

LIMITED  
LC/CAR/L.149  
12 December 2007  
ORIGINAL: ENGLISH

**ADDRESSING THE IMPACTS OF CLIMATE CHANGE:  
FOCUS ON THE CARIBBEAN**

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## **ADDRESSING THE IMPACTS OF CLIMATE CHANGE: FOCUS ON THE CARIBBEAN**

### **Introduction**

Climate change is a real phenomenon and is evidenced by increased frequency and intensity of extreme events. The overarching documents on climate change are the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol. The adoption of the UNFCCC in 1992 was the first major commitment expressed by the international community in addressing global warming. However, global emissions continued to increase. In an effort to curb this increase and implement stringent emission-reducing strategies, the Kyoto Protocol was adopted in December 1997. It is anticipated that at the United Nations Climate Change Conference in Bali, Indonesia, from 3 to 14 December 2007 discussions would focus on devising a firm and decisive global action plan or framework post Kyoto, 2012<sup>1</sup> era.

### **What is climate change?**

According to the United Nations Framework Convention on Climate Change (UNFCCC) it is defined as the change of climate which is attributed directly to human activity that alters the composition of the global atmosphere and which compounds natural climate variability observed over comparable time periods<sup>2</sup>. Some of the greenhouse gases that have been identified by the Intergovernmental Panel on Climate Change (IPCC) are as follows: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), perfluorocarbons (PFCs) and sulphur hexafluoride.

### **Tracking global climate change<sup>3</sup>**

The IPCC Fourth Assessment Report released in November 2007 outlined emerging patterns of climate change. It noted that climate change is unequivocal since the last 11 years have been the warmest since 1850. This warming has a domino effect on many ecosystems and weather events globally. It has been linked to an increase in sea level, which has risen on an average rate of 1.8mm/yr since 1961 and 3.1mm/yr since 1993. A reduction in snow and ice cover; increased precipitation, hotter days and nights; increased tropical cyclone activity especially in the North Atlantic since 1970 have also been observed.

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<sup>1</sup> [http://ec.europa.eu/environment/climat/bali\\_07.htm](http://ec.europa.eu/environment/climat/bali_07.htm) : Europa: The European Commission

<sup>2</sup> <http://www.ipcc.ch/pdf/glossary/ipcc-glossary.pdf>

<sup>3</sup> [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr\\_spm.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf)

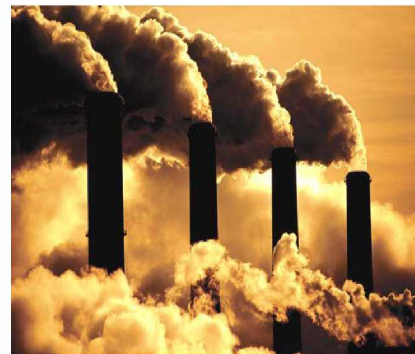
Evidence has also shown that terrestrial, hydrological and marine systems have been adversely affected by climate change. There have been changes in the thermal structure and quality of rivers and lakes; earlier springs and pole-ward and upward shifts in plant and animal ranges; changes in salinity, oxygen levels and circulation in the oceans. Warming slows the world's ocean circulation, which contributes to the uptake of carbon dioxide. As warming reduces terrestrial and ocean uptake of atmospheric CO<sub>2</sub>, there is an increasing fraction of anthropogenic emissions that remains in the atmosphere, thus compounding the effects of global warming attributed to greenhouse gas emissions (GHG).

Warming effects are also extended to natural and human environments such as changes in agricultural and forestry management as there are changes in planting seasons and disturbances regimes of forests due to fires and pests<sup>4</sup>. Human health is also affected through heat-related mortality and changes in infectious disease vectors.

### The drivers of climate change

It is important to identify the drivers of climate change so that appropriate mitigation measures may be developed. Some of these are as follows:

- Increased use of fossil fuels such as coal and oil;
- Increase in population means that there will be an increase in human activity which places a heavier burden on the environment and ultimately shapes energy consumption;
- Increased industrial activity which is a major contributor to GHG emissions;
- Increased production of methane emitted from ruminants e.g. cows, as a by-product of their grassy diet; from gas product facilities and landfills;
- Increased deforestation would contribute to increased amount of atmospheric CO<sub>2</sub>;
- Changes in land use patterns which involve the transformation from a natural forest to seasonal crops or from natural to urban environments. These alterations change the climate system.



Source: [concise.britannica.com](http://concise.britannica.com)

These drivers cause increases in the atmospheric concentration of GHG throwing the earth's delicate ecosystem out of balance. Increases in CO<sub>2</sub> concentration is the main contributor to global warming as annual emissions have increased by approximately 80 per cent from 1970

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<sup>4</sup> Natural forest disturbances are natural events that would clear a forest allowing new growth, for example, natural forest fires, damage from pests, disease and severe weather

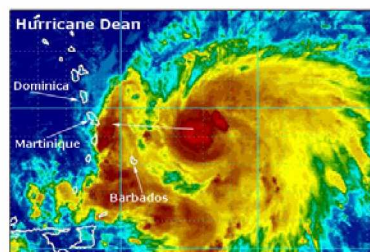
to 2004. However, the concentrations of CH<sub>4</sub> and N<sub>2</sub>O have also increased since 1750<sup>5</sup>. These emissions are the by-products of the industry and technology-intensive era and symptomatic of the current global activity such as population increase, energy use patterns, economic growth, technology and land use patterns.

Even though countries may implement stringent mitigation measures today, the effects of these measures would not manifest themselves until mid-2030<sup>6</sup>, because there is a natural time lag in the global ecosystem. The GHG emissions of today are already ‘locked into the ecosystem’ and will have adverse effects on tomorrow’s climate patterns.

Under the Kyoto Protocol developed countries were encouraged to take the lead in assuming responsibility for instituting strong mitigation measures because there is empirical evidence to show that developed countries, which comprise 15 per cent of the total complement of countries, account for almost half of the world’s CO<sub>2</sub> emissions<sup>7</sup>. These countries have the financial resources to implement deep cuts in emissions whereas poor and developing countries tread the world with a light carbon footprint. However this does not absolve developing countries from contributing to emissions reduction as climate change does not respect boundaries and one country’s emissions are the world’s problem. According to the United Nations Development Programme (UNDP) Human Development Report 2006<sup>7</sup> climate change threatens to erode human freedom and limits choice as it hampers the world’s poor to effectively develop and improve their lives and the lives of their children.

The IPCC Special Report on Emission Scenarios (SRES, 2000) predicts an increase in global GHG emissions by 25-90 per cent between 2000 and 2030 as fossil fuels may possibly maintain its strong position as the preferred energy source. If these trends continue, it is possible that further warming may cause the global climate system in the twenty-first century to be more devastating than the effects in the twentieth century.

### Climate trends in the Caribbean region



Source: stormvideographer.com

Caribbean countries being Small Island Developing States (SIDS) are among the most vulnerable to the effects of climate change. Major sectors, such as agriculture and tourism, will be devastated by the impacts of climate change. The Caribbean Community Climate Change Centre (CCCCC) has been instrumental in collating and modelling current trends and projections

<sup>5</sup> IPCC Fourth Assessment Report

<sup>6</sup> Human Development Report 2007/2008 (UNDP)

<sup>7</sup> Human Development Report 2007/2008 (UNDP)

for the region. Their work will assist the region's leaders in making informed decisions, which will be appropriate for the region. Some of the trends and projections that have been proposed for the region are listed in the table below:

CLIMATE TRENDS IN THE REGION	PREDICTED CLIMATE CHANGES FOR THE REGION
Mean temperature increase for past 3 decades	Annual warming by 0.2 degrees centigrade per decade
By end of 1970s a significant warming was detected in lower part of atmosphere	Greater warming in NW Caribbean than in E Caribbean
Significant increase in minimum temperature (1.4 deg. since 1960)	Greater warming in summer months than in cooler traditionally drier earlier months
2 degree decrease in diurnal temperature range for region	Drier Caribbean basin in annual total
Number of warm days in region has increased, number of cold nights has decreased	Sea-level rise is expected to worsen the effects of inundation, storm surge, erosion, and other coastal hazards; this will in turn threaten infrastructure, settlements and facilities that support the livelihood of island communities
Frequency of droughts increased since 1960 (Cuba)	Deterioration in coastal conditions – erosion of beaches and coral bleaching is expected to affect local resources
Frequency of occurrence of extreme events changing- Flooding & hurricane passage increased in 1990s	By mid-century, climate change is expected to reduce water resources in many islands – the Caribbean and the Pacific – to the point where they become insufficient to meet demand during low-rainfall periods
	With higher temperatures, increased invasion by non-native species is expected to occur, particularly on mid-and high-latitude islands

### *Impacts of climate change*

Impacts of climate change may be as follows:

- Sea level rise. In the Caribbean the majority of the population is located along the coast which may be low lying and therefore extremely vulnerable to sea level rise. Rising seas may inundate coastal areas destroying human settlements and tourist facilities thereby adversely affecting the resources required to sustain economies;
- Coral bleaching resulting from increased temperatures will have deleterious effects on the tourism industry, the economic base of many of the islands;
- Increased rainfall and drought will have serious implications for water availability and accessibility, impacting on the agricultural sector, public health and tourism. Increased rainfall will increase the probability of flooding especially in low-lying areas;
- Increased intensity and frequency of hurricanes. This would require quick recovery times and financial stability to address the costs associated with such disasters and events. However these economies are largely incapable of withstanding such shocks and in most cases such events hamper their economic development. Current data shows the increase



Source: [www.blog.thesietech.org](http://www.blog.thesietech.org)

in frequency and intensity of hurricanes in the Caribbean region over the last few decades, as shown below.

Category	1970-79	1980-89	1990-1999	2000
Category 3	9	7	11	6+
Category 4	3	7	12	8+
Category 5	3	3	2	5+
	15	17	25	19

Source: CDERA. CWWA High Level Ministerial Session, St Kitts/Nevis 2007.

Although the region follows the trend of having a light carbon footprint, Trinidad and Tobago ranks the highest in the region with CO<sub>2</sub> emissions averaging 24.68 CO<sub>2</sub> MT [metric tonnes of CO<sub>2</sub> per capita] resulting from its industrial activity. This country was listed in the top 10 nations emitting GHG, however the Prime Minister asked “that Trinidad and Tobago not be judged on this basis”.<sup>8</sup> Lagging very far behind are Suriname with 5.08 MT and Barbados with 4.36MT (2004 figures<sup>9</sup>). The Government of Trinidad and Tobago gave its commitment to reduce this country’s carbon emissions at the recent Commonwealth Heads of Government Summit in Uganda in November 2007<sup>10</sup>.

### **Response to climate change**

The Kyoto Protocol was adopted at the third Conference of the Parties (COP-3) to the UNFCCC in Kyoto, Japan, in December 1997. The main object of the Protocol was to encourage countries to commit to limiting GHG emissions. Reduction targets for developed countries were stipulated in the Treaty. These targets must be met within a five-year period between 2008 and 2012 and should add up to a total cut in GHG emissions of at least 5 per cent against the baseline of 1990<sup>11</sup>. The Protocol outlined a number of mechanisms to address this reduction. These included: joint implementation; clean development mechanism and emissions trading<sup>12</sup>. The Protocol calls on rich countries to bear the brunt of the responsibility in reducing global emissions based on the “common but differentiated responsibility”.

In developing strategies to avert the effects of climate change, it is important to look at the economic cost attached to climate change. The Stern Report, *The Economics of Climate Change*, states that carbon emissions need to be retrained to 450 and 550 ppm CO<sub>2</sub> equivalent (CO<sub>2</sub>e) to avoid the worst impacts of climate change. Emissions are currently 430 ppm and

<sup>8</sup> Trinidad Guardian – 6 December 2007

<sup>9</sup> MDG Monitor <http://www.mdgmonitor.org/map.cfm?goal=&indicator=&cd=>

<sup>10</sup> Trinidad Guardian, 4 December 2007

<sup>11</sup> [http://unfccc.int/kyoto\\_protocol/items/2830.php](http://unfccc.int/kyoto_protocol/items/2830.php)

<sup>12</sup> Climate Change Handbook for Caribbean Journalist

rising at approximately 2 ppm per year. If the target of 450 to 550 could be attained it would require emission to be at least 25 per cent below current levels by 2050. The report estimates that the overall cost and risks of climate change is a loss of 5 per cent of global GDP each year. However the cost of action, that is reducing GHG could be limited to approximately 1 per cent GDP each year.

### *Adaptation vs. mitigation*

The United Nations Secretary General, Mr. Ban Ki-Moon, stressed that tackling climate change is twofold. Firstly mitigation measures are essential and industrialised countries should increase their emissions reductions, but, developing countries also need to be a part of the solution. Secondly, he noted that adaptation is a global necessity especially for the most vulnerable developing nations that require assistance in building their capacity. These strategies should be backed by the generation of new technologies that reduce the effects of climate change and make renewable/alternative technologies more economically viable. There should be rapid promotion of these technologies.

#### Adaptation measures

Adaptation to climate change refers to adjustments in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects or impacts<sup>13</sup>. Climate change cannot be avoided and it will take place over the next two to three decades, therefore immediate and strong action is required.

The world has already locked into the effects of climate change because of “the inertia built in climate systems and the delay between mitigation and outcome”<sup>14</sup>. So the only other option afforded us at this time is to adopt adaptation measures. These measures will reduce the effects of climate change by building and developing climate defence structures.

There are a few vulnerability-reducing initiatives in the region. These include:

- (a) Fuel switching – the utilization of cleaner fuels such as natural gas in Trinidad and Tobago; in Jamaica the use of 87 octane fuel and diesel-powered vehicles is being advocated;
- (b) Renewable energy – in Barbados approximately 20 per cent of the population uses solar heaters;
- (c) In Jamaica wind energy is used at the Wigton Farm to power the Jamaica Public Service Company;
- (d) Green Globe Certification – an award that encourages resource conservation implemented in the hotel industry, recipients of this award include Sandals and Half Moon hotels in Jamaica;

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<sup>13</sup> Caribbean Change Handbook for Caribbean Journalist

<sup>14</sup> Human Development Report 2007/2008



(e) Planning and development policy – this involves the improvement of building and development standards to address threats of climate change, examples include: the Petroleum Company of Trinidad and Tobago (Petrotrin) which has incorporated climate change considerations into its Environmental Impact Assessment (EIA) process. The Environmental Management Authority (EMA) in Trinidad and Tobago has also incorporated climate change considerations into its Environmental Impact Assessment (EIA) process.

The Economic Commission for Latin America and the Caribbean (ECLAC) Subregional Headquarters for the Caribbean recently concluded a seminar on formulating public policies for the sustainable use of biofuels. The seminar reviewed ethanol production in Brazil and the potential of such production in Jamaica and Guyana. The seminar also led participants through an exercise in developing an appropriate policy for biofuels. In essence this exercise would assist policy makers to determine the viability of producing biofuels in their countries. This organization also collaborates with the regional disaster focal point Caribbean Disaster Emergency Response Agency (CDERA) and other agencies in the area of disaster assessment.

### Mitigation measures<sup>15</sup>

There are many strategies that can be implemented and utilized to reduce carbon emissions. Climate change mitigation is described in the Human Development Report 2007-2008 as transforming the way energy is produced and used. The first step in the process is to commit to stringent targets and ensure translation into national policies. For this to be successful, the necessary political will is required as this is one of the more challenging issues.



Source: dusteye.wordpress.com



Source: commons.wikimedia.org



Source: www.eia.doe.gov

<sup>15</sup> Human Development Report 2007-2008

Developed countries have the resources to pursue more robust mitigating measures whereas the developing world may utilize these measures over a period of time. Some of these strategies are as follows:

- Increasing energy efficiency is another route in the reduction of emissions. The automobile industry accounts for more than 30 per cent of greenhouse gases, if the fleet efficiency is increased it could potentially reduce oil consumption substantially;
- Carbon pricing. Direct carbon taxation, where the revenue collected could facilitate the reduction in labour and investment taxes. Cap-and-trade system where governments set an emission cap that businesses are allowed to emit, those that can reduce their emissions cheaply can trade allowances. The European Union Emissions Trading Scheme is one such example;
- Research and development (R&D) in the area of renewable energy. The Organization for Economic Cooperation and Development (OECD) countries have the potential to increase their renewable energy to power 20 per cent. Hydro-generated power, geothermal generated power and solar generated power are all examples of renewable energy technologies that are being utilized worldwide. Governments could change their investment patterns to develop R&D strategies in these alternative energy sources;
- Development and utilization of alternative fuels. Countries such as Brazil, the United States and Europe have been leading in the area of ethanol production which has a positive effect on reducing carbon emissions;
- Carbon Capture and Storage (CCS) is another new technology where CO<sub>2</sub> is captured from fossil fuel plants and stored in lieu of releasing it into the atmosphere. Geological formations have been proposed as the best storage options at this time. The IPCC estimates the potential of this method could be between 10-55 per cent of the total mitigation effort until 2100;
- Carbon sinks. Reforestation and restoration of degraded grassland could have tremendous benefits as a mitigation measure by increasing the natural global carbon sinks.

It is important that governments commit to developing low-carbon technologies so we could continually add mitigation measures to address climate change. This avenue will be enhanced if governments invest in research and development in these forward thinking technologies.

## **Caribbean efforts in addressing mitigation and adaptation measures<sup>16</sup>**

This region has taken scientific steps in developing a structured and informed strategy to climate change. The CCCCC was developed for this purpose. This organization is a clearinghouse for regional climate change data that helps to guide the Caribbean Community (CARICOM) and its member States in appropriate policy formulation to address climate change. The centre is involved in community projects, partners with regional and international agencies, educational institutions, and non-governmental organizations in preparing the region for the effects and implications of climate change.

There were many projects and initiatives that preceded the Centre, these included the Caribbean Planning for Adaptation to Climate Change (CPACC), the Adaptation to Climate Change in the Caribbean (ACCC) Project and the Mainstreaming Adaptation to Climate Change (MACC) Project. The CPACC initiative was the first step in a comprehensive, long-term programme of adaptation to global climate change. It served to build capacity, prepare national climate change adaptation policies and implement plans, and formulate technical assistance and investment projects.

The ACCC, on the other hand, focused on the development of risk management guidelines for climate change adaptation decision-making, political endorsement of the business plan and establishment of the CCCCC. The MACC Project was aimed at building capacity in a cost-efficient way, thereby contributing to the sustainability of the project activities and objectives. Some of the outcomes of the project were: the mainstreaming of climate change into the national and sectoral planning and policies through the use of climate models developed and customised through the project; developing a strong public education and outreach programme and a comprehensive communication strategy; and the creation of an environment conducive to the implementation of measures for adaptation to climate change. This project built on the CPACC project.

### **The way forward for the Caribbean region**

It is evident that the world needs to act now so future generations will not be ravaged by extreme climate events. The Caribbean region needs to devise an emissions-reducing programme that consists of various adaptation and mitigation measures. Some of these strategies may include:

- Formulating cost-effective adaptation measures, which should be practical and economical;
- Investment in R&D for cost-effective renewable energy devices. A company in Trinidad and Tobago is exploring the possibility of introducing solar water heaters, which have the potential not only to contribute to reducing carbon emissions but also to address increasing energy bills;

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<sup>16</sup> Climate Change Handbook for Caribbean Journalist

- Improving drainage systems especially in vulnerable low-lying areas that may channel excess water away from their homes (bigger drains, investigate the potential rainwater harvesting, which involves designing drainage that would effectively channel excess water from increased rainfall that could be used for domestic and commercial purposes);
- Investment in R&D in exploring other adaptation strategies appropriate for the region e.g. floating homes as used in the United Kingdom;
- Continuing to implement and refine pre-disaster strategies;
- Implementing and enforcing building code legislation;
- Mandatory safe rooms in newly-built homes to be used in an event of a natural disaster;
- Strengthening or increased support for the investment in the Caribbean Catastrophe Risk Insurance Facility (CCRIF). Saint Lucia and Dominica were able to access the fund after these countries experienced infrastructural damage after the earthquake 29 November 2007 with a magnitude of 7.3 according to the Port -of- Spain based Seismic Research Unit <sup>17</sup>;
- Establishing an extensive reforestation programme;
- Strengthening and enforcing national reserve legislation.

Even though the region does not contribute significantly to global emissions, it is important to adopt stringent and appropriate measures to be a part of the global effort in battling climate change. In the words of the Secretary-General of the United Nations:

*“Climate change threatens the entire family. Yet it also provides an opportunity to come together and forge a collective response to a global problem. It is my hope that we will rise as one to face this challenge, and leave a better world for future generations.”*

*Ban Ki-Moon, Secretary-General of the United Nations*

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<sup>17</sup> Trinidad Guardian 6 December 2007.

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