Impacts of Climate Change on Guyana and the World at large

Part 1: Observed climate change

In last week's article, we introduced the concept and scientific basis of climate change, along with some basic terminology. This week we will look at the changes in climate that have been observed over the last century, and the impacts of these changes on Guyana and the rest of the world.

Observed climate change

According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change**,** 2007 (IPCC FAR), there is little doubt that the Earth's climate system is warming as a result of greenhouse gas (GHG) emissions from human activities, as evidenced by increases in global air and ocean temperatures, rising global sea levels, and widespread melting of snow and ice.

Average **global temperatures** have increased by 0.74°C over the past century, and warming over the past 50 years (at a rate of approximately 0.13°C per decade) has been nearly double that of the preceding 100 years.

Global **sea levels** have risen by approximately 1.8mm per year between 1961 and 2003 and by 3.1mm per year between 1993 and 2003. In addition, the expanse of Arctic sea ice has shrunk by 2.7% per decade since 1978.

Significant changes in **precipitation** have also been recorded over the last century. Increases in rainfall have been observed in some regions (including eastern North and South America, north Europe and northern and central Asia), and decreasing rainfall in others (including much of Africa, the Mediterranean region and parts of Asia).

General impacts on ecosystems, human livelihoods and economies

Many natural systems, on all continents and in some oceans, are being affected by regional climate changes, particularly temperature increases. Some of theses effects are described below.

- Global extent of snow and ice cover has declined, especially since 1980 and at a greater rate during the past decade, contributing to the rise in sea-level. Mountain glaciers are getting smaller, snow cover is retreating earlier in the spring and sea ice in the Arctic is shrinking in all seasons, most dramatically in summer.

- Reductions are reported in permafrost, seasonally frozen ground and river and lake ice, leading to changes in Arctic and Antarctic ecosystems. Parts of the ice sheets on Greenland and West Antarctica, and the glaciers of the Antarctic Peninsula, are thinning and contributing to sea level rise.

- Hydrological systems have been affected resulting in enhanced run-off and warming of lakes and rivers in some regions.

- Warmer and drier conditions in the Sahel in Africa have led to a reduced length of growing season, with detrimental effects on crops, and severe implications for food security, malnutrition and starvation.

- Terrestrial ecosystems have been affected, with observations of earlier timing of spring events, such as leaf-unfolding, bird migration and egg-laying, and of poleward and higher elevation shifts in the distribution of plant and animal species.

- Marine and freshwater ecosystems have been affected by rising water temperatures, with observations of shifting species ranges and earlier fish migrations in rivers.

- There have been widespread increases in the number of heat waves and warm nights since 1950. There has been an increase in the extent of regions affected by drought, as well as an increase in the frequency of heavy rainfall events that have led to flooding in some regions. Tropical storm and hurricane frequencies vary considerably from year to year, but evidence suggests substantial increases in intensity and duration since the 1970s.

These changes in natural systems have been linked to many disaster type events experienced by many countries. These events have had massive human and environmental implications.

Impacts of climate change on developing countries

Continued warming of the atmosphere at the current rate will result in substantial damage to water resources, ecosystems and coastlines, as well as having an impact on food supplies and health. The Stern Review (2007) estimates that if we do not act to limit GHG emissions, the economic costs of climate change impacts will be between 5% and 20% of global GDP per year, and could be considerably higher. Climate change will affect the basic elements of life for people around the world – access to water, food production, health, and the environment. Hundreds of millions of people could suffer hunger, water shortages and coastal flooding as the world warms.

According to the Stern Review, climate change is a grave threat to the developing world and a major obstacle to continued poverty reduction across its many dimensions.

First, developing regions are at a geographic disadvantage: they are already warmer, on average, than developed regions, and they also suffer from high rainfall variability. As a result, further warming will bring poor countries high costs and few benefits.

Second, developing countries - in particular the poorest - are heavily dependent on agriculture, the most climate-sensitive of all economic sectors, and suffer from inadequate health provision and low-quality public services.

Third, their low incomes and vulnerabilities make adaptation to climate change particularly difficult.

Impacts of observed climate change on Guyana

Over the last century significant changes in Guyana's climate were observed. Guyana's Initial National Communication (INC) in Response to its Commitments to the UNFCCC (2002),

provides an analysis of these changes which are described below. The Second National Communication is currently being developed.

- Records suggest an increase by 1.0°C in the mean annual temperature in Georgetown within the last century (1909-1998).

- Prior to 1960, annual rainfall amounts were generally above or about the long term average. However, from 1960 and onwards, there has been a tendency for below average rainfall.

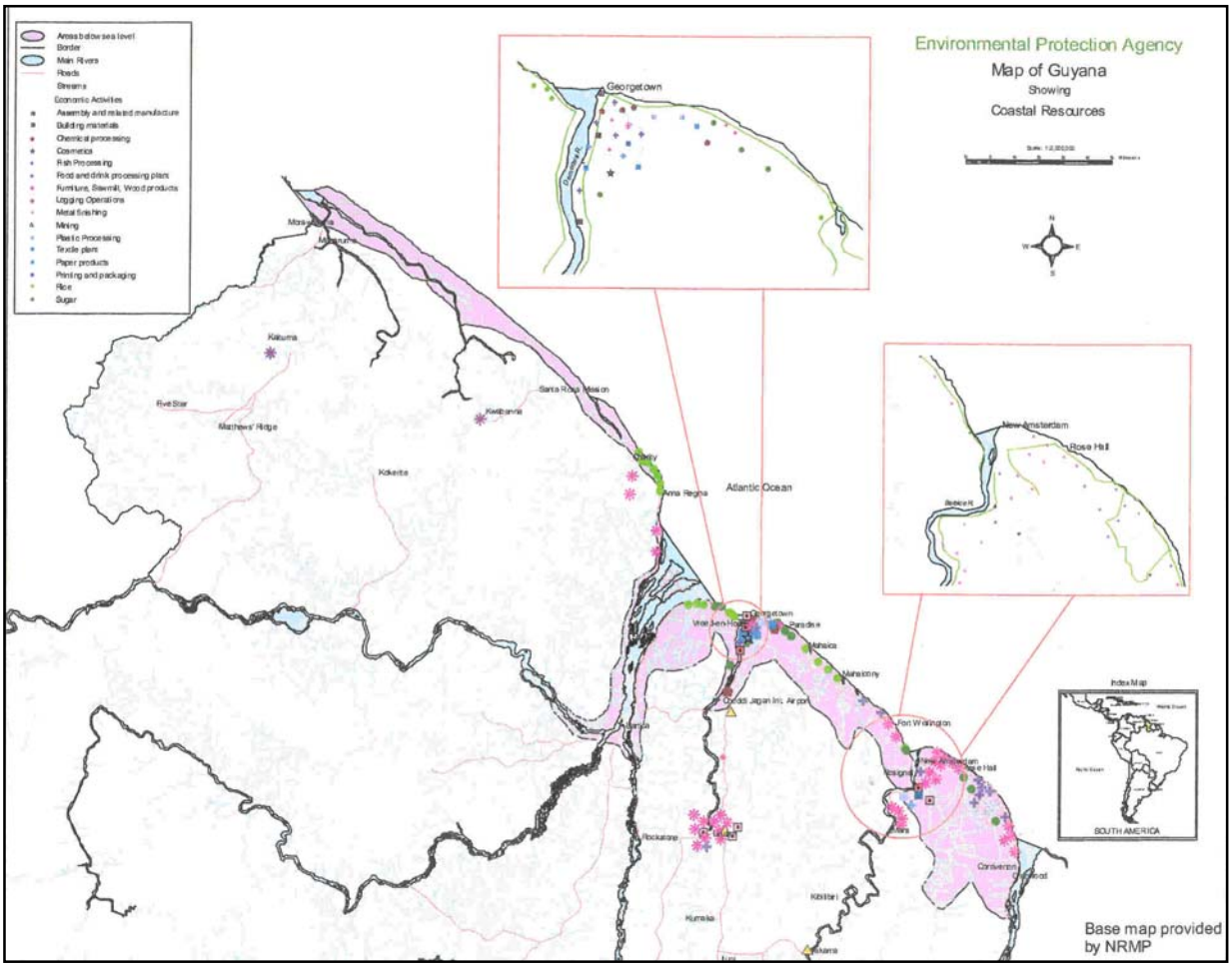
- Tide gauge data in Guyana for the period 1951 to 1979 indicated a mean relative sea level rise of 10.2 mm per year. This is more than five times the global average over a similar period.

Guyana is highly vulnerable to the effects of climate change for many reasons.

Approximately 90% of the country's population resides on the Coastal Plain which lies approximately 0.5 to 1 metre below mean sea level (see map showing areas below sea level)

The coast is also relatively flat, which favours rapid accumulation of rainfall runoff, and which makes natural drainage into the ocean very difficult. This situation presents severe challenges to the drainage and irrigation system. Over the years, high levels of flooding were observed in the country especially along the coast and in some inland areas. Climate change is likely to increase the frequency and intensity of flooding events.

Approximately 75% of the country's economic activities are located on the coastal area, where the major economic activities, such as agriculture, fisheries and industries are found. These sectors are extremely sensitive to extreme weather events and sea-level rise and are therefore highly vulnerable to changes in climate.



Map of Guyana showing the areas below sea-level on the coast in pink (Source: Environmental Protection Agency of Guyana)

The country has already suffered greatly over the last decade from weather related disasters.

In December 2004 and January 2005, an unusual weather system produced heavy rains which led to major flooding resulting in severe physical damage and economic loss to the country, leading to the worst flooding event ever recorded in Guyana's history (ECLAC/UNDP, 2005).

The 2005 flood was concentrated in the most heavily populated regions of the country, resulting in some 274,774 persons or 37% of the national population being severely affected by the flood waters. The flooding event claimed the lives of 34 persons. The magnitude of the damage caused by the floods was estimated to be equivalent to G$92.2 billion, or 59% of current GDP for the year 2004. Studies indicate that the rains were not associated with the usual weather systems affecting Guyana.

It is clear that climate change will pose a major challenge to developing countries like Guyana.

In next week's article, we will focus on projections of future climate change. Future articles in this series will discuss how we can avoid the worst effects of climate change through adaptation and mitigation, and what Guyana is doing to combat climate change.

*Information used in this feature was extracted from the following reports: The Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007 (IPCC FAR), Guyana's Initial National Communication (INC) in Response to its Commitments to the UNFCCC (2002), The Economics of Climate Change: The Stern Review (2007) and the UNDP/ECLAC, Guyana, Macro-Socio Economic Assessment of the Damage and Losses caused by the January-February 2005 Flooding (2005).

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