of crops. Drought damage to livestock includes: low body-weight, increase in disease, lowered fertility, delayed maturation, increase in juvenile mortality.

Fisheries

Water resources, agriculture and fisheries already are sensitive to currently observed conditions in small island states, and impacts are likely to be exacerbated by future climate and sea level rise

Fishing contributes significantly to the protein diet of island inhabitants. Many breeding grounds and habitats for fish and shellfish, such as mangroves, coral reefs, seagrass beds, and salt ponds, will face increasing threats from likely impacts of projected climate change.

Coastal Zone

Much of the coastal changes currently experienced in small island states is attributed to human activities on the coast. Projected sea level rise of 5 mm per year over the next 100 years, superimposed on further coastal development, will negatively impact on coasts. Rising air and sea temperature and sea level will adversely affect coral reefs, mangroves, and seagrass beds that often rely on stable environmental conditions. Mangroves, which are common on low-energy, nutrient/sediment-rich coasts and embayments in the tropics have been altered by human activities such as coastal and marine development. Changes in sea level are likely to affect landward and along-shore migration of mangrove forest remnants that provide protection for coasts and other resources.

Human health, settlement, infrastructure and tourism

Human health is a major issue given that many tropical islands are experiencing high incidences of vector- and water-borne diseases that are attributable to changes in temperature and rainfall, which may be linked to the El Nino southern oscillation (ENSO) phenomenon, droughts and floods.

Almost all settlements, socioeconomic infrastructure, and activities such as tourism are located at or near the coastal areas in tropical islands. Tourism is an important income earner for most Caribbean islands. Changes in temperature and rainfall regimes, as well as loss of beaches, could devastate the economies of many Caribbean small island states.

The anticipated climate change impacts are gleaned from global circulation models, the scale of which have not been resolved to a scale that would project impacts of climate change on small geographic regions like the Caribbean. Consequently, the vulnerability of Caribbean states and the associated sector impacts may be severely underestimated or estimated with a large degree of uncertainty. Accordingly, a priority area for research would be collaborative efforts to resolve GCMs to a scale that would decrease the uncertainty of vulnerability.

Possible areas of research:

- Climate change impact assessments across sectors;
- Expected changes in yields of crops;
- Food security, famines and socio-economic impacts including insurance schemes;
- Heat/drought resistant plants and crops;
- Salt resistant plants and crops;
- Modification of farming and cultivation practices including timing of sowing and reaping;
- Variation of crops and livestock;

- Feasibility of establishing seed banks of agricultural and forest species;
- Ecosystem vulnerability
- Integrated Coastal Zone Management Systems (ICZM);
- Water recycling systems, desalination;
- Meteorological, sea level, tidal, erosion monitoring;
- System modeling (agricultural species, storm surges, coastal erosion etc.)

References:

IPCC Third Assessment Report Vols. I, II and III. 2001.