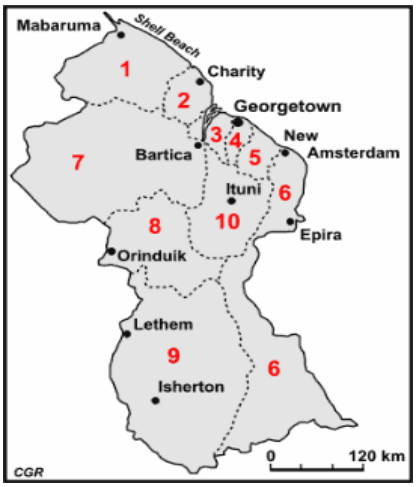
GUYANA

CLIMATE CHANGE ACTION PLAN

IN RESPONSE TO ITS COMMITMENTS TO THE UNFCCC

Actions for addressing climate change



June , 2001

ACKNOWLEDGEMENTS

The Climate Change Action Plan is a supplement to the Initial National Communication. Funding by the Global Environment Facility through the UNDP is acknowledged. The National Task Force worked dedicatedly to come up with the activities that are to be undertaken to adapt to and to mitigate climate change and to respond to the adverse impacts associated with the effects of global warming. Their work was valuable and highly appreciated.

The Project Staff is also acknowledged for coordinating this work.

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INTRODUCTION:

The Action Plan seeks to address the commitments of Guyana to the Convention by "formulating national programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change" - Article 4.1 (b).

The Plan seeks to develop, apply and diffuse technologies (and technology transfer), practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases in all relevant sectors, including energy, transport, industry, agriculture, forestry, waste management and health sectors.

It is recognized that the Plan cannot be implemented without the financial and other resource assistance of the developed Country Parties and multilateral institutions. It is therefore necessary that the Convention Secretariat, the Global Environment Facility and the developed country Parties honour their commitments by providing resources (financial, technological and technical) to enable Guyana to realize the implementation of the activities listed in the Plan.

GOALS OF THE PLAN

- Develop the capacity to undertake sectoral and national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases using comparable methodologies agreed upon by the Conference of Parties (COP);

- Develop the capacity to conduct vulnerability assessment of sectors and communities and to identify adaptation measures required to address the impacts of climate change;

- Implement measures to facilitate adequate adaptation to climate change;

- Implement programmes containing measures to mitigate climate change;

- Identify and implement sustainable development measures which are compatible with the objectives of the Convention; and

- Identify and implement capacity building and other programmes which seek to promote the objectives of the UNFCCC as well as other Conventions and Protocols.

CLIMATE CHANGE AND THE NATIONAL DEVELOPMENT STRATEGY

While the Strategy makes no direct mention of global warming, climate change and impacts in Guyana, the general theme of environmental problems, especially in the coastal zone, addresses some of the problems associated with global warming.

The important connection between the objectives of the Strategy and the Climate Change issue can be examined as follows:-

- The impacts of climate change will definitely delay the realization of the objectives since resources will have to be set aside for emergency operations with regards floods, droughts, etc. The coastal zone will be expected to come under further "stress" as the impacts become evident.

- Economic development will depend on a reliable energy supply. The transfer of technology to the energy, industry and local community sectors, with developed country financing, can certainly assist in promoting economic development and poverty alleviation.

- The Strategy recognizes institutional weaknesses as a major hindrance to integrated planning and effective execution of programmes and activities. The Climate Change National Communication also identifies capacity building as a necessary programme to address adaptation and mitigation activities.

It is therefore necessary for the Climate Change Action Plan to be seen as an important supplement to the Strategy and for socio-economic development programmes to take into consideration the activities which have been included in the Action Plan.

THE ACTION PLAN PROGRAMME AREAS

MOBILIZATION OF FINANCIAL AND TECHNICAL RESOURCES

Guyana will not be in a position to fund the Action Plan out of the finances available locally to the government. It will be necessary for regional and international assistance to be provided to Guyana by the Multilateral Agencies and by the Developed Country Parties. The use of ODA for funding of the Action Plan should not be encouraged unless it is seen as also addressing the programmes under the National Development Strategy.

Technical and technological assistance are most important for implementing adaptation and mitigation measures. It is clear that the developed country parties will have to demonstrate the will to comply with their commitments under the Convention by effecting the provision of assistance in a timely manner so that the effects of climate change do not result in under-development. The Climate Technology Institute (CTI) can play a major role in technology transfer for Guyana.

HUMAN RESOURCES AND INSTITUTIONAL CAPACITY BUILDING

Guyana 's ability, to respond to the impacts of climate change and to take mitigation actions, is weak. The country will require substantial assistance to provide for the relevant training and capacity to carry out the programmes. The coordinating agency and the sector agencies along with the stakeholders in the energy and industry sectors, the regional implementing agencies and the local communities will all require assistance.

CONSOLIDATION OF THE POLICY, LEGAL AND ADMINIS TRATIVE FRAMEWORK

As indicated earlier, it is expected that the Action Plan will be looked at as a supplement to the National Development Strategy (NDS). The NDS will require policy, legal and administrative settings within which the NDS programmes will be implemented. These settings should address climate change.

RESPONSE MEASURES FOR ADAPTATION TO CLIMATE CHANGE

Given that the capacity is there to deliver on the measures for adaptation, it will the responsibility of the government to coordinate the actions which will be crucial for lessening the impacts of climate change. *The adaptation programme is seen as the priority programme for our low-lying state.*

EDUCATION, TRAINING AND PUBLIC AWARENESS

This is a very relevant programme especially in view of the political instability which can arise when sections of the population do not understand why certain actions are taken to deal with the impacts of climate change. It is expected that this programme will reach out to local communities, the planners and the school systems.

RESEARCH AND SYSTEMATIC MONITORING OF CLIMATE AND CLIMATE CHANGE

In order for Guyana to make reliable plans to respond to the impacts of climate change, it is necessary that adequate and reliable data be available to conduct sensitivity analyses and to develop designs and other plans which will be of some level of accuracy. There is a need for the availability of the necessary resources for monitoring the climate, climate change and the signals of the impacts of climate change.

MEASURES FOR MITIGATION OF CLIMATE CHANGE

This programme will target mostly the energy, forestry and agriculture sectors. Actions will be geared towards the reduction of emissions of greenhouse gases by energy efficiency, improved forestry and agricultural management, *and the use of renewable energy resources*.

MEASURES FOR FURTHERING THE AIMS OF THE KYOTO PROTOCOL

The Clean Development Mechanism (CDM) is the mechanism under the Kyoto Protocol which will provide opportunities for Guyana this by participation in projects in energy efficiency, renewable energy resources, carbon sequestration and improved farm management. Private sector agencies stand to benefit from this programme.

DEVELOPMENT AND TRANSFER OF TECHNOLOGY

There are technologies which can be of considerable benefit to Guyana in its efforts to address climate change adaptation and mitigation. There are also endogenous technologies which require capital and expertise for development. This programme will seek to enhance the local capacity for identifying technologies that are expected to be of benefit to Guyana. It will also seek to effect the transfer of suitable technologies to address climate change impacts. The Institute of Applied Science and Technology will be the focal point for technology transfer.

RECOMMENDATIONS:

The recommendations given below are necessary for Guyana to respond to climate change issues and attain sustainable development. The basic actions are capacity building and garnering of resources, financial as well as human, to execute the programme identified in the Action Plan.

- Assess the Action Plan in terms of the recommendations of the National Communication Executive Summary and the National Development Strategy (NDS) with a view towards determining which programme/project areas can be dealt with under the NDS and the project areas which will be critical to prepare Guyana for responding to Climate Change.

- Capacity building must be seen as a priority programme in the NDS as well as in the Action Plan. Establishment of the Climate Change Division/Unit will be needed very early to begin the implementation of measures identified in the Action Plan. It is recommended that the resources of the Global Environment Facility be tapped for this programme. A priority for this Division/Unit will be developing project proposals for the programme activities.

- Coastal Zone Monitoring and Management is a necessity in the NDS and is critical from a Climate Change stand point. Response Measures for Adaptation to Climate Change should therefore be examined from a national socio-economic development view for the impacts of sea level rise and global warming can restrict developmental progress in the coastal zone.

- Policy direction with regards responding to climate change is not available. This needs to be remedied early so that government agencies can budget for and put in place mechanisms to address issues of relevance to their mandates.

- There should be a grouping of the energy and industry agencies and private sector to fashion a programme for Guyana to benefits from the Clean Development Mechanism of the Kyoto Protocol and from Joint Implementation Initiatives of the Convention. The opportunities for substantial technology transfer should also be examined by this grouping with the assistance of TERI and the CTI.

CHAPTER 1: INTRODUCTION

1.1 GENERAL

Guyana's Initial National Communication on Climate Change has identified several areas and sectors that will require assistance to carry out the response programmes necessary to adapt to the vulnerabilities, and to mitigate emissions of greenhouse gases. The Action Plan, which is a supplement to the Initial National Communication, identifies the programmes Guyana should consider undertaking, assuming the availability of financial and other resources.

This Action Plan identifies short term (2001-2005) undertakings; this can be regarded as *phase I* of Guyana's Climate Change Action Plan. It focuses on capacity building for national inventory of greenhouse gases, vulnerability assessment, administrative framework, adaptation and mitigation options.

It is envisaged that the *phase II* Action Plan will be the main component of Guyana's Second Communication.

While the Action Plan itemizes the activities under each programme, it is expected that the implementation stage will require the development of project proposals for submission to funding agencies. The establishment of a Climate Division will be crucial for coordinating the sector programmes and for making contact with donor agencies.

1.2 CONTEXT OF THE ACTION PLAN

The Action Plan seeks to address the commitments of Guyana to the Convention by "formulating national programmes containing measures to mitigate climate change by addressing anthropogenic emissions by sources and removals by sinks of all greenhouse gases not controlled by the Montreal Protocol, and measures to facilitate adequate adaptation to climate change" - Article 4.1 (b).

The Plan seeks to develop, apply and diffuse technologies (and technology transfer), practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases in all relevant sectors, including energy, transport, industry, agriculture, forestry, waste management and health sectors.

It is recognized that the Plan cannot be implemented without the financial and other resource assistance of the developed Country Parties and multilateral institutions. It is therefore necessary that the Convention Secretariat, the Global Environment Facility and the developed country Parties honour their commitments by providing resources (financial, technological and technical) to enable Guyana to realize the implementation of the activities listed in the Plan.

1.3 GOALS AND OBJECTIVES OF GUYANA'S CLIMATE CHANGE ACTION PLAN

The ultimate objective of the Action Plan corresponds to that of the United Nations Framework Convention on Climate Change (UNFCCC): stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system - Article 2.

In order to achieve this international objective, Guyana must implement certain actions, which will result in the country honoring its commitments to the Convention either on its own or in cooperation through regional and/or international programmes. ***It is to be noted that Guyana's coastal zone is most vulnerable to the effects of climate change. On the other hand it is a net sink country. It will therefore be necessary for Guyana to focus on adaptation as a priority in the short-term.***

The Plan therefore focuses on achieving the following goals:

- Develop the capacity to undertake sectoral and national inventories of anthropogenic emissions by sources and removals by sinks of all greenhouse gases using comparable methodologies agreed upon by the Conference of Parties (COP);
- Develop the capacity to conduct vulnerability assessment of sectors and communities and to identify adaptation measures required to address the impacts of climate change;
- Implement measures to facilitate adequate adaptation to climate change;
- Implement programmes containing measures to mitigate climate change;
- Identify and implement sustainable development measures which are compatible with the objectives of the Convention; and
- Identify and implement capacity building and other programmes, which seek to promote the objectives of the UNFCCC as well as other Conventions and Protocols.

1.4 OVERVIEW OF CLIMATE CHANGE IMPACTS IN GUYANA

Guyana, being a relatively large country with both a tropical Marine Environment, in which most of the population and economic activity are located, and an interior Continental Tropical/Equatorial Environment would be most vulnerable to climate change and impacts of sea level rise, especially in the coastal zone and in the water resources, agriculture, forestry, energy, human settlements and health sectors. This vulnerability must be considered in the light of the already prevailing coastal and inland "stress" that currently demands significant attention. The impacts of climate change have been highlighted in Box 1.

BOX 1: IMPACTS OF CLIMATE CHANGE

DIRECT IMPACTS

AGRICULTURE	**-**	**Effects of rising temperature, moisture changes, increased CO_2 content of the atmosphere, pest abundance.**
SEA LEVEL RISE	**-**	**Inundation of coastal areas, overtopping of sea defences.**
WATER RESOURCES	**-**	**Droughts, floods, regional shifts in rainfall patterns.**

SOCIAL IMPACTS

ECONOMIC AND POLITICAL STABILITY	**–**	**Response to the growing social and economic challenges.**
POPULATION SHIFTS	**-**	**Migration creating stress in certain towns or villages.**
HUNGER AND POVERTY	**–**	**Disputes over limited or diminishing resources.**
SOCIETAL STRESS	**-**	**Rapid adjustment to accelerating change, especially in the health sector.**
CULTURAL AND PSYCHOLOGICAL STRESS	**-**	**Movement of people from cultural roots, and feelings of fear, anxiety and insecurity.**

1.5 THE NATIONAL VISION FOR RESPONSES TO CLIMATE CHANGE

Guyana's efforts to respond to the commitments under the Convention will necessarily have to be in the form of adaptation and the mitigation measures. However, these will not be achieved unless public awareness, capacity building, information sharing, and the right policy, legislation and financial measures are put in place.

1.5.1 The National Development Strategy

The National Development Strategy of Guyana was tabled in Parliament in July, 2000. It is a policy framework for the period 2001 to 2010 and has the following objectives:

- attain the highest rates of economic growth that are possible;
- eliminate poverty in Guyana;
- achieve geographical unity;
- attain an equitable geographical distribution of economic activity; and
- diversify the economy.

In achieving these objectives, the Strategy emphasizes the important role of environmental conservation as a prime consideration. The principles of precautionary actions and generational responsibilities are seen as environmental philosophies on which socio-economic development will proceed.

While the Strategy makes no direct mention of global warming, climate change and impacts in Guyana, the general theme of environmental problems, especially in the coastal zone, addresses some of the problems associated with global warming.

The important connection between the objectives of the Strategy and the Climate Change issue can be examined as follows:-

- The impacts of climate change will definitely delay the realization of the objectives since resources will have to be set aside for emergency operations with regards floods, droughts, etc. The coastal zone will be expected to come under further "stress" as the impacts become evident.
- Economic development will depend on a reliable energy supply. The transfer of technology to the energy, industry and local community sectors, with developed country financing, can certainly assist in promoting economic development and poverty alleviation.
- The Strategy recognizes institutional weaknesses as a major hindrance to integrated planning and effective execution of programmes and activities. The Climate Change National Communication also identifies capacity building as a necessary programme to address adaptation and mitigation activities.

It is therefore necessary for the Climate Change Action Plan to be seen as an important supplement to the Strategy and for socio-economic development programmes to take into consideration the activities which have been included in the Action Plan.

CHAPTER 2: PROGRAMME AREAS

2.0 INTRODUCTION:

Several programme areas have been identified as necessary for addressing implementation of the several activities required for Guyana to meet its commitment under the Convention.

2.1 MOBILIZATION OF FINANCIAL AND TECHNICAL RESOURCES

Guyana will not be in a position to fund the Action Plan out of the finances available locally to the government. It will be necessary for regional and international assistance to be provided to Guyana by the Multilateral Agencies and by the Developed Country Parties. The use of ODA for funding of the Action Plan should not be encouraged unless it is seen as also addressing the programmes under the National Development Strategy.

Technical and technological assistance are most important for implementing adaptation and mitigation measures. It is clear that the developed country parties will have to demonstrate the will to comply with their commitments under the Convention by effecting the provision of assistance in a timely manner so that the effects of climate change do not result in under-development. The Climate Technology Institute (CTI) can play a major role in technology transfer for Guyana.

2.2 HUMAN RESOURCES AND INSTITUTIONAL CAPACITY BUILDING

Guyana 's ability, to respond to the impacts of climate change and to take mitigation actions, is weak. The country will require substantial assistance to provide for the relevant training and capacity to carry out the programmes. The coordinating agency and the sector agencies along with the stakeholders in the energy and industry sectors, the regional implementing agencies and the local communities will all require assistance.

2.3 CONSOLIDATION OF THE POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

As indicated earlier, it is expected that the Action Plan will be looked at as a supplement to the National Development Strategy (NDS). The NDS will require policy, legal and administrative settings within which the NDS programmes will be implemented. These settings should address climate change.

2.4 RESPONSE MEASURES FOR ADAPTATION TO CLIMATE CHANGE

Given that the capacity is there to deliver on the measures for adaptation, it will be necessary for government to coordinate the actions that will be crucial for lessening the impacts of climate change. *The adaptation programme is seen as the priority programme for our country that has a very vulnerable coast.*

2.5 EDUCATION, TRAINING AND PUBLIC AWARENESS

This is a very relevant programme; as all levels of the society would need to understand the application of the strategies to deal with the impacts of climate change. How these shall be implemented and what benefits will be delivered to the respective communities and country generally. It is expected that this programme will reach out to local communities, the planners and the school systems.

2.6 RESEARCH AND SYSTEMATIC MONITORING OF CLIMATE AND CLIMATE CHANGE

In order for Guyana to make reliable plans to respond to the impacts of climate change, it is necessary that adequate and reliable data be available to develop designs and other plans, then being able to conduct sensitivity analyses that should provide reasonable level of confidence. There is a need for the availability of the necessary resources for monitoring the climate, climate change and the signals of the impacts of climate change.

2.7 MEASURES FOR FURTHERING THE AIMS OF THE KYOTO PROTOCOL

The Clean Development Mechanism (CDM) is the mechanism under the Kyoto Protocol, which will provide opportunities for participation in projects in energy efficiency, renewable energy resources, carbon sequestration and improved farm management. Private sector agencies, generally, stand to benefit from this programme.

2.8. MEASURES FOR MITIGATION OF CLIMATE CHANGE

This programme will target mostly the energy, forestry and agriculture sectors. Actions will be geared towards the reduction of emissions of greenhouse gases by energy efficiency, improved forest and agricultural management practice *and the use of renewable energy resources*.

2.9 DEVELOPMENT AND TRANSFER OF TECHNOLOGY

There are technologies, which can be of considerable benefit to Guyana in its efforts to address climate change adaptation and mitigation. There are also endogenous technologies, which require capital and expertise for development. This programme will seek to enhance the local capacity to identify technologies that are expected to benefit Guyana. It will also seek to effect the transfer of suitable technologies to address climate change impacts. The Institute of Applied Science and Technology will be the focal point for technology transfer.

CHAPTER 3: MOBILIZATION OF FINANCIAL AND TECHNICAL RESOURCES

3.0 INTRODUCTION:

This is a critical programme of the Action Plan and will be given the highest priority in the early stages of this phase. The current state of Guyana's human and financial resources require significant additional financial and technical resources in order to develop the capacity necessary to address the country's commitments under the Convention.

3.1 ACTIVITY 1: Ensure short and long term financing and sustainability of the Action Plan:

Senior expert (Fund Raising Specialist) positions should be available in the Climate Change Coordinating Mechanism with responsibility for identifying and obtaining financial and technical support for all projects under the Plan. This responsibility includes mobilization of resources from regional and international donors and other communities, whether public or private. The assignments should also include mobilization of resources from national sources - public, private and the administrative regions.

ACTIVITY 2: Develop a spectrum of project proposals for all activities of the Action Plan:

The Action Plan itemizes several activities for which resources will be required. The Fund Raising Specialist(s) will develop these proposals and use them to mobilize resources for their implementation. The priority proposals shall be for capacity building and adaptation (including addressing coastal vulnerability).

ACTIVITY 3: Work with regional organizations to develop regional projects for addressing climate change:

The Caribbean: Planning for Adaptation to Climate Change (CPACC) is moving towards the implementation stage and the Government would be required to support this evolution. Other projects proposed for SIDS and AOSIS countries will also be beneficial to Guyana and the Government should play a strong role in the formulation of these projects.

ACTIVITY 4: Work with regional and international NGOs to develop climate change projects for Guyana:

It is necessary to maintain continuous interactions with the several international NGOs that can assist Guyana to undertake climate change projects by providing skills and assistance in raising funds. The TERI and CTI are two such NGOs.

CHAPTER 4: HUMAN RESOURCES AND INSTITUTIONAL CAPACITY BUILDING

4.0 INTRODUCTION:

This chapter addresses the need for resources to execute the various activities that are in this Plan. Primarily, the need is for capacity development to satisfy the new and additional activities in the area of climate change.

4.1 ACTIVITY 1: Creation of a Climate Change Division (CCD) within the Government Structure.

Justification

- The Initial National Communication has identified several activities involving many agencies, which will require efficient coordination and guidance. A central agency will satisfy this need.
- The CCD will coordinate activities under the UNFCCC, UNCCD, VC and its MP thereby having one agency dealing with all conventions and protocols related to the atmospheric environment.

Objectives

- Collect and disseminate, through the sector agencies data on inventories of greenhouse gases, droughts, floods, ozone-depleting substances, etc.
- Advise Government on climate change and ozone depletion, etc. related to the conventions and protocols.
- Play a pivotal role in the implementation of the Kyoto Protocol in Guyana.
- Seek funds and projects for sector agencies in order for Guyana to honour its commitments and to allow for adequate responses to impacts of climate change.
- Facilitate research by tertiary institutions into climate change, ozone depletion and desertification.
- Ensure that an effective public awareness programme is carried out.
- Be the locus for linking with other sustainable development initiatives in Guyana and with external projects, programmes and institutions.

Functions

- To recommend policies for adaptation and mitigation as well as the necessary continuous monitoring of climate change,
- To develop administrative and legal requirements for coordinated responses to the impacts and opportunities arising from climate change.
- To advise government on strategies, plans, and programmes for complying with commitments under the Conventions and Protocols,

- To advise the government on priorities for climate change monitoring, research, special investigations, public awareness, technology transfer, and on response mechanisms,

Governance

The National Climate Committee will direct the policies and operations of the CC division and shall recommend policies to government.

Organization

There will be an Executive Project Coordinator, a Fund-Raising Specialist, a Senior Climate Change Officer, Information and Public Awareness Officer working along with technical officers who shall address national inventories, national communications, data for ODS, etc., along with support staff.

ACTIVITY 2: Establishment of a Climate Change Information Centre (CCIC).

There are several local agencies that are involved in climate change activities. Information relevant to these agencies includes: climate change negotiations, scientific findings, available databases, projects and local activities. However, ready information cannot be easily obtained.

This proposal is for the establishment of a Climate Change Information Centre to be located in the Climate Change Division. It will require the following:

- **Staffing:** a qualified librarian, library assistant, secretary and office assistant.
- **Equipment:** catalogue database, with linkages to agencies which contribute information and publications.
- **Linkages** to regional and international climate change information centres.

ACTIVITY 3: Institutional Strengthening of the Central Housing and Planning Authority.

Internal Actions

Summary

The agenda of the CH & PA has expanded dramatically without the needed resources or operating structure. The Ministry has implemented significant improvements in staffing and procedures but a lot more needs to be done so as to cope with the expectations. One of these expectations is the need for capacity building to effectively deal with issues arising from climate change adaptation in Guyana. Some matters of interest are:

- Staff training in Operating Systems
- Technological Training in GIS, MIS and Project Planning
- The employment of a full time engineer to address the development of Community Planning and to advise and monitor the development of self-help Community Development strategies.

- Full time employment of a Legal Specialist to facilitate expert advise on Real Estate Laws.

- Physical Planners: Necessary funding is needed for implementation of the fore-mentioned capacity. These employees should be remunerated on contractual basis because of the low wages that are offered in the traditional Public Service.

External Actions:

A policy on adequate working relationships with the private sector and housing developers needs to be addressed. A Consultant may be required to guide the development of the policy.

Even though internal actions may address some of the administrative problems, well-defined working relationships are necessary for the implementation of adaptation and protection measures that will be needed if there is a sea level rise.

PLANNING

Administrative work in human settlements is not only the allocation of house lots but is a process which encompasses the building of communities, including infrastructure, waste disposal, health care, etc.

Although physical plans in the design of communities allow for basic facilities such as hospitals and recreational facilities, these plans are not always implemented. Mainly, housing facilities are the priority because of the need.

There is need for the implementation of Settlement Planning where sites are selected that are suitable for future development and clearly defined community development standards are set.

There should be code enforcement –that is, the uniform building standards must be applied to individual structure in specific areas. This can be facilitated by policy reform and implementation.

. Planning is integral to the mitigation of disasters for it can impact on the infrastructure required for drainage of land if flooding is to occur.

POLICY / REGULATION

- There is great need for updating of policy and regulation documents because this agency is forced to operate within a policy and legal framework. This framework has been unchanged from colonial period and is profoundly unsuitable to the adaptation strategies.

- A legal team should be put together to amend/modify the existing Acts/Laws taking on board the recommendations outlined in the NDS and Initial National Communications.

INTER-AGENCY RELATIONS / IN-AGENCY RELATIONS

Settlements in Guyana should be approached holistically; key personnel in the various agencies involved should have consultations to examine prospective settlement areas and develop schedules to promote well-developed schemes. Inter-function co-ordination should be encouraged to take into account all possibilities of adaptation implementation.

In an effort to facilitate these actions, there is need for Administrative and Legislative policies. The Mission of this Ministry is to formulate policies in the Human Settlements and Water Sectors and to monitor the implementation of plans, programmes and projects designed to satisfy the Housing and Water needs of the population.

A Needs Analysis:

1. Extensive training for key personnel focusing on the functions within agencies.

2. Orientation for incoming staff in all agencies.

- Ministry of Housing & Water
- Central Housing & Planning Authority
- Guyana Water Authority
- Georgetown Sewerage & Water Commissioners
- Contractors - Successful Tenders for Projects
- Lands & Survey
- Deeds Registry
- Property Tax Agencies

PUBLIC AWARENESS

Prior to 1998, the public saw acquisition of house lots as any location vacant. A process to regularise the many settlements is on going.

There are a number of important public awareness activities that are also timely and should be implemented along with recommendations outlined in the NDS. It is necessary that potential settlers be advised about those areas that are likely to be Vulnerable to Climate Change and possible Sea Level Rise. It would be necessary that planners include in the drainage design the expected high intensity rainfall and expected longer dry periods.

This will impact on the decision making of prospective coastal dwellers to seek and encourage the development of inland and interior settlements.

RESEARCH AND DOCUMENTATION

There is a common problem among most entities in Guyana where there is a lack of data and the unavailability of funds for research in areas that would affect the Housing Sector.

The provision of funds so that research can be done and the establishment of units in the Housing Sector to look at these issues will be required. Three important units are:

A Research Department
A Documentation Centre
A Housing Sector Library

These shall help to make better decisions based on the outcome of research on the effects of climate change and documentation of precedents in and out of Guyana.

Research is needed to know the extent of available land and the potential for such locations adapting to the expected climate scenario. Deeds of Gifts can be assigned so that more inland lots will be available for allocation.

ACTIVITY 4: Capacity Building of coastal regions to deal with impacts of Climate Change.

It is expected that coastal regions will be most affected by the effects of global warming and sea level rise. Some of these effects are:

- Acceleration of erosion and inundation

- Increased risks of flooding in estuarine areas
- Deterioration of coastal defence structures
- Salt water intrusion, and
- Health effects

In order to cope with climate change, the regional administrations and local communities must also be prepared to:

- Identify signals of the impacts
- Communicate in real time
- Develop plans of response actions, and
- Take actions to alleviate hardships

This is a capacity building activity that will provide the regions with the skills, training, equipment (including communication equipment), financial and human resources to routinely monitor potentially vulnerable sectors, to plan response measures (including civil defence) and to take actions in cases of severe impacts.

The training component will require competent persons to run courses at the University of Guyana, NARI etc. to satisfy the capacity needs outlined above.

ACTIVITY 5: Improving the Capacity of the University of Guyana to teach and research Climate Change.

The University of Guyana has an Environmental Studies Unit, which addresses teaching programmes in biodiversity but does not substantially address climate change. There is also no research in climate change issues.

There exists a need for this institution to have the training and equipment in order to address the introduction of climate change issues into the teaching and research programmes. The research capability must include studies into the science of climate change, vulnerability and response mechanisms, carbon sequestration, energy efficiency, etc.

A programme of activities should therefore be established to introduce research and teaching on climate change into the University's activities. This programme should include

- Mechanisms for exchange programmes and partnerships with developed country institutions,
- Support for the Regional Climate Centre and the programmes of the CPACC and MACC,
- National Modelling of climate and its impacts,
- Archiving and management efforts for research applications,

- Introduce training and manpower development through a scholarship programme.

ACTIVITY 6: Capacity Building in the Government Information Service.

In responding to the impacts of climate change, the government will have to implement programmes, which may affect sections of the Guyanese population. It will be necessary for the support of these sections to be obtained and this will require a public awareness programme to create public understanding of climate change and the consequences of the impacts of the adverse effects. However, policy makers (public and private) will also have to be sensitised to the vulnerabilities and the necessary responses. The objective of this activity will therefore be to encourage public participation in the climate change debate and to promote involvement of all stakeholders in the development of response measures.

It is expected that the programme will include:

- Training of officers in the Government Information Service to make use of national, regional and international organizations in executing an effective public awareness programme in Guyana,

- Provision of computer and communication equipment to enable the Government Information Service and the climate change agencies to develop documentaries and for networking with national, regional and international agencies,

- Regular interviews on radio and television with climate change experts and local agencies such as coastal administrations,

- Regular radio and television clips on climate change and related issues of interest to Guyanese,

- Out-reach programmes to coastal and hinterland communities to sensitise the local populations on the problems, how to detect signals, and how the government will deal with the problems.

CHAPTER 5: CONSOLIDATION OF THE POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK

5.0 INTRODUCTION:

The policy framework on Climate Change is not in place at the national nor at the sectoral levels. The National Development Strategy (NDS) should be supplemented with related policies regarding implementation of the Convention in Guyana. The policy and legal foundations should provide guidance on the administrative framework, which will emerge.

5.1 POLICY:

PROGRAMME AREA:

PROJECT:

Formulating a national legislative policy on climate change.

Objective:

To create the legislative environment to ensure that climate programmes are directed from

- Specific economic and technological opportunities and restrictions,
- Ideas on governance in relation to environmental policy as well as relationships between the State, the market and civil society
- Macro-socio economic policies such as the NDS

Justification:

Guyana's EPA ACT does not detail adequately, policy with regards to global warming and anthropogenic climate change. Particularly, it needs to include adequate policy direction for the commitments that Guyana must address under the UNFCCC and the direct beneficial actions under the Kyoto Protocol.

The National Environmental Action Plan (NEAP) is also very short on policy direction with regards climate change, vulnerabilities and responses to the adverse effects of climate change and how to deal with opportunities, which will arise from the negotiation process.

Also, there is no policy direction for treating with conflicts arising from implementation of the various Conventions and Protocol relating to the environment in general and the atmosphere in particular. These shortcomings must be addressed through legislation in order to promote coordinated and effective implementation of climate change programmes.

Summary

The project will require a consulting firm to review, rationalize and recommend legislative amendments to environment policy documents already in place or, if it is justified, a policy document on climate change with directions on dealing with ambiguities, overlaps and other weaknesses in current policy. The legislation will also address local government and climate policy.

Scope: National

Timing/Duration

One (1) year

Local Parties

EPA, HYDROMET, OTHER SECTOR AGENCIES

BUDGET	*US$*
Consulting Agency	80,000.00
Local Travel	10,000.00
Consultations	10,000.00
Miscellaneous	10,000.00
Contingency	11,000.00
TOTAL	**121,000.00**

Performance Indicators

1. Recruitment of Consulting Agency
2. Stakeholders participation
3. Legislative drafts

Means Of Verification

1. Consultant's report
2. Legislation produced

Risks and Assumptions

Government's commitment to the process through assignment of responsibilities to agencies.

5.2 CLIMATE CHANGE MONITORING AND RESEARCH

The objective here will be to provide the legal framework for the Hydrometeorological Service to take the lead role in monitoring changes in climate and directing research into sectoral impacts of the consequences of climate change. This department of the Ministry of Agriculture requires to be directed by way of legislative policy and legality since it is tasked with execution of governmental programmes, which can influence the socio-economic development of Guyana.
The project will see the contracting of a suitable consultancy, preferably through the World Meteorological Organization, to map out a strategy for the future of the department and draft corresponding legislation to support the strategy.

CHAPTER 6: RESPONSE MEASURES FOR ADAPTATION TO CLIMATE CHANGE

6.0 INTRODUCTION

For Guyana, adaptation and responses to vulnerabilities will have to take priority due to the economic value of its low-lying coastal zone that is expected to be affected by sea level rise and other consequences of global warning.

6.1 COASTAL ZONE

Sea level rise, one of the expected spin off of global warming is expected to have far reaching consequences on Guyana's coast. This is because of the diverse coastal assets found in this region. These include the major towns, 90% of the population and human settlements, infrastructure, agriculture (one of the major contributor to GDP), mangrove ecosystems, roads and communication networks.

This are is extremely sensitive to climate change because, in the event of a likely sea level rise, inundation and flooding, erosion, saline intrusion into surface and ground water sources would affect the coast.

Adaptation Options

- Fortification of sea and river defences in accordance with Sea Level Rise (SLR) in vulnerable areas
- Use of building set-backs
- Limit buildings and other major developmental work on the coast
- Carry out surveys to identify most vulnerable areas along the coast and determine adaptation strategy
- Encourage gradual retreat to higher grounds - by making land available in the interior areas cheaply, in an effort to decentralize the coast
- In view of climate change, studies must be conducted beforehand in the interior, so as to promote housing schemes and suitable industries in the interior regions most likely to have less annual rainfall but conducive temperature (leaving potential areas that will have high annual rainfall and soil fertility so as to promote agriculture, in the medium to long term), areas likely to have a reduction of biomass as a result of changes in vegetation type i.e. forest areas changing to shrub savannah (leaving potential areas that will have high biomass density as a medium for carbon storage and continued benefits from sustainable logging). The Impact and Vulnerability Assessment already done can be used as a starting tool for identification of areas, but much detailed studies is needed especially on the shift in vegetation types.

Adaptation Response Strategies

Given the low priority assigned to climate change, it may be easier to integrate adaptation options into current programmes as follows:

- Economic development policies
- Disaster mitigation and management plan (should be developed, does not exist)
- Strategy for ICZM
- Environmental Impact Assessment Process
- Strategy for Environmental Education and Public Awareness

6.1.1. AGRICULTURE AND FISHERIES

Climate change and variability would very likely bring about more extreme weather conditions ranging from excessive high intensity rainfall and flooding to protracted droughts, both of which would have damaging effects on Guyanese agriculture.

Adaptation Options and Response Strategies

- Carry our survey to identify areas where losses can be tolerated, spread or shared.
- Promote changing use or activity in most vulnerable areas, if necessary.
- Substitution of crops - carry out research to identify suitable crops that will withstand the effects of climate change such as increased temperature, salinity, flooding etc, especially on the coast.
- Carry out research to identify suitable inland and interior areas for promotion of large-scale agriculture in the medium to long term due to the seriousness of the impacts of sea-level rise on the coast. Emphasis must be placed on the impacts of climate change in the interior locations as well (rainfall changes, soil fertility etc), as described in the Impacts and Vulnerability chapter in the Initial National Communication as a criteria for the identification of areas for agriculture.
- Improvements in farm level management and productivity.
- Pest control for crops.
- Crops grown on the coastal region to be examined for cultivation in regions away from this impact zone.

6.1.2 WATER RESOURCES

The projected rise in temperature (1-4 ^{o}C) and sea-level in Guyana as a consequence of global warming will reduce the availability and quality of water resources for industrial, residential and agricultural use.

Adaptation Options and Response Strategies

- Water conservation measures, including metering, the use of time-runs where the water supply may be staggered according to regions or sectors in the domestic/industrial sector.
- Continue cautiously, the development of new artesian wells in the interior regions for anticipated population migration from the coast.
- Introduce efficiency control and management practice for water reservoirs network, especially that for agriculture use.
- Introduce scientific monitoring and management of irrigation and drainage systems.

6.1.3 ENERGY

Adaptation Options and Response Strategies

- Energy conservation techniques practical in buildings (commercial/residential/public buildings) such as reducing lighting in and around buildings when not in use or when it serves no purpose.

- Purchasing fuel-efficient machines/equipment/vehicle and efficient maintenance of it.

- Setting up and implementing a more efficient transportation plan.

- Continue to set up micro-systems and mini-scales hydropower station in the interior locations in selected areas to be developed, and the possibility of wind and solar power.

- Continue to promote co-generation of energy from using biomass resources (rice husk, bagasse, sawmill waste, slash waste in forest etc) in the sugar, rice and forestry industry.

6.1.4 FORESTRY AND LAND USE

Climate change and sea level rise would also supposedly affect the forestry sector of Guyana. This is one of Guyana's key economic sectors and adaptation policies aimed at its sustainability will have to be implemented.

Adaptation Options and Response Strategies

- In the short term, adaptation measures may have to be focused on a redefined forest management plan, addressing such concerns as a forest fire protection plan and stricter control of logging practices, under the supposedly drier climate.

- In the case of land use, in the short term, cleared forest (from mining/forestry activities) and parts of savannah regions to be utilised for housing schemes instead of clearing more forest for this purpose in response to migration from the coast as a result of sea level rise.

- Using the Impact and Vulnerability Assessment as a starting tool, carry out detailed studies, using different models for temperature projections and vegetation shifts, in the interior region to reveal:
    - soil fertility
    - areas likely to be impacted from severe reduction in annual rainfall and the area/areas likely to receive less annual rainfall overall
    - areas likely to be affected by high temperature increases, and the area/areas likely to receive overall high temperatures
    - areas likely to be significantly affected by a reduction in biomass (shift in vegetation type)

Based on these studies, choices will be made for developmental work in the best region/area, in the medium to long term, in the field of agriculture, housing/industry in the interior region.

6.1.5 WASTE

Insofar as the waste sector is concerned, climate change may exacerbate the very poor condition of waste management in Guyana. Currently there are a number of unmanaged dumpsites that, apart from being aesthetic eyesores, pose severe health problems, especially in the urban areas. This condition can only get worse under a hotter and more humid climate.

In the short term then, adaptation measures should focus on improved waste disposal management plans, including the creation of more managed waste sites, especially in urban areas, and the implementation of waste reduction measures, namely reducing consumption and recycling and reusing products.

6.2 STUDY INTO THE IMPACTS OF SEA LEVEL RISE ON PORTS AND STELLINGS IN GUYANA.

Port Georgetown is vital to Guyana's commerce. Stellings in the mouths of large rives play a significant role in transportation and in regional commerce. They can be put at risk by sea level rise.

A Study should be conducted into the impacts of Sea Level Rise on Port Georgetown, other potential port locations and on the major piers in Guyana in order to assess the implications of higher sea levels on these structures and on the vessels, which make use of them.

The Study should consider whether protection of the ports and piers will be required and the technologies available for use in the protection measure. It should also examine the possibility of funding for the protection programme.

6.3 ASSESSMENT OF THE IMPACTS OF SEA LEVEL RISE AND GLOBAL WARMING ON COASTAL ACTIVITIES.

Since the coast is vulnerable to sea level rise and global warning, it is necessary that an assessment of their impacts be done on

- Agriculture land
- Coastal aquifers
- Coastal flooding
- Fish stacks
- Nursery and aqua-culture sites
- Migratory fish species
- Drainage and irrigation

The assessment should identify vulnerabilities and provide recommendations on measures (including technology transfer), which should be implemented to address the impacts of sea level rise and global warming.

6.4 ASSESSMENT OF SEDIMENT LOSSES ON THE COAST OF GUYANA AND IDENTIFICATION OF ACTIONS TO LAND EROSION.

A research programme should be initiated to identify coastal areas suffering from sediment losses and to find out the rate of erosion in order to develop a phased programme of activities to stop or supplement the loss of sediment from the foreshore of critical areas.

Proposals, for the design and building of new structures to accommodate sea level rises projected by the IPCC with consideration of sea defence technologies which are tested and available, must be a major part of this assessment.

PROJECT NO 1:

Create and maintain activity database for all sectors of the GHG Inventory.

Objectives

1. To ensure that country-specific activity data for future GHG Inventory is available for all sectors and sub-sectors and to create and maintain activity databases in this area.

2. To transfer knowledge and skills to local institutions/personnel to gather and store activity data for GHG Inventory.

3. To further enlighten and strengthen the few government institutions that are already knowledgeable on a few aspects of activity data gathering for GHG Inventory and to foster collaboration among public and private institutions/agencies on this issue.

Justification

In light of the absence of country specify activity data, in some areas of the various sectors of the GHG inventory, as pointed out in the recent inventory conducted for Guyana, it is of utmost importance to create and maintain a database on a permanent basis for future GHG Inventory. It is also because uncertainties increase in the GHG Inventory when country-specific data is lacking and data has to be source from international databases or when estimates has to be derived and used.

Summary

The project will further enlighten and strengthen local institutions in GHG Inventory and help to foster collaboration among institutions that will be directly or indirectly involved in meeting the objectives as set out above.

Training should be direct to collection of data particularly to the Energy sector) Bottom-up/Sectoral approach activity data collection); and Land Use Change and forestry sector (e.g.) production, usage and reading of satellite images to detect and estimate land use changes/forest conversion area etc.).

This project should create/assigned a government institution to collaborate with all respective Government institutions and private organizations/agencies that collect and store climate change related data (such as the GEA, Hydromet, Ministry of Agriculture, Bureau of Statistics etc) and build and maintain a database for quick reference.

Note

The Statistics Bureau could be utilized to collect and store activity data for some sectors of the GHG inventory (with an improved service). For example, this agency is already collecting data on production of alcoholic beverages and food items to be used under the Industrial Processes sector. Additional data , such as bread production, consumption of asphalt for road paving, and to specifically separating the production of items individually (beer, stout, red wine, white wine etc.) could be recommended for improved data collection and presentation by this agency.

PROJECT NO 2:

Develop local emission factors for use in future Greenhouse Gas (GHG) Inventory.

Objectives

1. To reduce uncertainties in the estimation of GHG emissions in the GHG Inventory.

2. To encourage local participants in the field of Climate Change and to build and transfer technical knowledge to local personnel/institutions to develop local/country-specific emission factors in all sectors of the GHG Inventory.

Justification

The GHG inventory recently conducted under the Initial National Communication of Guyana pointed to the absence of country-specific emission factors. This resulted in the use of the IPCC default emission factors, which has somewhat increase the uncertainty level of the inventory. Since a good quality GHG Inventory is dependent of local/country-specific emission factors, great emphasis should be placed in developing emission factors that reflects local conditions.

Summary

The National GHG Inventory conducted to prepare the Initial National Communication of Guyana to the UNFCCC have indicated a lack of local emission factors which have further contributed to the already existing uncertainties in the estimation of GHG emissions in GHG Inventories. As such, this project will aim specifically to the stated objectives above.

Efforts should be taken to develop emission factors for all sectors of the GHG Inventory, that is, the Energy, Industrial Processes, Agriculture, Land Use Change and Forestry, and the Waste Sectors.

It is recommended that emission factors that will not differ regionally, as in the case of the Land Use Change and Forestry and to some extent the Energy sectors, these can be done in collaboration with countries that has similar activities/circumstances so as to reduce cost and to create emission factors that can be used **regionally**. (Special reference can be made to the IPCC Technical Paper on "Land Use Change and Forestry and Energy Sectors").

Activities

1. Mobilize and acquire funding for project.

2. Select personnel from Government Institutions, two each to represent the five sectors of the GHG Inventory, (personnel from the Government Institutions already identified to represent the various sectors of the GHG Inventory) for short training overseas in the field of EMISSION FACTOR DEVELOPMENT. This will be done after collating with the relevant overseas institution(s) that provide such training.

3. Identify specific areas of training.

4. Create and fill a position of Project Manager prior to completion of training of local personnel overseas.

5. Identify specific/priority areas of the GHG Inventory's sectors that need to develop local emission factors or possibly include all areas.

6. Plan and execute work Programme

7. Store and compile data

8. Compile and submit report on completion of project

Timing/Duration

Start immediately after acquisition of funding.
Duration: 2 years (adjustable and depending upon identified areas of research)

Local Parties

- GEA
- GFC
- HYDROMET
- MINISTRY OF AGRCULTURE
- EPA
- IAST
- UG
- IWOKRAMA
- TROPENBOS

BUDGET *US$*

1. Project Coordinator (Government)
2. Project Manager (International Expert in the field)
3. Trained Technicians/resource personnel
4. Equipment
5. Computer
6. Training
7. Travel
8. Research Cost
9. Miscellaneous

Performance indicators and means of verification

- Round-Table assessment
- Half-yearly review

Risk and Assumptions

- Funding
- Availability of dedicated, local personnel to be involved

CHAPTER 7: EDUCATION, TRAINING AND PUBLIC AWARENESS

7.0 INTRODUCTION

Forward planning and preparedness are the keys to having a successful Action Plan. This will require the involvement of all stakeholders. The programme will be an initiative to facilitate:

- capacity building
- achieving objectives
- implementation of mitigation measures
- monitoring and evaluation

The target groups for this programme will involve the stakeholders from various sectors, those being:

- Energy
- Industry
- Agriculture
- Waste management
- Forestry and land use
- Fisheries
- Human settlement
- Human health
- Water resources
- Tourism
- Others - NGOs, consumers, all levels of learning, press and the public.

7.1 THE PROGRAMME

7.1.1 MEDIA COMPONENTS:

The programme will utilize all media available, these being:

- Electronic media (radio, television, and internet)
- Print media (newspaper, and news letter)
- Presentations and Lectures

The following is an insight of potential media for the accomplishment of the objectives of the Action Plan:

♦ **Electronic Media**

- Five- minute radio talks to be broadcast at least twice per week
- Utilization of View Point which has been broadcasted for almost twenty-six (26) years
- Live call-in programmes and panel discussions
- Press Conferences and briefings on the latest developments
- Press Releases
- Establish an electronic mail address and website for the main purpose of dissemination of information

♦ **Print Media**

- Press Releases
- Contributing to the " Letters to the Editor Column " of the various newspapers so as to stimulate debates on various climate change issues.
- Contributing articles
- A climate change corner printed at least twice per week
- Stimulate the various Editors to make climate change a national priority issue

♦ **Presentations and Lectures**

Establish a schedule to advocate to all stakeholders the importance of work being done via public media relating to all workshops and seminars.

7.1.2 EDUCATION AND PUBLIC AWARENESS

For environmental conservation to succeed, the public must understand their role and they must be given the relevant skills so that they can effectively participate. In fact, it was agreed at United Nations Conference on Environment and

Development that education is critical to promoting sustainable development and for improving the capacity of the population to address and deal with environment and development issues (UNCED, 1992).

In Guyana, it has been acknowledged that environmental awareness of the Guyanese public is low, and hence fosters environmental degradation. Although there are environmental awareness programmes offered by a number of institutions, this is not done in a coordinated form (National Environmental Education and Public Awareness Strategy, 1999).

The Environmental Protection Act of 1996 gives the Environmental Protection Agency of Guyana (EPA) an environmental awareness mandate. As such, in 1999, after a period of consultations, the EPA drafted a National Environmental Education and Public Awareness Strategy (NEEPAS). The goal of the strategy is to enhance the public consciousness with respect to the environment, and to encourage behavioural changes conducive to environmental management and protection. (NEEPAS, 1999).

Hence, for the adaptation and mitigation measures with respect to climate change to be effectively implemented in Guyana, education and public awareness must play a critical role. This education and public awareness must be aimed at the different target groups in all of the relevant sectors, as well as the general public. For instance, owners, managers and technicians of power generation equipment, must be aware of the climate change and its implications in order to understand the need for regular and timely maintenance; the policy/decision makers must also be aware of climate change and its implications for them to implement any energy conservation plans, such as car pooling, reduction of importation of cars of a certain age; the general public has to understand the need for the energy conservation plans in order to fully implement and comply with them.

The relevant sectors to be targeted are those, which have to implement mitigation measures, and those, which have to adapt to climate change. These are:

- Energy
- Industry
- Agriculture
- Waste
- Forestry
- Fisheries
- Human Settlements

- Human Health
- Water Resources
- Tourism
- Infra structure

Hence, for each sector, education and public awareness have to be interwoven with the adaptation and mitigation measures.

Training

This is essential to the understanding of climate change and its implications on Guyana, as well as in the successful implementation of the adaptation and mitigation measures in Guyana. Specific areas that require capacity building are:

- Monitoring of climate change and its implications, negative inputs, e.g. erosion, health changes, forest loss, agriculture, human settlement, water resources, conversion of land uses etc. as for predictions for regions as Guyana.
- As for predictions for Guyana, use and interpretation of predictive computer models for climate change.
- Assessment of the vulnerability of various resources to climate change.
- Use of GIS
- Use and maintenance of alternative sources of energy, such as solar power.
- Cultivation and harvesting practices in the use of hybrids of crops able to withstand the predicted climate changes.
- Construction and management of managed sanitary landfills and the recovery of CH_4 gas for energy purposes.
- IPCC methodology for calculations and estimations of greenhouse gas emissions.

7.1.3 STRATEGY FOR IMPLEMENTING EDUCATION, TRAINING AND PUBLIC AWARENESS

Implementation of this strategy for education, training and public awareness will seek:

- To enhance the public's awareness of climate change and its associated implications for Guyana

- To encourage active participation in mitigation and adaptation measures

- To encourage integration of climate change issues into future developmental projects/actions/decisions

- To strengthen the capacity of agencies to monitor climate change and its impacts.

The NEEPAS (1999) identifies the target groups and the major environmental issues to be addressed; the aims and activities associated with providing environmental education and public awareness for the various groups; and the time frames for implementation of the strategy.

The major target groups to be addressed by the NEEPAS (1999) are:

- Children and youth

- Teachers and Teacher's Unions

- Policy and Decision makers

- Elderly and the Disabled

- Consumers

- Private Sector

- Resource Users

- Media

- General Public

- Scientific and Academic Community

Although climate change is not clearly identified as one of the major environmental issues to be addressed by the NEEPAS, it is likely to be partially addressed since it is related to all of the other environmental issues identified (in the NEEPAS). In addition, the target group for the Climate Change would be the same as indicated for the NEEPAS. Hence, in order to reduce duplication, to promote coordination and to effectively utilise the human resources, the EPA should include climate change as one of the major environmental issues to be

addressed by the NEEPAS. However, there are a number of aspects to include:

- Climate change issues should be included when undertaking the curriculum audit at the primary and secondary school levels
- Climate change components must be available to all the degree programmes on the University of Guyana campus.
- Fishermen should be included under the farmers/miners/loggers target group
- Tradesmen/ technicians should be included as a target group
- Under the scientific and academic community, the health community must be included. In addition, another aim should be to encourage them to undertake research in order to better understand climate change and its implications
- Target groups in the relevant sectors mentioned earlier, i.e. energy, industry, agriculture, etc., should be subjected to education and public awareness, as well as involved in facilitating education and public awareness programmes with respect to climate change
- NCC members should be involved in facilitating education and public awareness programmes with respect to climate change

Upon infusion of climate change into the NEEPAS, as indicated in the latter, climate change will be addressed by use of:

- the school system, both formal and non-formal
- in- and pre-service professional and occupational training
- community and non-formal education
- the mass media
- workshops, conferences and round table discussions

Upon the establishment of the Climate Change Unit, the latter should be installed as a member of the National Environmental Education Advisory Committee. In addition, the Climate Change Unit should be facilitators in education and public awareness programmes for the various target groups. Coordination of the climate change education and public awareness programmes will be the task of the EPA.

TRAINING:

It may be considered ideal to use the `train-the-trainers' approach in order to propagate the knowledge and skills (obtained from the training) in Guyana. Workshops, with the inclusion of practical or `hands on' sessions, are an effective method for providing the training required.

The Climate Change Unit should be primarily exposed to the training identified earlier, specifically the first five (5) areas. With regards to the last three (3) areas, the various agencies with the relevant sectors should receive the training.

PROJECT NO. 1

Incorporation studies on climate and climate change, and the general environment into the curricula of schools

Objective

The objective of this project is to ensure that pupils/students of all schools received formal education on climate and climate change, and other environmental links.

Justification

With the global issue of pollution to the environment as a consequence of human activities which is causing climate change and the resulting sea level rise, it is very important to educate the population at large, especially the youths since this seems to be a very strange and new issue/topic to all Guyanese. In addition, Guyana has a low-lying coastal zone that is very vulnerable to climate and measures to adapt to these changes will be costly. In such case, educating the younger generations to this problem is crucial to the future. It may also assist to educate and transfer techniques in mitigating GHG emissions in many areas such as energy/fuel efficiency.

Scope

This project is conceived as one that is national in scope, involving the entire formal education system.

Summary

A survey of curricula will be undertaken to determine the extent to which climate and other environmental issues are addressed. It is absolutely clear that the topic of climate change is not being dealt with at the moment in the formal education system.

Recommendations will be made to incorporate climate and climate change teaching materials into already existing geography and other science programmes.

Proposed learning objectives are outlined below:

- Understand and illustrate the layers of the earth's atmosphere.
- Be familiar with and explain in simple terms the 'GHG concept' of the earth's atmosphere.
- Investigate and discuss how air pollution is threatening the normal functioning of the earth's 'greenhouse effect', and discuss possible consequences.
- Investigate and discuss the types and sources of air pollution, their root causes and their effects on the environment.
- Suggest ways in which individuals and governments can decrease human interference with the 'greenhouse effect'.
- Investigate and discuss global sources of pollution.
- Propose solutions to air pollution problems.
- Understand and appreciate the role of the 'greenhouse effect' in maintaining the temperature of the earth's atmosphere at a level suitable for life.
- Understand and appreciate the role of the earth's ozone layer.
- Explain how the ozone layer is being threatened by human activities and discuss the possible consequences.
- Propose ways in which individuals and governments can protect the ozone layer.
- Demonstrate concern for problems of air pollution and a commitment to taking action to help solve them.

Timing/Duration

It is intended that this project will be introduced from the inception of the Programme and will cover a period of one-two years.

Local Parties

Ministry of Education (MoE), National Centre for Education Research Development (NCERD), EPA, UG, Cyril Potter College of Education (CPCE)

BUDGET	*US$*
Workshops	10,000.00
Honoraria for Instructors	20,000.00
Salary for Coordinator (full-time)	20,000.00
Travelling	1000.00
Materials	1000.00
Miscellaneous	2000.00
TOTAL	**54,000.00**

Performance Indicators

1. Constitution of Task Force drawn from local Parties

2. Progress Reports on Development of curricula and syllabuses

Means Of Verification

Task Force constituted; periodic reports of Task Force submitted; progress reports on curriculum and syllabus reforms.

Risk And Assumption

1. Limited number/absence of knowledgeable personnel locally in the Science of Climate Change.

2. Materials may be lacking/limited.

3. Funding

PROJECT NO 2:

Training of teachers to teach courses on environment: topics on climate and climate change in general.

Objective

To train teachers to teach courses on environment, and environmental changes (climate change) adumbrated in project No. 1.

Justification

Implementation of the proposed project: Incorporating studies on climate and climate change, and the general environment into curricula of schools (project no. 1 above), will require teachers with specialized training in the relevant subject areas.

It is envisaged that such training will be dovetailed with the preparation of syllabuses, so that the latter can be tested and refined in the classroom, while ensuring that a complement of trained teachers will be available to take the process forward.

Scope

This project will be based at the Cyril Potter College of Education (CPCE) and involves a number of selected pilot project schools.

Summary

Syllabuses of the CPCE will be examined to identify courses, which may be upgraded or modified to provide the training requirements for implementation of project No. 1 described above. Teaching modules prepared jointly by the EPA, NCERD, and CPCE will be used as a framework for instruction of teacher trainees to prepare them to teach the courses developed earlier under Project No.1 in the schools to which the teachers are assigned after completion of their training.

Timing/Duration

Implementation of this project will be contingent on the preparation and adoption of syllabuses, a process that is estimated to take 1 year. The project should therefore start in the second year. It is expected to last a duration of 18 months.

Local Parties

Environmental Protection Agency (EPA), National Centre for Education Resource Development (NCERD), Cyril Potter College of Education (CPCE), Ministry of Education (MoE)

BUDGET	*US$*
Training Workshops	12000.00
Honoraria for Instructors	15000.00
Salary for Coordinator	10000.00
Travelling	1000.00
Materials	1000.00
Miscellaneous	2000.00

TOTAL **31000.00**

Performance Indicator

Syllabus for training of teachers on issues of the environment (climate and climate change) implemented by CPCE.

Means Of Verification

- Progress Reports on performance of teacher trainees submitted in a timely manner.
- Adjustments to syllabus based on Progress Reports.

Risk and Assumptions

- Funding

PROJECT NO. 3

Preparation of instructional material for 'climate and climate change issues' education and awareness programmes.

Objective

To ensure relevant materials are available for guidance of students, instructors, drafters of curricula and syllabuses, as well as producers of audio-visual and non-formal education aids, based on ongoing monitoring and evaluation.

Justification

Project No.1 and No.2 will require relevant materials to service the work of the projects. In addition, preparation of instructional materials will ensure availability of materials to promote and achieve the objectives above.

Summary

Under the direction of the Hydrometeorological Service and EPA, a multi-disciplinary team of experts will be retained to prepare appropriate programme inputs. The team will maintain active communication links with the EPA and the Hydrometeorological Service and other data sources, as well as with the various levels of programme implementing personnel.

Timing/Duration

This project should start at the beginning of the programme (year 1), so that material would be available to service the other projects. It is conceived as ongoing, covering the entire duration of the Action Plan.

Local Parties

Hydrometeorological Service, EPA, NCERD, CPCE, and UG

BUDGET	*US$*
Salary of Science Writer	
Salary of Illustrator	
Salary of Project Coordinator*	
Salary of Resource Person	
Travelling and subsistence	
Material	

* The Project Coordinator is expected to service all projects.

Performance Indicator

- Early constitution of multi-disciplinary team
- Production of instructional materials

Means Of Verification

- Multi-disciplinary team constituted
- Timely production of materials required to implement projects in programme

Risk/Assumptions

There are some areas of uncertainty associated with (1) assembling the multi-disciplinary team early in the project, (2) securing funding for the programme.

7.1.4 KEY ISSUES:

Some of the key issues that will be addressed are:

- Human Settlement

- Coastal Zone Management
- Energy
- Forestry and Land Use
- Agriculture and Fisheries
- Monitoring and Evaluation

♦ **Human Settlement**

- Guidelines for the acquisition of land and areas available
- Vulnerability of areas already allocated, and areas to be allocated, to climate change and sea level rise

♦ **Coastal Zone Management**

- Use of building setbacks
- Limit building on the coast and encourage gradual retreat to higher ground
- Accommodate - enforcing building codes - should be mandatory that houses on the coast be built on stilts
- Protect - construct and raise the height of seawall, etc.

♦ **Energy**

- Implement demand side management which will improve efficiency
- Technological improvements on power plant efficiency to reduce greenhouse gases emissions
- Encourage the use of alternative energy sources such as hydropower, solar, and wind
- Switch to clean air fuel such as natural gas
- Increase use of co-generation
- Standards for electrical appliances
- Vehicle standards
- Regulate and monitor the importation of used cars
- Promote the use of energy efficient vehicles

♦ **Forestry and Land Use**

- Establish reserve areas for conservation
- Rehabilitation of the forest cover and recovery site productivity
- Plan for forest fire protection

- Mapping of various forest types (Geographic Information System)

♦ **Agriculture and Fisheries**

- Identify vulnerable agriculture and fishery zones
- Identify crops, which can resist the climate associated with global warming
- Promote reduced commercial fishing in parts of the year to preserve stocks
- Promote inland and interior agriculture and fisheries

♦ **Monitoring and Evaluation**

Throughout the implementation of the programme, monitoring will be continuing exercise conducted internally by the National Climate Committee (NCC) using the following guidelines:

- Maintenance of the context of the NCC objectives
- Adherence to the implementation and training
- Interaction with stakeholders
- Initiating and managing advocacy
- Design and conduct of mass media communication initiative

Evaluation will be carried out using:

- Process evaluation
- Impact evaluation

7.1.5 PROJECT TO ADDRESS CLIMATE CHANGE AWARENESS AND EDUCATION

Developing non-formal methods of promoting education and awareness in climate change and its impacts, and possible adaptation and mitigation option for a projected sea level rise and change of climate.

Objectives

- To provide a vehicle for the rapid and effective dissemination of information on climate change and its impact, and options for adaptation/mitigation from climate change and sea level rise.

- The project is intended to complement formal programme such as in schools. It is also to ensure that the general population becomes aware of the severity of the problems that Guyana may face with projected sea level rise and change of climate so that proper decisions

individually or companies/organisations will be taken to avoid losses of lives/property from these occurrences.

Justification

Taking into considerations that climate change is a very new subject in Guyana, and there is a lack of information on this issue, it is with these circumstances in mind that the population should be informed and be prepared to take actions whatsoever.

There may be positive results entailed in the aspect of climate change, but the negative results are indicative of severe hardships/losses.

Considerations must be placed on uncertainties in prediction of climate change and sea level rise, but should not be seen as a barrier for awareness programmes since, for example, without climate change the population is steadily facing severe hardships from natural flooding or from man's influence. Actions for these should be tied in with actions for climate change and sea level rise.

Scope: National

S*ummary*

Sectoral Agencies will be informed and assisted to host workshops/seminars to discuss with the public the issue of climate change and sea level rise. Pamphlet, flyers, brochures and posters will be distributed to disseminate information.

The same process will be promoted at regional and local levels, to include administrative and other interest groups.

Some of the key issues that will be addressed are: climate change and sea level rise, its impacts and adaptation/mitigation response measures.

As to the commitment of reducing GHG emissions on the country level, encouraging population to be practically involved in some of the recommendations provided will provide information to ways of achieving this.

CHAPTER 8: RESEARCH AND SYSTEMATIC MONITORING OF CLIMATE AND CLIMATE CHANGE

8.0 INTRODUCTION

To respond effectively to climate change and its related issues in Guyana, especially in the field of greenhouse gas inventory, adaptation and mitigation measures, the following are research areas for projects to be developed and implemented to facilitate better understanding of climate change and related issues.

8.1 AREAS FOR RESEARCH AND MONITORING

8.1.1 GREENHOUSE GAS INVENTORY

Project No. 1

Develop local emission factors for use in future Greenhouse Gas (GHG) Inventory.

Objectives

- To reduce uncertainties in the estimation of GHG emissions in the GHG Inventory.
- To encourage local participants in the field of Climate Change and to build and transfer technical knowledge to local personnel/institutions to develop local/country-specific emission factors in all sectors of the GHG Inventory.

Justification

The GHG inventory recently conducted under the Initial National Communication of Guyana pointed to the absence of country-specific emission factors. This resulted in the use of the IPCC default emission factors, which has somewhat increased the uncertainty level of the inventory.

Since a good quality GHG Inventory is dependent on local/country-specific emission factors, great emphasis should be placed in developing emission factors that reflects local conditions.

Summary

The National GHG Inventory conducted to prepare the Initial National Communication of Guyana to the UNFCCC have indicated a lack of local emission factors which have further contributed to the already existing uncertainties in the estimation of GHG emissions in GHG Inventories. As such, this project will aim specifically to the stated objectives above.

Efforts should be taken to develop emission factors for all sectors or priority areas of the GHG Inventory i.e. Energy, Industrial Processes, Agriculture, Land Use Change and Forestry and the Waste Sectors.

It is recommended that emission factors that will not differ regionally, as in the case of the Land Use Change and Forestry and to some extent the Energy sectors can be done in collaboration with countries that have similar activities/circumstances so as to reduce cost and to create emission factors that can be used **regionally.** (Special reference can be made to the IPCC Technical Paper on “Land Use Change and Forestry and Energy Sectors”).

Project No. 2

Create and maintain activity databases for all sectors of the GHG Inventory.

Objectives

1. To ensure that country-specific activity data for future GHG Inventory is available for all sectors and sub-sectors and to create and maintain activity databases in this area.

2. To transfer knowledge and skills to local institutions/personnel required to gather and store activity data for GHG Inventory.

3. To further enlighten and strengthen the few government institutions that are already knowledgeable on a few aspects of activity data gathering for GHG Inventory and to foster collaboration among public and private institutions/agencies on this issue.

Justification

In light of the absence of country specific activity data, in some areas of the various sectors of the GHG Inventory, as pointed out in the recent inventory conducted for Guyana, it is of utmost importance to create and maintain a database on a permanent basis for future GHG Inventory. It is also because uncertainties increase in the GHG Inventory when country-specific data is lacking and data has to be sourced from international databases or when estimates have to be derived and used.

Summary

The project will further enlighten and strengthen local institutions in GHG Inventory and help to foster collaboration among institutions that will be directly or indirectly involved in meeting the objectives as set out above.

Training should be directed to collection of data particularly to the Energy sector (Bottom-up/Sectoral approach activity data collection); the Agriculture sector; and Land Use Change and Forestry sector (e.g. production, usage and reading of satellite images to detect and estimate land use changes/forest conversion area etc).

This project should create and or assign a government institution to collaborate with all respective Government institutions and private organizations/agencies that collect and store climate change-related data (such a the GEA, Hydrometeorological Service, Ministry of Agriculture, Bureau of Statistics etc) and build and maintain a database for quick reference.

Note:

The Statistical Bureau could be utilized to collect and store activity data for some sectors of the GHG inventory (with an improved service). For example, this agency is already collecting data on production of alcoholic beverages and food items to be used under the Industrial Processes sector. Additional data, such as bread production, consumption of asphalt for road paving, and to specifically separating the production of items individually (e.g. beer, stout, red wine, white wine etc.) could be recommended for improved data collection and presentation by this agency.

Project No.3

Develop a methodology to acquire/estimate annual data on the amount of wood products available nationally as stored carbon.

Summary

The present IPCC methodology assumes that all biomass from the forest is oxidised in the year of harvesting. Since majority of Guyana's wood from the forest may be used as building materials where the carbon is stored for as long as 100 years for some wood species, Guyana can increase its carbon sink capacity by including carbon stored in wood products in the GHG inventory calculation. However, a methodology needs to be developed to estimate and maintain on an annual basis the amount of wood products available as stored carbon in the form of building materials, on a national perspective.

In addition, the IPCC methodology software should be expanded to facilitate this input data.

This can be a response measure to mitigate GHG emissions on a short-term basis since the wood biomass would eventually degrade, releasing the stored carbon.

Project No. 4

Carry out research to investigate if Guyana's forest (undisturbed portion) is continually sequestering carbon from growth.

Summary

A recent study of tropical rain forest in Brazil indicates that undisturbed forests are continually sequestering carbon. Since Guyana has a large portion of its total forested area of 16.45 mha relatively intact and undisturbed, a study can be conducted to find out if the Brazil's case is occurring to our forest.

If this is so, our sink capacity for CO_2 can increase since undisturbed, natural forest is not included in the GHG inventory with the analogy that they are in a stable manner. Maybe this can also lead Guyana to conserve its forest to make claim for benefits under the Clean Development Mechanism (CDM).

Note

International Organizations and Technical Experts should be solicited for such projects, while local personnel could be involved for acquiring basic knowledge and techniques.

8.1.2 Adaptation

Project No. 1

Health Impacts

Monitoring the health impacts of Climate change

Summary

Climate change is likely to have various adverse impacts on human health. One direct impact is likely to be changes in the distribution and activity of insects, ticks and rodents, which are carriers of certain human diseases. While Guyana has been controlling the spread of some diseases, such as malaria, there is the need for proper documentation and monitoring, and for projections to be made on future needs to respond to outbreaks. The project will be focussed on routine surveillance of diseases and the establishment and maintenance of a database, which will include health and climate change information along with socio-economic data which can be analysed with models to

be provided by the World Health Organisation (WMO) and other regional and international agencies.

However, the data collection part of the project will require substantial resource inputs to get the local communities, regional health authorities and the national health authorities to network their components of the database system. It is expected that computer systems and SSB transceivers along with a substantial training effort will be required.

Project No. 2

Natural Resources Impacts

Summary

Detailed sectoral evaluation studies of the natural resources of Guyana (water resources, forests, mining, etc) should be done by the Guyana Natural Resources Agency in order to determine the vulnerable sectors to climate change. This will require funding and technical assistance for this agency.

Adaptation Planning

Project No. 3

Hinterland Areas

Summary

In relation to climate change impacts on the coastal zone, a plan/strategy should be developed for the development of the rural hinterland areas with regards to:

- Establishment of housing schemes to reduce the population of the coastland by planned retreat programmes.
- Establish industries in those areas to provide employment for the residents.
- Obtain funding for basic works to implement the retreat programme.
- Making low interest loans available for construction of houses, farming and business ventures away from the coast.

Project No. 4

Coastal Zone - Region Two

Summary

Since region two (Pomeroon - Supernam) is in the Impact Zone I (shown in the Impacts and Vulnerability chapter of the Initial National Communication) which is already experiencing difficulties with floods and droughts, and is an important area for agriculture, it is proposed that this Region be deemed a pilot project area for:

- The establishment of a regional climate warning centre with links to the Hydrometeorological Service Department for routine climate forecasts to be provided to farmers etc. via the regional centre. A regional climate change information centre will be a component of this project.

The other components of this project will be:

- Establish a monitoring system for climate and water resources (including sea current, level of the sea, sea surface temperature) in accordance with a 25km resolution scheme.

- Set up a Geographic Information System (GIS) assessments and model projections capabilities.

- Train regional persons in the Hydrometerological monitoring and analyses, GIS operations, modelling techniques and information dissemination.

Climate

Project No. 5

Assessment of current and future climate scenarios for Guyana

Summary

Current climate and climate change scenarios are the basis for climate change vulnerabilities and adaptation studies. Comparison between the current situation and the one that would prevail under climate change conditions allows for the identification of vulnerable regions and the qualification/quantification of vulnerability. This may be done by evaluating the land area adversely affected by climate change (e.g. with reduction in agricultural yields or decrease in the level of water reservoirs). Specific regionalisation criteria and methods based on physical considerations should be applied in the development of regional climate scenarios.

Project No. 6

Capacity building for the Hydrometerological Service Department

Summary

The Hydrometerological Service is the agency tasked with monitoring changes in climate. It is currently in need of equipment, staffing and training. It is also necessary to be provided with the means to retain staff. This activity will involve:

- Setting up a national network of climate, water resource and oceanographic stations in accordance with the GCOS programme and with a resolution of 50km.

- Establish a Hydrometeorological Climate Change Database with links to regional centres (in Guyana).

- Provide maintenance and operational training for operators of equipment.

- Provide undergraduate and postgraduate training for meteorologists, hydrologists and oceanographers.

- Provide remuneration comparable with educational requirements

- Set up a modelling unit for limited area climate modelling with links to regional and international modelling centres.

- Establish a Global Atmospheric Watch station to monitor CO_2 and other GHG concentrations.

8.1.3 MITIGATION OF GREENHOUSE GASES

Project No. 1

Measuring Soil Carbon Stocks – A system for Quantifying and Verifying Change in Soil Carbon Stocks due to Changes in Management Practices on Agricultural Land.

Objectives

- To improve on agricultural management practices allowing carbon sequestration to occur in soil.

- To increase soil productivity of agricultural land and effective draining of soil.

Scope

Rice and sugar sectors.

Summary

When land was taken from natural forest or grassland for agriculture, a large amount of the native soil organic matter was lost as CO_2 to the atmosphere. However, if land management practices are changed in ways that increase the soil organic carbon, the reverse occurs and CO_2 is effectively removed from the atmosphere and put into the soil. Land management practices on agricultural land that increase carbon sequestration includes reduction in tillage, restoring degraded land, improving pasture management, and reducing fallow periods.

Thus, the project will aim to establish criteria and indicators for the conservation and sustainable use of agricultural soils while at the same time increasing and promoting carbon sequestration in soil.

System Description: The system is based on well-developed science of soil carbon dynamics. Using a refined and validated computer model of soil carbon, changes in stocks of soil carbon are simulated for individual situations of soil type, land management and weather. Using a Geographic Information System (GIS), large area or national estimates of changes in soil carbon stocks can be obtained. The accuracy of these estimates is audited by comparing the predictions with the rich set of carefully measured carbon changes in the benchmark fields – identified/marked areas in the fields involved. The benchmark fields provide precise measurements of soil carbon over time.

8.1.4 CPAAC - IMPACC ACTIVITIES

Continuation of the CPACC (Caribbean Planning for Adaptation to Climate Change) initiates

Summary

The CPACC project has involved Guyana in several of its components. CPACC may evolve into MACC in its next stage and the CARICOM Regional Centre will be one of its components

CPACC has served the region well in promoting adaptation to climate change and in raising the level of public awareness in Guyana.

While CPACC is a coastal zone adaptation project, it is hoped that MACC will have a wider mandate to include the entire country for Guyana is comprised of coastal zone, a rainforest area and Savannahs. While about 90% of the people of Guyana lives on the coastal zone, there are populated areas in other parts of the country and the population on the coast depends directly or indirectly on those areas. The vulnerabilities of these areas, therefore, should be assessed under MACC.

The following activities should be considered under the MACC:

- Widening the network of sea level and climate monitoring stations to adequately address the Global Climate Observing System (GCOS) programme.

- Conduct studies into the Demerara Eddy in the Guyana current and examine its impact on water and sediment accumulation off Guyana's coast and in estuarine areas.

- Assess vulnerabilities of inland and interior locations in Guyana.

- Promote the transfer of coastal adaptation technologies into Guyana, particularly sea defence technologies.

- Carry out a systematic public awareness programme for Guyana highlighting vulnerabilities, sectoral problems and the way forward in dealing with adaptation to climate change.

- Make fellowships available for Guyanese to be trained in GHG inventory, vulnerability assessments, impacts monitoring and analyses, climate studies, climate change studies and socio-economic studies.

CHAPTER 9: MEASURES FOR FURTHERING THE AIMS OF THE KYOTO PROTOCOL

9.0 INTRODUCTION:

The CDM represents a mechanism which allows developing country parties to assist the industrialized countries to meet their reduction targets and, at the same time, benefit economically by doing so.

9.1 STUDIES TO PREPARE GUYANA TO BENEFIT FROM THE CDM

Summary

Guyana can expect to benefit from the Land Use, Land Use Change and Forestry (LULUCF) projects and Energy projects under the CDM. However, there are basic questions, which will have to be answered for both sectors. These activities will enable Guyana to provide baseline values, which are necessary for CDM projects. The activities are:

- Energy Sector: Several studies must be undertaken in emissions baselines, carbon credit for hydropower projects started from year 2000, additionality definitions, marginal cost determination, emissions accounting and evaluation of cost-effective GHG reduction projects.

- LULUCF:

  - Additionality activities
  - Lock-in technology
    - Quantification of carbon stocks and changes to these stocks
    - Emissions baseline studies
    - Monitoring LULUCF
    - Treatment of wood products in national accounting system
    - Carbon sequestration programmes
    - Defining land use boundaries
    - Study of options for emissions reduction in LULUCF including avoiding deforestation, preventing forest fires, using residues for production method efficiency, improving forest management, using low impact shoring-up techniques etc.
    - Using salt resistant crops in saline areas and improved grazing management practices in rangelands
    - Sustainable land practices - conservation tillage, extended crop rotations. (Project to determine feasibility of measuring and verifying soil carbon changes on representative landscapes, using soil benchmark databases, carbon process models, land use information and remote sensing applications. Benefits can be reductions of emissions and enhancing sinks, improved soil and water conservation, soil quality and productivity and sustainable land management.

9.2 ASSESSMENT OF SOIL MANAGEMENT OPTIONS:

Project:

Soil management options to sequester carbon and mitigate climate change.

Objective:

Land-use change and ecosystem conversion is a main anthropogenic source of GHG. The objective of this Project is to improve soil sequestration of carbon through improved management of degraded cropland and grassland.

Justification:

Agro-ecosystem can be managed to reduce carbon emissions and increase carbon uptake in soils and vegetation. Guyana's agriculture practices are currently not done with climate change as an objective. Noting that Guyana has an obligation to mitigate climate change and can benefit from CDM projects, it is therefore of necessity that Guyana's agricultural practices, in sugar, rice and other crops, be placed under improved management targeting emissions reduction as well as carbon sinks. Guyana will also have to address baseline measurements in the agriculture sector.

Summary

The project will require an international consultancy as well as a local consultancy to examine current management practices in the sugar, rice and other crops sectors in Guyana with a view towards assessing the potential for improved soil management and other options for sequestering carbon and mitigating climate change. Working in collaboration with government and other stakeholders, recommendation on pilot projects and sites with details on costs, etc. will be made.

Scope: national

Timing/duration:

Six (6) months

Local Parties:

EPA, HYDROMET, rice, sugar and other crops agencies.

BUDGET:	*US$*
Consulting Agencies	150,000.00
Local Travel	15,000.00
Consultations	15,000.00
Preliminary Measurements	25,000.00
Miscellaneous	10.000.00
Contingency	21,500.00
TOTAL	**236,500.00**

Performance Indicators

1. Recruitment of Consultants
2. Stakeholders participation
3. Carbon Measurements
4. Reports

Means Of Verification

1. Consultant's report
2. Pilot areas identified
3. Pilot project documents

Risk and Assumptions:

Commitment of government, GUYSUCO, rice industry stakeholders and other crops stakeholders to the project and its outcomes.

9.3 PREPARING FOR CDM PROJECT ACTIVITIES

Project No.1

Conducting studies to assess emissions avoided by the Moco-Moco hydropower plant.

Objective:

To develop a capacity and a process for Guyanese to evaluate the emissions avoided by small and mini hydropower systems being used instead of fossil fuel utilization and to promote investments, under the CDM of the Kyoto Protocol, in hydropower in Guyana.

Justification:

Guyana, a Party to the UNFCCC, is committed to sustainable development through energy projects, which mitigate emissions of greenhouse gases. The Moco-Moco hydropower plant has replaced a fossil fuel operation and so there has been an emission credit for Guyana as a consequence. An industrialized country, under the CDM, may purchase this credit in order to achieve its reduction target. The know-how for determining the carbon credits is needed in Guyana and this project will enable Guyanese to measure the emissions reduction.

Scope: National

Summary

A workshop will be held for the participants from the GEA, GNRA and IAST to provide a knowledge base for monitoring and measuring emissions and calculating carbon credits. A group of local professionals will then be identified to conduct the studies under the guidance of an international consultancy. Some of the issues to be addressed in the studies are given in the Appendix.

Timing/Duration

The project is recommended for immediate implementation and will continue for two years.

Local Parties:

Guyana Energy Agency, Guyana National Resources Agency and Institute of Applied Science and Technology.

BUDGET (2 years)	*US$*
Project Activities	50,000.00
Local coordinator's salary	24,000.00
International Consultancy	50,000.00
Travelling and Subsistence	15,000.00
Materials, Equipment	40,000.00
Contingency (10%)	18,000.00
TOTAL	**197,000.00**

Performance Indicators

I. Report on workshop.

II. Reports on monitoring, measuring and calculating of variables.

III. Report on the Moco-Moco emissions and emissions reduction study

Means Of Verification

I. Workshop conducted

II. Monitoring, measuring and calculating of variables conducted. Database established.

III. Report on Moco-Moco emissions and emissions reduction study presented to the Government.

Risk and Assumptions

I. Failure to secure collaboration of sectoral agencies.

II. Adequate funding should be available.

ISSUES TO BE ADDRESSED

- Measure the emissions, if any, of greenhouse gases (GHG) from the Moco-Moco reservoir defusing baseline level of emissions before the dam was built
- Evaluate net GHG emissions in a non-flood scenario and that which existed after the reservoir was created. This is necessary in order to do similar studies for future sites.
- Estimate and take account of carbon flowing into the reservoir from upstream and from other development and resource management activities in the basin.
- Establish net emissions for the site taking into consideration that natural habitats emit GHG and the fact that it is the net change due to impoundment that should be used for assessment and not the gross emissions from the reservoir.
- The uncertainties which need further studies for clarification.

Project No 2.

Preparing project activity information brochures for CDM project based activities in Guyana.

Objective

To provide a means for rapid and effective dissemination of information to stakeholders in the industrialized countries on activities, in Guyana, which can be of interest under the CDM.

Justification

Guyana has a significant potential to benefit from the Kyoto Protocol Mechanism know as the Clean Development Mechanism (CDM). However, Guyana needs to provide information on energy, industry, land use and forestry activities which are available for development and for attraction of investments by public and private sector agencies in the industrialized countries. This Project will see the preparation of brochures for distribution via hard copy and Internet means to interested Parties.

Scope: National

Summary

Sectoral Agencies will be assisted with the equipment and materials required to produce brochures of a high standard for distribution. A web site will be created especially to advertise the CDM project-based activities which can be done in Guyana. A local project coordinator will head the sector agencies, team and will work with CC: Train and the UNFCCC Secretariat to produce the brochures and distribute them after governmental clearance is obtained. One sector agency will be placed in charge of the equipment and the team will be adequately trained to update the web site.

Timing/Duration:

The project is recommended for immediate implementation and will continue for 6 months after the procurement of equipment and human resources.

Local Parties:

Guyana Forestry Commission, Guyana energy Authority, Guyana Natural Resources Agency, EPA, Hydromet.

BUDGET	*US$*
Project Coordinator	15,000.00
Honoraria for sector agencies team members (6)	12,000.00
Web Consultant	10,000.00
Computer and publishing equipment	15,000.00
Materials	10,000.00
Miscellaneous	10,000.00
Contingency	7,200.00
TOTAL	**79,200.00**

Performance Indicator

1. Project Coordinator appointed
2. Team set up
3. Equipment and materials purchased.

Means Of Verification

1. Team constituted
2. Equipment operational
3. Brochures
4. Web-site operational

Risk and Assumptions:

Government and agencies are committed.

CHAPTER 10: MEASURES FOR MITIGATION OF CLIMATE CHANGE

10.0 INTRODUCTION:

The convention requires all parties to mitigate climate change and although Guyana is a net sink country, it will take affordable actions, which are in support of sustainable development.

10.1 MITIGATION MEASURES

10.1.1 PILOT STUDIES IN CARBON SEQUESTRATION

Projects for carbon sequestration in soils under the Clean Development Mechanism (CDM) can realize benefits to Guyana and developed countries which have to show real greenhouse gas (GHG) emissions cuts in the commitment period, 2008-2012. However, measuring, monitoring and verifying carbon changes in soils require scientifically credible and cost effective methods. It is proposed that forest types, savannah types, agricultural areas, shelter belt potential areas etc. be identified for studies into baseline measurements, and to develop procedures and methodologies for measuring, monitoring and verifying carbon changes.

10.1.2 CREATING SOIL SINKS IN GUYANA

Certain farming practices can slow the loss of carbon from soils and increase the amount of carbon stored in the long term. Project activities can be identified in the agriculture sector in the following areas:

- Using legumes/grasses in crop rotation
- Minimizing tillage to reduce soil disturbance and decrease CO_2 emissions
- Converting marginal croplands to perennial trees
- Mulch farming
- Agro-forestry
- Cover crops - depending on soil type, yields etc.

10.1.3 PROTECTION OF THE DRY EVERGREEN AND MANGROVE FORESTS

There are concerns about the overuse of the Dry Evergreen and Mangrove forest types in Guyana. These are unique ecosystems, which need to be protected and substantially utilized and contribute to the reduction of GHG emissions while increasing carbon sinks. Two projects should be attempted for the sustainable utilization of these forest types. Reasons and possible actions are presented as follows:

A. Dry Evergreen Forest/White Sand Forest

The forestland base of Guyana is estimated to be 13,678,616 hectares (33,799,860 acres). It has also been estimated that 10 – 15% of this land base is covered by white sand forest of various types and that an estimated 500,000 hectares of this so called dry evergreen forest, locally called white sand forest (WSF), have been damaged by over-use. This amounts to nearly a third of this entire forest type.

The WSF in Guyana covers a wide belt of land from east to west just inland from the coastal wetlands and reaching well into the hinterland, at least as far South of Mabura Hill. The soil is very coarse and has virtually no organic matter, clay or silt. This soil is also so porous that plants

tend to suffer moisture stress during the periods of low rainfall (February to the end of April and August to the end of November). It supports many hundreds of tree species. Soft Wallaba (*Eperua falcata*) is a major species of this forest. Dakama (*Dimorphandra conjugata*) is the dominant species at very early pioneering stages, after severe disturbances such as repeated logging, land clearing for agriculture, fires (caused by nature or man), firewood cutting or charcoaling.

The WSF are especially vulnerable to over-use because they are located immediately inland from he coast where most of the population resides and they are easily accessed because of the main highway system.

Possible Actions

- Explore the possibilities of establishing reserve areas for the conservation of this unique ecosystem, and at the same time safeguard the water supply.

- The rehabilitation of the forest cover and recovery of site productivity.

- Besides the above the single most important aspect remains that of the need to include **a plan for forest fire protection**.

- In order to properly manage the WSF against these interventions mentioned, there is an urgent need for mapping the white sand forest at various over exploited stages, before further clearing and burning takes place.

B. The Mangrove Forest

The mangrove belt of up to 80,000 hectares, mostly along the North-western Atlantic Coast, was harvested for fuel wood and for bark tanning.

The mangrove forest is important for the local economy and for customary uses. On the socio-economic front, mangroves are used as a source fuel, fulfilling the requirement of many rural households. Further, the *Rhizophora mangle* is used extensively in the tanning industry, as it is a cheap and often readily available material. Production of mangrove bark in Guyana varied from 22,730 kg in 1994 to 35,762 Kg in 1998. The Mangrove Forest type (*Rhizophora mangle and Avicenia nitida*) of the marine ecosystem provides protection to the shoreline against marine erosion.

The mangrove is also a rich source of fauna. These faunal species have great potential to generate revenue through tourist activities, etc.

The most important effect on the mangrove fringe at present is the practice of cutting for fuel wood. This occurs in all areas, and is carried out both on an artisanal and commercial scale.

The removal of the mangrove results in risks for the sediment stabilization, the shoreline anchoring, the flood control, production and food chain support, wildlife habitat, fisheries, fuel wood, etc. The vulnerability and risk of the biological diversity resources is highly affected for fishes and sea turtle.

Possible Actions

- Reforestation and protection of the mangrove forest should be pursued under the Integrated Coastal Zone Management (ICZM).

- In order to properly manage the mangrove forest against these mentioned interventions, there is an urgent need for mapping this over-exploited forest.

10.1.4 REDUCING DEPENDENCE ON FOSSIL FUEL USAGE

Guyana's energy policy caters for reduction of the country's dependence on imported fuels and for the promotion of increased utilization of domestic energy resources. The National Development Strategy (NDS) also focuses on these objectives of the energy policy. Based on the availability of funding, Government has started to implement renewable energy generation programmes. Funding should be obtained to pursue the following programmes, which will lead to reduced GHG emissions and can attract developed country funding. The following are proposed measures to reduce energy consumption in the various sectors as captioned.

1) Electricity Generation

- Implement demand-side management which will improve energy efficiency
- Technological improvements on power plant efficiency will reduce GHG emissions
- Encourage the use of alternative energy sources such as hydropower, solar, wind, biomass
- Switch to cleaner fuels such as natural gas

2) Industry

- Introduce energy efficiency technologies
- Conduct energy audits
- Increase use of co-generation

3) Residential

- Encourage energy conservation
- Introduce energy efficiency lighting and cooking
- Set standards for electric appliances
- Set insulation standards
- Enforce laws requiring that all appliances have energy labels

4) *Transportation*

- Introduce vehicle standards
- Regulate and monitor the importation of used or reconditioned vehicles
- Promote the use of energy efficient vehicles
- Address the possibility of fuel switching (ethanol, methanol, or natural gas)
- Implement infrastructure projects for both existing roads and new human settlement areas

10.2 A STUDY OF ECONOMIC INSTRUMENTS FOR MITIGATING GHG EMISSIONS

Guyana can benefit from mitigation of ghg emissions but there will have to be favourable policies to encourage investments in sectors, which can reduce emissions of ghg's. This project is intended to provide guidance to the government on policy measures, which will encourage investment projects.

An international consultancy along with local resource persons should examine Guyana's trade policies and laws and make recommendations on the creation of a favourable economic environment for encouraging local and external investments in mitigation activities.

It is expected that the study will examine:

- Domestic taxes-designed to achieve specified national emission reduction targets
- Tradable permits-designed to achieve specified international emission reduction targets for developed country partners in joint activities
- Harmonized taxes
- Tradable quotas
- Joint Implementation-can be used to transfer resources and technologies to Guyana.

10.3 DESIGN AND IMPLEMENTATION OF A PUBLIC EDUCATION AND INFORMATION PROGRAMME ON ENERGY EFFICIENCY.

Technical support can be sought for a comprehensive public awareness programme on energy efficiency. The programme should be geared towards targeting all sections of the population and all energy-using sectors in Guyana. It should identify ways and means for improving energy efficiency and the use of all sections of the media. Brochures and pamphlets will be a necessary means for communicating with the public.

It is expected that the Guyana Energy Agency will be the local agency driving this project. There may be a need for equipment, staff and a consultancy to execute this project.

CHAPTER 11: DEVELOPMENT AND TRANSFER OF TECHNOLOGY

11.0 INTRODUCTION:

A necessity for compliance with the Convention is the development and transfer of technology. The Policy of Guyana on Science and Technology recognizes the importance of technology transfer for the country's development. It is therefore crucial for the transfer of appropriate technology to be seen as a vehicle for sustainable development.

11.1 TECHNOLOGY TRANSFER

Renewable Energy Technologies

Guyana is in need of substantial investment in the energy sector for its socio-economic development. It is best to pursue renewable energy options in order to mitigate climate change, especially since Guyana has potential for substantial use of hydropower, solar and wind systems. The following are activities, which will result in a substantial mitigation effort while satisfying Guyana's energy needs:

- Building small and mini hydropower systems in areas where development can take place and where it is suitable for connecting to the national grid. The Guyana Energy Agency has already done feasibility studies on several potential sites.

- Establishment of wind power and/or solar photovoltaic systems on the coast and in the hinterland areas to promote energy substitution and rural development.

- The hotel and restaurant sectors use large amounts of hot water. Solar hot water collectors can be installed in these as well as in other businesses, which utilize large amounts of hot water.

- There is a need for substantial savings in energy use in government buildings. Energy-efficient lighting and air-conditioning along with energy-efficient wiring systems can be done to improve lighting and cooling while at the same time, resulting in savings in energy costs.

One necessary activity, which requires to be done, is to strengthen capabilities to design and construct more efficient buildings especially since Guyana has already experienced a 0.9 ^{o}C warming over the last century. A project is necessary to develop/amend an energy efficiency code for air-conditioned buildings and to help in the implementation of the code. Training of construction operators and introduction of the code into building permit procedures will be a part of the project.

Other Projects

Implementation of a programme to develop rural energy services companies
The objective of this project is to ensure that a range of energy services is available to targeted regions. The services include wind systems for the residential sector, photovoltaic systems and hybrid systems.
Companies and individuals will require funding for hardware and technical support (including training) and this project will address these. Technology transfer and maintenance systems will be required.
The Guyana Energy Agency will require equipment and training to execute the programme.

Strengthening the Capacity of the Institute of Applied Science and Technology to assess local technology needs and appropriate technology transfer
In order to fully make use of the opportunities under Article 4.5 of the Convention, Guyana will require the capacity to

- Ensure assessment of local technology needs so that transfer of and investment in environmentally sound technologies (EST) can be effected,
- Create awareness of products, processes and services that use ESTs by encouraging eco-labelling, product standards, industry codes and community education,

- Expand research and development programmes to ensure development of ESTs and adaptation to local conditions, and
- Ensure South-South transfer of ESTs.

It will therefore be necessary to provide the Institute, and the Guyana National Bureau of Standards, with the capacity, in terms of equipment, training, networking facilities and expert consultations in order for climate change activities to be carried out.

CHAPTER 12: CONCLUSIONS

The Climate Change Action Plan is geared towards the implementation of the Convention in a way that supports the implementation of the National Development Strategy (NDS) of Guyana. It is recognized that the imperative of climate change activities will be to ensure that Guyanese are prepared to deal with the impacts of the consequences of global warming. This requires that climate change programmes are not to be decided entirely on the basis of programmes of the NDS. The matter of long-range forecasting and monitoring of impacts cannot wait for the programmes of the NDS to be defined.

The Plan recognized the capacity weaknesses in the sector agencies as well as the coordinating agencies. This is also seen as a problem in the NDS. It is a priority for development and a priority for taking actions under the Convention. Since Guyana is very vulnerable due to its low-lying coast and which is expected to bear the brunt of the impacts of rising temperatures, changing rainfall patterns and rising sea levels, capacity building and response measures for adaptation to Climate Change will need to be addressed as a matter of urgency.

The Government alone cannot address the response measures. The local communities will have to be sensitised and prepared to work with the agencies of Government. More importantly, local agencies must be kept in the picture as important participants. Public awareness, education and training will be a most critical tool to involve all sections of the public in the implementation of the Plan.

Climate Change will not only bring disasters. It can bring benefits also. Funding can be realized for capacity building and other measures, which will help to implement parts of the NDS. However, the Joint Implementation Programmes of the Convention and the Initiatives of the Kyoto Protocol will be of significant benefit to the energy, industry, forestry and agriculture sectors. It will require the human resource to promote an aggressive programme to attract the external private sector to do business with companies in Guyana.

This Action Plan should not be seen as a static document. As climate change negotiations proceed, there will be the need to shift priorities and to accommodate new initiatives. It is expected that, in the next 5 years, there will not be the need to modify the Plan.