

**BELIZE COUNTRY REPORT  
SECOND NATIONAL COMMUNICATION TO THE UNFCCC**

**TECHNOLOGY NEEDS ASSESSMENT  
LAND USE, LAND USE CHANGE AND FORESTRY SECTOR**

**Submitted to the Ministry of Natural Resources and the Environment**

**By**

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## **Background**

Belize became a signatory to the United Nations Framework Convention on Climate Change in 1992 and ratified the Convention in 1994. The ultimate objective of the UNFCCC is to stabilize the concentration of greenhouse gases in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. As part of its obligations under the convention, contracting Parties are required to conduct periodic GHG Inventories for submission to the Secretariat. The first GHG inventory was conducted in 1998 using 1994 as the reference year and the second inventory that was recently completed in the first half of 2007, reports on the years 1997 and 2000.

The GHGI estimated the quantity of GHG emissions that were generated by the five major economic sectors that impact GHG balances. This included the Land Use, Land Use Change and Forestry (LULUCF) Sector which in 1994 accounted for 68% of total national GHGI emissions and which in 1997 continued to predominate in the amounts of GHGs emitted at the national level.

As a follow up to the second national GHGI, the Second National Communications Climate Change Project has commissioned assessments of technology needs in the five national climate change related economic sectors. This report assessed and describes the technology needs and the potential application of appropriate technology in the LULUCF sector in Belize for the mitigation of GHG emissions.

# 1 Introduction

## 1.1 Technology

The term “technology” may have different connotations and perspectives depending on the context in which it is used. Therefore, it is considered important to define what is meant by the term “technology” in this report. The Wikipedia dictionary provides the following discussion on the term “technology”:

“In general, "[technology](#)" is the relationship that society has with its tools and crafts, and to what extent society can control its environment. The [Merriam-Webster](#) dictionary offers a definition of the term: "the practical application of knowledge especially in a particular area" and "a capability given by the practical application of knowledge".<sup>[1]</sup> [Ursula Franklin](#), in her 1989 "Real World of Technology" lecture, gave another definition of the concept; it is "practice, the way we do things around here".<sup>[2]</sup> The term is often used to imply a specific field of technology, or to refer to [high technology](#), rather than technology as a whole.<sup>[3]</sup> However, the term is mostly used in three different contexts: when referring to a [tool](#) (or [machine](#)); a technique; the cultural force; or a combination of the three.

The word "technology" can also be used to refer to a collection of techniques. In this context, it is the current state of humanity's knowledge of how to combine resources to produce desired products, to solve problems, fulfill needs, or satisfy wants; it includes technical methods, skills, processes, techniques, tools and raw materials. When combined with another term, such as "medical technology" or "space technology", it refers to the state of the respective field's knowledge and tools. "[State-of-the-art](#) technology" refers to the [high technology](#) available to humanity in any field.”

The term “technology” in this report is used in its broadest sense, as a state of knowledge and its application to achieve a desired good.

In this report the term “environmentally sound (or sounder) technologies, (EST’s)” is also used, often synonymously with climate change mitigation and/or adaptation technologies. These EST’s refer to "technologies which protect the environment, are less polluting, use all resources in a more sustainable manner, recycle more of their wastes and products, handle residual wastes in a

more acceptable manner than the technologies for which they were substitutes, and are compatible with nationally determined socio-economic, cultural and environmental priorities. The term encompasses hard and soft technologies” (United Nations, 1993). Some examples of soft technologies are capacity building, information networks, training and research, while examples of hard technologies include equipment and products to control, reduce or prevent anthropogenic emissions of greenhouse gases in the energy, forestry, agriculture, industry and waste management sectors, to enhance removals by sinks and to facilitate adaptation

There is also a difference between technologies for mitigation and adaptation to climate change. Simply put, mitigation focuses on slowing climate change, whereas adaptation deals with the effects of climate change. The general question that the TNA attempts to address is what technology is required to provide practical and appropriate mechanisms that will reduce or avoid GHG emissions in the LULUCF sector.

## **1.2 Technology Transfer**

Although not mentioned specifically within the terms of reference of the TNA, it is understood that for new technology (or modified technology) to be utilized there is a process of transfer from those who have developed the technology to those who want to use the technology and who have the expectation of being beneficiaries of the new technology.

UNCED in 1992 gave life to the UNFCCC. Article 4.1.c requires the parties to the Convention "to promote and cooperate in the development, application, diffusion, including transfer, of technologies, practices, and processes that control, reduce, or prevent anthropogenic emissions of greenhouse gases" (UN, 1992).

Article 4.5 of the UNFCCC further states:

"The developed country Parties and other developed Parties included in Annex II shall take all practical steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties, to enable them to implement the provisions of the Convention. In this process, the developed country Parties shall support the development and enhancement of endogenous

capacities and technologies of developing country Parties. Other Parties and organizations in a position to do so may also assist in facilitating the transfer of such technologies".

Another important outcome of UNCED was Agenda 21, a vision for the 21st Century based on the concept of sustainable development. Chapter 34 of the Agenda, on the "Transfer of environmentally sound technology, cooperation, and capacity building" calls for access to scientific and technical information, promotion of technology transfer projects, promotion of indigenous and public domain technologies, capacity building, intellectual property rights, and long-term technological partnerships between suppliers and recipients of technology. It points out that "Technology cooperation involves joint efforts by enterprises and governments, both suppliers of technology and its recipients. Therefore, such cooperation entails an interactive process involving government, the private sector, and research and development facilities to ensure the best possible results from transfer of technology". It also recommends the utilization of existing technological information and promoting research partnerships and assessment networks and the development of new ones.

The Kyoto Protocol to the UNFCCC also makes recognition of the importance of "technology transfer" in Article 10c, which asks all Parties to "Cooperate in the promotion of effective modalities for the development, application and diffusion of, and take all possible steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies, know-how, practices and processes pertinent to climate change, in particular to developing countries, including the formulation of policies and programmes for the effective transfer of environmentally sound technologies that are publicly owned or in the public domain and the creation of an enabling environment for the private sector, to promote and enhance the transfer of, and access to, environmentally sound technologies".

The term "technology transfer" also includes the related concepts of "technology cooperation" and "technology diffusion".

It must be pointed out that technology transfer occurs at all levels and is not restricted to exchanges from one country to another but also occurs within one country whether at a geographic, economic, sectoral, or cultural level. Technology transfer should be viewed as the result of many day to day decisions involving all the stakeholders who participate in the decision

making process regarding strategy, investment, international trade, market opportunities, etc. Technology transfer is also influenced by social, economic, political, legal and technological factors. Cultural preferences, consumer awareness, social values, lifestyles, corruption, competition, etc. are also reflected in technology transfer.

## 2 Overview of the LULUCF Sector

### 2.1 Description

The land cover of Belize is dominated by forests (including forest cover as defined by the IPCC) and natural vegetation. Until the mid 1950's the production of timber predominantly mahogany, cedar, and rosewood, mostly for export was the main economic mainstay of the country. Since then agriculture and more recently in the last two decades, tourism have become the major economic activities in the country. The land cover of Belize is summarized in the table below.

**Table 1: Broad Ecosystem Classes and Land Uses by Cover**

Cover	% ±	km <sup>2</sup> ±
Lowland broadleaf forest and shrubland	51.4%	11,803
Agriculture, all subclasses	16.7%	3,835
Submontane and montane broadleaf forest	10.0%	2,296
Lowland savanna including pine savanna	8.8%	2,021
Mangrove and littoral forest	4.2%	964
Submontane pine forest (dense)	2.1%	482
Water	2.1%	482
Wetland	1.9%	436
Lowland pine forest (dense)	1.4%	321
Coastal savanna (marine salt marsh)	1.1%	253
Urban	0.5%	115

Source: Central American Ecosystems Map – Belize (Meenman & Sabido, 2001)

Even though timber production has continued to decline sharply, Belize still maintains a healthy and substantial forest cover rich in biodiversity which provides and has the potential to provide a myriad of goods and services essential to sustained development, as well as invaluable ecological services such as fresh water production, coastal zone protection, and maintaining soil fertility.

Since the late 1980's a paradigm shift in forest resource management has been initiated which places increasing emphasis on protected areas management rather than forest product (mostly timber) management and a shift towards ecosystem management at an integrated level that recognizes the interface between terrestrial and marine ecosystems as well as the need to coordinate the management of these natural resources beyond the confines of political boundaries. Terrestrial protected areas now cover 36.46 % of the land area and the extractive reserves still form the largest component.

The expansion of the agricultural sector to a large extent continues to depend on the conversion of forest cover to prepare land for the cultivation of agricultural crops. Forest clearance for agricultural activities including aquaculture takes on different modalities depending on the geographic region of the country where it occurs, on past land/forest use, on the crop that is being planted and economic level of the project, cultural preferences, etc.

About 80 % of deforestation occurs primarily in areas covered by broadleaved forests as these **generally** represent or are thought to represent the more productive soils. The other 20 % occurs in thickets, riparian vegetation, mangroves, and pine savannahs.

The LULUCF Sector is the source of the highest emissions of CO<sub>2</sub> in Belize. Paradoxically, it is also the sector responsible for the removal of the greatest amount of CO<sub>2</sub> from the atmosphere.

## **2.2 Emissions**

The largest source of green house gas emissions accounted for under the LULUCF sector in Belize is as a result of the combination of activities that are involved in the clearance of forest cover in order to facilitate agricultural activities. In most cases woody vegetation is cut down manually often assisted by chainsaws and after a suitable period of drying, the resulting slash is burnt. In some cases, the forest cover is knocked down to the ground using bulldozers or similar machinery. After being left to dry for a period ranging from two months to a year the resulting slash is burnt in situ or piled up in "windrows" and burnt. In both manually and machine assisted forest clearance, large woody stems of commercial species are often converted to logs and removed from the site to be utilized in the sawmilling industry. About 80% of the sawdust and

mill “waste” produced in the conversion of logs to lumber is disposed off by burning. In many cases where forests clearance occurs in small areas or difficult terrain, trees of species suitable for timber production are converted to lumber in situ using chainsaw mills. However forest clearance is not limited to agricultural endeavours but may also occur as land preparation activities for settlements, and the construction of roads.

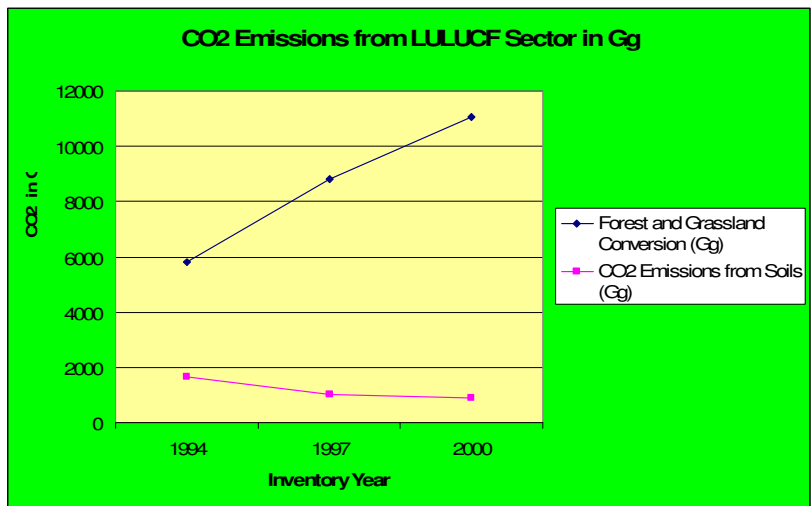
The other source of carbon emissions is from soils, mostly as a result of the alteration of the physical and chemical properties of soil that occur from the removal of natural vegetation cover, tillage practices and the addition of fertilizers.

An analysis of trends in the table below for the 1994, 1997, and 2000 reporting years show a continuous increase in emissions due to the conversion of forest and natural grassland cover. However there is a decrease in emissions of soil carbons over the same period, paradoxically perhaps due to an increase in liming using dolomite.

Table 2: CO<sub>2</sub> Emissions from LULUCF

Inventory Year	Forest and Grassland Conversion (Gg)	CO <sub>2</sub> Emissions from Soils (Gg)
1994	5826	1,657
1997	8,803	1,000
2000	11,077	873

Chart 1:



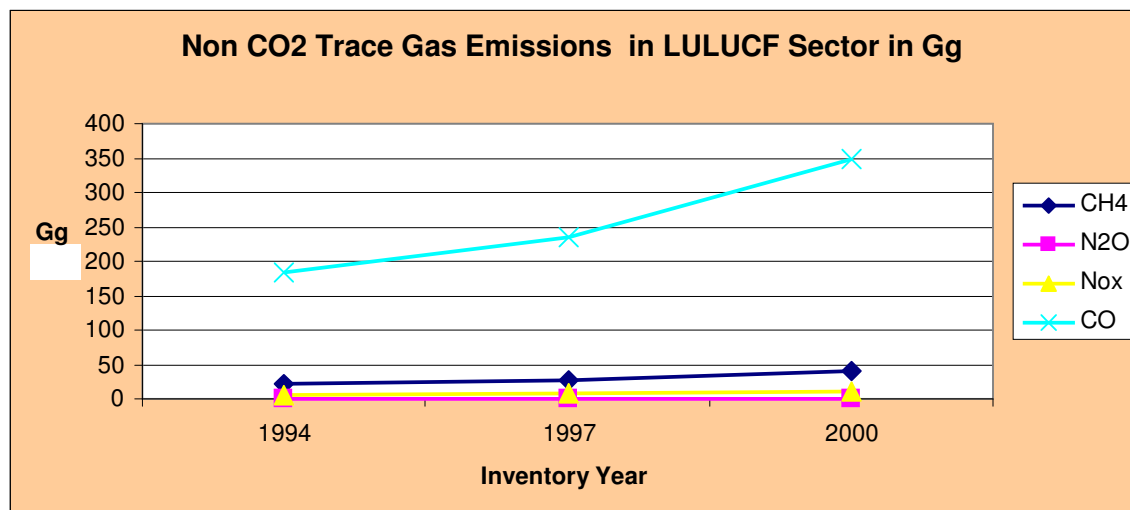
The process of deforestation is also the source of another important group of GHG's, namely the so called non CO<sub>2</sub> trace gases which are methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), nitric oxides (Nox), and carbon monoxide (CO).

These occur principally during the process of burning and while the quantities produced are much smaller than CO<sub>2</sub>, their global warming potential is very high as they tend to remain for very long periods in the atmosphere. So for example, in a period of over 100 years, one tonne of methane has the same impact on the climate change process as 26 tonnes of CO<sub>2</sub>. One ton of nitrous oxide has the same impact as 296 tonnes of CO<sub>2</sub>. The table below shows a continued increase of these GHG's as the rate of deforestation increases.

Table 3: Trace Gas Emissions from LULUCF Sector

Inventory Year	Area	CH4	N2O	Nox	CO
	Deforested (has.)				
1994	18,265	21	0	5	185
1997	23,157	27	0	7	235
2000	34,428	40	0	10	349

Chart 2:



Population increase and an increasing demand for land to satisfy agricultural imperatives are factors propelling deforestation in Belize. Unfortunately, this occurs without a national land use plan to guide land development. Since most of the new agricultural frontiers that are being created for a large part occur on lands pertaining to the National Estate, the role of GOB institutions in providing the necessary guiding framework is most noticeable by its absence. As long as a disconnect remains between agriculture development and proper land use management at the national scale, it will be extremely difficult to effectively address the issue of deforestation related to agriculture development. It would appear therefore that in the interim of waiting for a comprehensive and effective national land use plan to be developed, those technological initiatives and measures focused on promoting sustained agriculture production systems that reduce the need for forest conversion and retain soil carbon together with those technologies that promote sustained forest management and increase the carbon sequestration capacity of the forest resource will have to be reviewed as options for mitigation.

### **3 Review of Policy, Legislative, and Institutional Framework**

#### **3.1 Land Use Policy**

There is no comprehensive land use policy and regulations legislated and adopted at the national level for Belize. Even though there are technical reports on land use potential at the national and in some areas at the sub-national level to guide development and in particular agricultural development, the latter seems to have evolved with little guidance based on soil suitability. Government agencies have been remiss in establishing the level of cohesion necessary for proper land development within a coherent national framework. It is not clear if this is a reflection of priorities at the policy level.

##### **3.1.1 Mechanisms Promoting Good Land Use**

A number of projects have been initiated and some completed at the national and sub-national level to achieve sustainable use and proper management of land resources.

These are as follows:

- ❖ The Southern Development Project funded by the Inter-American Development Bank is designed to support economic, social, and physical planning activities. It also includes investment in rural enterprise and sustainable farming techniques aimed at increasing economic opportunities and social development in the southern region. It is expected that traditional agriculture methods which place the most pressure on land will be significantly reduced.
- ❖ The Caribbean Development Bank (CDB) in conjunction with International Fund for Agricultural Development (IFAD) funds the Community Initiated Agricultural Resources Management Project (CARD) in the southern districts.
- ❖ The Land Management Program (LMP), funded by an IDB loan and counterpart funding from the Government of Belize intends to improve land management in Belize by completing four components – national cadastre and property rights registration, the expansion of land administration, land use planning and development review and land policy reform and ministry-wide strengthening.
- ❖ In fulfillment of its commitments under the LMP project, the Ministry of Natural Resources and the Environment has appointed a National Land Advisory Committee which has under its consideration a national land policy.
- ❖ After several village level and regional level consultations, a Land Planning Bill has been prepared under the LMP project which seeks to provide the necessary legislation for a decentralized land use planning framework.

### **3.2 Forest Policy**

Even though forestry in Belize began in the 1800's and timber production was the mainstay of the economy for more than 200 years, it was not until 1954 that a national forest policy was promulgated. The 1954 forest policy is antiquated and does not effectively address the present realities of the forestry sector that includes maintaining a national forest estate that has undergone tremendous transformation since the policy was promulgated with a preponderance towards strict protected areas, a downsized Forest Department that is presently under-resourced and overwhelmed by its ever increasing mandate in areas such as protected areas management, biodiversity conservation, the sustainable utilization of the goods and services provided by the forest resource, community participation in the management of the forest resource and a host of

commitments as the institutional focal point for multilateral environmental agreements . As would be expected present policy does not specifically address climate change issues related to forests.

### **3.2.1 Mechanisms Promoting Sustained Management of the Forest Resource**

Prior to and since UNCED in 1992, a series of mechanisms and strategies have been initiated and some completed that strengthen the sustained management of the national forest and biodiversity resource.

These include the following:

- ❖ The Forest Planning and Management Project (FPMP)
- ❖ Natural Resource Management and Project (NARMAP)
- ❖ National Biological Corridors Project supported by the Mesoamerican Biological Corridors Project
- ❖ National Biodiversity Policy
- ❖ National Protected Areas Policy and Systems Plan
- ❖ Toledo Healthy Forest Initiative

### **3.3 Environmental Protection Policy**

Even though Belize has comprehensive environmental protection legislation, there is no comprehensive environmental policy legislated and adopted at the national level. However, there is a National Environmental Action Plan (NEAP) which is revised periodically. The NEAP which is implemented by the DOE provides a national framework for formulating and implementing environmentally sustainable development policies by Government. The NEAP also seeks to improve inter-sectoral coordination between all the stakeholders in the environmental sector.

### **3.4 Land Use Legislation**

There are several pieces of legislation dealing with land in Belize. However, there are only two that primarily deal with land use planning. These are :

- ❖ Land Utilization Act
- ❖ Housing and Town Planning Act

These two acts have been characterized as outdated and deficient. Most importantly, they are seldom employed as effective mechanisms for forward planning and promoting effective land use management practices.

### **3.5 Forest Legislation**

- ❖ The Forest Act (circa 1920's) is outdated and focuses primarily on the administration of the national forest estate including the declaration of forest reserves (but very little regarding their protection) and the control of timber exploitation ensuring that timber royalties are paid to Government. The concept of sustained forest management is completely avoided in the legislation.
- ❖ The Wildlife Protection Act seeks to regulate hunting of wildlife but is inadequate to address the issues and concerns that beset wildlife management today both within the context of sustainably addressing community needs, regulating the commercial utilization of wildlife, and maintaining biodiversity.
- ❖ The National Park Systems Act is perhaps one of the more recent legislation in the forestry area (circa 1981) but again national, regional, and international events have overtaken this critical piece of legislation which seems to follow the “Yellowstone model” of protected areas management.
- ❖ The Private Forest (Conservation) Act is a misnomer, since its primary purpose is to ensure that Government collects royalties from timber cut on private land.

There are other bits and pieces of minor legislation related to the forestry sector some of which is no longer considered to be in force.

### **3.6 Environmental Protection Legislation**

The Environmental Protection Act and its Subsidiary Laws provides for the prevention and control of environmental pollution both on land and on the sea, the disposal of waste, and the application of environmental impact assessments on development projects. The DOE is empowered by this Act.

### **3.7 Institutional Framework**

The Ministry of Natural Resources and the Environment has the mandate for the overall direction and coordination of natural resource policy. It includes the Lands and Survey Department, the Forest Department, the Department of the Environment, the Petroleum and Geology Department and the National Meteorological Service.

#### **Lands and Survey Department**

The beginnings of the Lands and Survey Department date back to 1862. The Department has the responsibility for management of the national estate, the facilitation and recording of private estate transactions, surveying standards, land use planning, valuation and taxation of rural lands, and the collection of data and dissemination of land/natural resource information. The land use planning and data collection and land information capacities were established in 1992. It has the responsibility of administering and enforcing all the national legislation pertaining to land.

It is noteworthy that presently Belize is characterized by a variety of landholdings with ownership (tenure) vested through both private freehold and leasehold titles in both urban and rural areas. In addition, National Estate lands are available for leases or currently in lease application process to a total of 8% of all rural lands available.

#### **Forest Department**

The Forest Department was legally instituted in 1927. While it's early focus was to oversee and manage the exploitation of timber on both national and private land ensuring that royalties on timber were assessed and collected, the present day responsibility of the FD now encompasses tourism management, watershed management, wildlife management, biodiversity conservation, protected areas management, law enforcement, forest-fire prevention, sustainable forest resources management, sustained utilization of non-timber forest products etc . The present day responsibility of the Department also includes coordination and implementation of many multilateral environmental agreements at both the regional and international level.

In 2005 a 5-year strategic plan was launched to assist the FD in developing both its organizational and operational capacity to carry out its mandate. The overall strategic objective

of the FD is to have in place a regulated, efficiently facilitated, integrated and sustained management of the forest resources in such a manner that they are recognized for their ecological functions as well as their contributions to the local and national economy. A financial sustainability plan is also being developed.

### **Department of the Environment**

The Department of the Environment is responsible for fostering the prudent use of and proper management of the natural resources of Belize, the preservation, protection and improvement of the environment and the control of pollution. Among its strategies, it includes strengthening the coordination of environmental activities between government and non-government organizations; establishing and enforcing standards for pollution control; promoting environmental planning for key areas of development such as the coastal zone, islands and tourism sites.

It also facilitates public participation in environmental issues, through public education campaigns and district outreach activities, in order to encourage community based environmental planning and enforcement of regulations. DOE also ensures that the Government's Environmental Impact Assessment procedures are implemented for all environmentally sensitive projects.

### **3.8 National Framework for Sustainable Development**

The following excerpts from the *National Assessment Report for Barbados plus 10* (GOB, 2004) was reviewed and are thought to be succinct and pertinent to providing a useful national background.

“In 1999, with the assistance of ALIDES and CIDA, Belize drafted legislation for the establishment of National Sustainable Development Council. However, since that time no actions were taken in its establishment. To date, there exists a concept paper and draft Terms of Reference for the Council. It is proposed that the Council draw from already existing mechanisms, and be a process-oriented body. These existing coordination mechanisms include

committees such as the National Human Development Advisory Council (NHDAC), which although housed in one Ministry, is comprised of representatives from several government departments and the non-government sectors. The NHDAC seeks to advise the Government of Belize on issues related to the social aspects of poverty elimination. Other institutions include the Economic Advisory Council and National Task Force for Sustainable Development..... “

“As a follow up to the 1992 United Nations Conference on Environment and Development (UNCED), the Government of Belize signed the agreement establishing the Central American Alliance for Sustainable Development (ALIDES). In this 1994 agreement, Belize joined the other Central American countries, who committed themselves to:

- ❖ Establish National Councils for Sustainable Development – made up of the Public Sector, the Private Sector and Civil Society; and
- ❖ Create the Central American Council for Sustainable Development – made up of the Heads of Government of Central America.....

While there may not be any specific or comprehensive national sustainable development policy, a number of strategies have been developed and implemented with this as the goal. The comprehensive sustainable development policy may, therefore, evolve through the integration of the objectives and activities of those strategies. The national programmes introduced by the government were designed and introduced to address the broad issues of Poverty, Health and Education. Sustainable development plans and strategies include the draft “Towards a National Protected Areas Systems Plan for Belize” (NARMAP), the “National Biodiversity Strategy and Action Plan” (Jacobs and Castañeda, 1998) and the Land Management Programme. These were drafted to address land-use issues and threats to biological diversity. The National Poverty Elimination Strategy and Action Plan (1998 – 2003) was formulated by the GOB to provide guidance for policy and program development with regard to poverty elimination initiatives, particularly as they relate to the social sector. It is also a tool to guide, monitor and evaluate the implementation of integrated programs including those related to poverty elimination and overall socio-economic development. Currently, assistance is being provided to GOB in its efforts to update and strengthen the current NESAP and support its implementation.

In 2001, Belize committed to become a part of a CARICOM initiative to establish a CARICOM Sustainable Development Task Force.

The Government of Belize continues to plan for sustainable development within policy and legislative and institutional frameworks across the areas of the environment, economic development and social/human development. These include the creation of the several advisory bodies, the development of strategies and action plans and programmes....”

### **Millennium Development Goals**

In September of 2000, 191 member countries of the United Nations General Assembly adopted the Millennium Declaration which outlines the main challenges confronting the world at the start of the new millennium. Governments agreed to a set of goals and related targets now known as the Millennium Development Goals which are:

1. Eradicate extreme poverty and hunger
2. Achieve universal primary education
3. Promote gender equality and empower women
4. Reduce child mortality
5. Improve maternal health
6. Combat HIV/AIDS, malaria and other major diseases
7. Ensure environmental sustainability
8. Develop a global partnership for development.

Belize’s First Millennium Development Goals Report was completed in July, 2005. It is to be noted that Goal No. 7 “Ensure environmental sustainability” which seeks to “integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources” is characterized as being “behind”. The challenges that have been experienced are listed as ensuring that the integration of principles translate into reversal of environmental resource losses, enforcement, and achieving community buy-in.

## **National Poverty Elimination Strategy (NPES) 2007 -2011**

The recently launched poverty elimination strategy was be crafted around four policy pillars and an additional policy that deals with special attention areas. The strategies around which an action plan is to be implemented are clustered around these pillars.

Notable strategies are:

### ***Policy Pillar 2: Good Governance and Sustainable Development***

2.6 Consolidate and strengthen existing environmental laws and land and protected areas management legislation

2.7 Expand the area of registered land and strengthen land administration at the district level

### ***Policy Pillar 4: Infrastructure to Support Poverty Reduction***

4.3 Regulate the housing sector and promote affordable housing.

4.5 Promote alternative energy in rural areas.

### ***Policy Pillar 5: Strategic and Comprehensive Intervention in Special Attention Areas***

5.1 Target activities to the rural populations.

5.2 Coordinate implementation of Toledo Strategy and Action Plan (TSAP).

## **4 Mitigation Technologies for the LULUCF Sector**

As mentioned earlier, the land cover of Belize is dominated by forests. The forest cover of Belize and the forest sector has the highest potential to mitigate GHG emissions generated by the other sectors of agriculture, energy, waste, and industry as well as the deleterious effects of deforestation and burning through the application of adequate technologies that within the LULUCF sector often mirror sustained development technologies and EST's.

### **4.1 Climate Mitigation and Adaptation Technologies**

Technologies in the forestry sector require a broader definition than in the other sectors. These technologies could include genetically superior planting material, improved silvicultural practices, sustainable harvest and management practices, protected area management systems, substituting fossil fuels with bioenergy, incorporating indigenous knowledge in forest management, efficient processing and use of forest products, and monitoring of area and

vegetation status of forests. These technologies can meet several objectives, including conserving biodiversity and watersheds, enhancing sustainable forest product flows, increasing the efficiency of use of forest products, and maximizing the resilience of forest ecosystems to climate change, in addition to enhancing sinks.

However, it should be pointed out that enhancing sinks will not necessarily or automatically lead to such outcomes. Emphasis must also be placed on carbon accounting methodologies, and the development of rules and guidelines for sink activity which underpin the achievement of these objectives.

#### **4.2 Mitigation Potential of Forests**

Perhaps one of the more comprehensive yet readable studies on the mitigation potential of forests and technology transfer is the IPCC special report on Methodological and Technological Issues in Technology Transfer, 1995. The following paragraphs are paraphrased from this report:

*In 1990 FAO estimated that forests covered about 34,400,000 square kilometers, or about a quarter of the earth's land surface. It is estimated that the total area under tropical forest is 51% of total global forest area. This area represents a forest biomass roughly equal to 67.5 % of total global biomass. Evidently the world's forests store large quantities of carbon (C). It is estimated that 330 GtC is found in live and dead above-ground biomass vegetation and 660 GtC in soil. Furthermore, an unknown quantity of C is stored in wood products. It is currently estimated that forest in high and mid latitudes are a net C sink of about 0.5 to 0.9 GtC annually. Low latitude or tropical forests are estimated to be a **net C source** of 1.1 to 2.1 GtC annually (IPCC, 1995), largely due to clearing and degradation of forests (IPCC, 1996). Forests in addition to being a source of C emissions, are also shown to have a large potential for mitigation, which is estimated to be in the range of 60-87 GtC globally over 50 years (1990 to 2040). Mitigation is accomplished through forest conservation (slowing deforestation), forestation, and regeneration and agroforestry options. Furthermore it is estimated that the tropical forest region dominates by accounting for about 79% of mitigation potential.*

*In addition to forest C conservation and sink expansion, the forestry sector offers a large potential for C emission reduction through fossil fuel substitution. For example it is estimated*

*that with the advances in energy conversion and yield, short rotation woody crops can reduce global fossil fuel emissions by up to 20%.*

*Forest-sector mitigation options are also shown to provide multiple, local environmental, as well as socio-economic benefits, apart from C abatement. Consequently there is a large interest in promoting forest-sector mitigation options. The adoption of forestry mitigation options is subjected to technical, financial and institutional barriers. Technology, including the "software" (such as methods for monitoring forest area and protected area management practices) as well as the "hardware" (logging or processing equipment), is one of the limiting factors, in addition to lack of financial incentives for large-scale adoption of forest conservation, reforestation, sustainable forest management and fossil fuel substitution options.*

*Article 2 of the Kyoto Protocol recommends promotion of sustainable forest management practices, including afforestation and reforestation to protect and enhance C-sinks (UNFCCC,1997).*

*It is important to recognize that technological alternatives can address only a few aspects of the strategies to promote adoption of GHG abatement programmes. For example in countries like Brazil, slowing deforestation represents by far the most attractive option. But the traditional technological solutions can only play a modest role.*

Forests, in addition to being a source of C emission and having a large potential for mitigation, will be subjected to changing climate. The IPCC (1996) concluded that global models project that a substantial fraction of the existing forests will experience climatic conditions under which they do not currently exist. Thus, large forested areas are likely to undergo changes from the current forest types to new vegetation types. However, large uncertainties exist in making regional projections of climate change and the potential response of forest ecosystems.

#### **4.3 Features of Forestry Mitigation Technologies**

- ❖ *Long gestation period. Decisions on transfer and adoption of technologies are going to be determined by the anticipated carbon abatement and long-term biological (such as biodiversity) and socio-economic factors.*

- ❖ *Forestry projects (such as hard wood plantations) could take 50-100 years to provide carbon mitigation benefits. The long gestation period leads to uncertainties regarding carbon abatement and socio-economic impacts.*
- ❖ *Linked to subsistence economy. In tropical countries millions of indigenous and rural households depend on forests for their livelihood, whereas in temperate countries dependence on forestry is largely commercial, although protective functions of the forests are important too. Therefore, the potential impact of forestry projects on the livelihood and local economies is higher in developing countries.*
- ❖ *Subject to natural calamities. Forests and plantations are subjected to fire, drought, pests and diseases affecting the C stocks and flows. Thus, any intervention will have to be carefully evaluated.*
- ❖ *Climate and location specificity of technologies. Forestry technologies vary among tropical, temperate and boreal regions, as well as with varying forest and plantation types, precipitation regions and socio-economic pressures.*
- ❖ *State control of forests. In most countries, and particularly in tropical countries, forests are largely controlled and managed by the state forest departments.*
- ❖ *Mitigation options involving minimal technology transfer. Some of the mitigation options require only policy initiatives, funding, regulations and control (e.g., ban on forest conversion or tighter control of extraction).*
- ❖ *Links to local and global environmental factors. Decisions on forestry will affect biodiversity and other ecological benefits such as watershed protection, soil erosion protection, resilience to climate change and prevention of desertification. Sustainable forest management practices could be beneficial to timber logging countries for conserving biodiversity and watersheds. Most of the local and global environmental benefits have not been well quantified in monetary values.*
- ❖ *Low economic return: Forestry technologies generally have low economic return. This impedes the investments from private (commercial) sectors.*
- ❖ *Long term sustainable approach. Requires adoption of long term sustainable management practices.*
- ❖ *Participation of local communities. Local participation is required for implementing mitigation projects where local communities currently reside in or depend on the forests.*

#### 4.4 Climate Change Mitigation Technologies

Forest-sector mitigation technologies could be grouped into four general categories according to their main expected impact on C emissions and removals:

- a) Carbon conservation (avoided emissions by halting deforestation, forest protection, etc);
- b) Carbon sequestration;
- c) Carbon offsets (substitution of fossil fuels or non-sustainable timber extraction); and
- d) Carbon offsets from wood products.

The technologies are listed in the table below.

**Table 4: Climate Change Mitigation Technologies, Benefits, and Impacts**

<i>Types of mitigation Projects</i>	<i>Technologies, practices and systems</i>	<i>Carbon sequestration or emission reduction potential</i>	<i>Bio-diversity conservation</i>	<i>Socio-economic Benefits</i>	<i>Application in the LULUCF Sector in Belize</i>
	1. Deforestation reduction through policy changes	+++	+++	++	No significant nationally comprehensive policy change but National Land Planning Bill drafted.
	2. Formation of Protected Areas	+++	+++	++	NPASP has been drafted. Strong intersectoral support for consolidation including communities. Strong external support.
	3. Monitoring forest; area and vegetation status	++	++		Evolving but still weak. Ecosystem mapping provide good baselines but monitoring deficient.
	4. Recreational reserves	++	++	++	Well represented but weak management.

	5. Sustainable Forest Management	+++	++	+++	RBCMA and nascent implementation limited to Forest Reserves
	6. Fire protection techniques	++	++		Very limited application (MPRFR, RBCMA, PCNP). Insufficient public awareness.
	7. Reduced impact logging (RIL)	++	++	+	FD/FAO will commence training and establishment of national RIL facility.
Carbon sequestration	8. Afforestation	++	++	+++	None
	9. Reforestation	+++	++	+++	High private sector interest for reforestation of MPRFR following pest outbreak
	10. Industrial Plantations	++		++	None at this scale
	11. Agroforestry	++	+	++	Minimum promotion by MAFC and CBO's
	12. Urban forestry	++	+	+++	None
Carbon Offsets (substitution for fossil fuels and unsustainably harvested wood)	13. Short rotation forestry for biofuels	+++	+	+++	None
	14. Sustainable biomass plantation	+++		+++	None
	15. Waste use for energy	++	+		None. However limited feasibility scoping by private sector

	16. Efficient processing technologies	++		+++	Some examples of application and increasing interest by private sector.
	17. Recycling of forest products	++	+	++	None
	18. Bio-energy (bio-electricity through gasification of biomass or combustion)	+++		++	None
	19. Fuel efficient stoves	+	+	+++	Intermittent limited promotion by CBO's
	20. Biogas for cooking	+++	+	+++	None
	21. Efficient charcoal kilns	++		++	None being promoted
Carbon offsets from wood products	22. Recycling forest products	++	+	+	None
	23 Substitution of fossil-fuel intensive products with wood products (e.g., steel with wood for construction)	++	+	+	None. Actually decline in utilization of wooden houses and components in favour of steel and concrete.
	24 Storage in long-term wood products	++	+		Traditional practice diminishing due to imported substitutes.

Adapted from Methodological and Technological Issues in Technology Transfer

+++HIGH POSITIVE IMPACT

+ LOW POSITIVE IMPACT

As can be appreciated from the table above many of the mitigation technologies available for the LULUCF sector are being implemented in Belize in particular those that do not large capital outlays or expensive hardware.

#### **4.5 Current Pathways in Technology Transfer**

Global experience in technology generation and transfer in the forestry sector is limited, compared to the agricultural and energy sectors. The IPCC Special Report on Methodological and Technological Issues in Technology Transfer indicate that there are three major pathways in technology transfer in the forestry sector.

The pathways are complex and country – specific. The three major pathways are: government, private sector, and community-initiated.

- ❖ Government initiated transfers are predominantly non-commercial in nature and have a low level of involvement of commercial institutions.
- ❖ Private Sector Dominated. Private sector timber companies and industries (paper mills) are increasingly participating in R&D and technology transfer in the forestry sector. Technologies and machinery for recycling, harvesting, and processing are well developed and largely originate from industrialized countries. The private sector is likely to play a larger role in the future, even in developing countries.
- ❖ Community Initiated. A substantial part of technology transfer in the forestry sector within developing countries is driven by local communities and NGOs. This is particularly true for forest conservation practices, agro forestry systems, and systems for harvesting of non-timber and other subsistence products. Much of the transfer also takes place in the form of "software", i.e., training and capacity building. Local institutions, such as NGOs and grassroots organizations, are increasingly participating in these technology transfer programmes. In some countries, such as Mexico, communities with commercial forest resources have organized nation wide organizations of social forestry enterprises. Through these organizations villages receive administrative and technical training and financial resources.

The existing institutions are currently playing a limited role compared to the demands. The existing institutional mechanisms have several limitations to promote climate mitigation technologies, namely, limited resources and absence of policies and institutions to process, evaluate and approve mitigation projects for implementation.

## **5 Criteria for Technology Needs Assessment**

There are several pre-conditions that must first be met for technology transfer to be effective.

The IPCC has grouped these criteria into four categories.

They are (i) GHG and environmentally-related; (ii) economic and socially-related; (iii) administrative, institutional and politically-related; and (iv) process-related:

### **5.1 GHG and Other Environmental Criteria**

#### *GHG reduction potential*

How many tons of carbon or carbon equivalent will be reduced by the application of the technology?

#### *Other environmental considerations*

What will be the percentage change in emissions of other gases/particulates; level of biodiversity conservation, soil conservation, watershed management, indoor air quality, etc.?

### **5.2 Economic and Social Criteria**

#### *Cost effectiveness*

What are the average and marginal costs and how does this compare to alternative options ?

- Benefits of technology transfer must exceed its costs

From the buyer's perspective, especially for enterprises in the private sector with incentives to maximize profits or increase shareholder value, the benefits of a technology must exceed its acquisition costs.

Strong policies and mechanisms must be in place to promote investment in new technology, especially where traditional technology has a policy and legislated monopoly.

The perceived risk of the technology may play an important part in the benefit-cost calculation.

- price and conditions must provide incentives to seller

#### *Adequate financing*

There must be adequate financing available to ensure the transfer of technology. The financing can be in the form of commercial bank loans, capital provided through the equity markets, or any one of a number of new and innovative financing schemes. In addition, financing could be provided by public sector organizations such as countries' DFID, the GEF, or the IFC.

#### *Project-level considerations*

Capital and operating costs, opportunity costs, incremental costs must be estimated and compared to alternative options.

#### *Macroeconomic considerations*

GDP change, jobs created or lost, effects on inflation or interest rates, implications for long-term development, foreign exchange and trade, other economic benefits or drawbacks.

#### *Equity*

#### *considerations*

Differential impacts on countries, income groups or future generations.

### **5.3 Administrative, Institutional and Political Criteria**

#### *Information about technology*

Buyers require accurate, balanced, and comprehensive information about the technologies they are considering acquiring. Information costs money.

The costs to generate useful and useable information about technologies can be costly but, once developed and in the public domain, helps to reduce the buyer's costs.

#### *Access to technology*

Buyers must have access to technology. There are various impediments that sometimes limit the buyers' access.

In some instances, the obstacles may involve patent restrictions, whereas in others it could be the high level of technical know-how and costs that limit the diffusion of the

technology. While in others market restrictions can be important barriers.

*Administrative burden*

Institutional capabilities to undertake necessary information collection, monitoring, enforcement, permitting, etc.

*Political considerations*

Capacity to pass through political and bureaucratic processes and sustain political support; consistency with other public policies.

*Replicability*

Adaptability to different geographical and socio-economic-cultural settings.

#### **5.4 Process-related Criteria**

*Market penetration*

Rate of indigenisation; geographic extent of penetration and impacts on other technologies and ancillary benefits

*Long term institutional capacity building*

- flexibility and capacity to adapt technology to changing circumstances
- capacity of local staff and long-term financing
- improvements in training and management practices

*Monitoring and evaluation of continuous delivery of services provided by technology and adequate financial performance*

- continuous delivery of services provided by technology
- comparison of actual and intended benefits
- performance of technology
- quality of benefits
- satisfaction of beneficiaries
- distribution of benefits (equity)

- maintenance and service of equipment
- adequate financial performance
- payback period
- financial rate of return
- net present value

*Leakages that reduce the impact of the programme or measure*

In the following table an attempt is made to simplify the above criteria in three main groups.

**Table 5. Criteria for Technology Needs Assessment**

<b>Selection Criteria</b>				
<b>1 Contribution to Climate Change</b>				
<b>1.1</b> Avoid/diminish GHG emissions				
<b>1.2</b> Low environmental impact				
<b>1.3</b> Risks of leakage reduced/controlled				
<b>2 Socio-economic Benefits</b>				
<b>2.1</b> Create employment				
<b>2.2</b> Social acceptance and adaptation				
<b>2.3</b> Provide equity in benefits from use of technology				
<b>2.4</b> Use of local resources				
<b>2.5</b> Cost Effective				

<b>2.6</b>	Affordable				
<b>3</b>	<b>Institutional &amp; Political</b>				
<b>3.1</b>	Institutional capability to support technology				
<b>3.2</b>	Real political/policy support				
<b>3.3</b>	Can be replicated				
<b>3.4</b>	Adequate information about the technology				
<b>4</b>	<b>Process related</b>				
<b>4.1</b>	Affordable				
<b>4.2</b>	Investment sustainability				
<b>4.3</b>	Market penetration				
<b>4.4</b>	Long term institutional capacity building				

## 6 Selection of Priority Areas for Needs Assessment

Even though no formal exercise has been carried out to prioritize technology needs in the LULUCF sector in Belize, personal communication with FD staff including the Chief Forest Officer, and also with the Commissioner of Lands and Survey provide some indication of where the priorities lie in the perspective of the two Government agencies whose remit is to manage the land and the land based biota in Belize.

The development and formal adoption of a national land use policy as well as a national land use plan with the necessary supporting legislation would appear to be a high priority for achieving an effective level of land planning and land management at the national level.

A modern national forest policy with the supporting legislation is also indicated as an institutional priority for the FD. In this regard the Forest Department has submitted a proposal to FAO's National Forest Planning Facility.

The development of adequate models of sustained forest management at the sub-national level which are adapted to local conditions but guided by national criteria and indicators for sustained forest management is also considered a priority not only in national protected areas such as the forest reserves but also on other national land considered as production forest as well as private land remaining under forest cover.

It is expected as is currently happening that the major cost of implementing sustained forest management within the forest reserves will be taken up by the private sector, although the Toledo Healthy Forest Initiative plans for community implemented sustained forest management on community managed lands in Toledo. However, presently the national forest policy and legislation does not provide the necessary framework support to ensure that SFM remains both economically and socially viable. Nor is SFM supported by macroeconomic policy.

There is an existing example of carbon conservation through a combination of protected areas management and sustained forest management in the RBCMA funded via a joint implementation mechanism. The devastation of the pine stands in the Mountain Pine Ridge by the Southern Pine Beetle has also created an opportunity for carbon sequestration through reforestation. A private sector company has submitted a proposal to the FD to carry out reforestation and implement long term sustained forest management of the new crop as well as the surviving natural forest.

The application of technology (hardware and software) to create forest monitoring systems including access to recent remote sensing imagery is also signaled as a priority.

The recently completed GHG Inventory for the LULUCF sector in Belize also comments on the uncertainties regarding the areas under forests, rates of deforestation, causes of deforestation and the C-densities in vegetation and soil of different forest categories. Such information is crucial for developing strategies, projects and technologies to reduce deforestation. Currently, the lack of funding and technical capabilities in most of the national institutions limit the generation of information on all of the above aspects. Therefore the development of forest monitoring systems which provide updated and systematic assessments of forest areas, vegetation status, biomass densities and growth, etc. are also considered a priority together with the creation and maintenance of robust and comprehensive forest information systems that can provide data for national carbon accounting methodologies, rules, and guidelines, including more reliable GHG inventories in the LULUCF sector.

Herrera ( 2002), estimates that Belize has 217,241 ha. of potential Kyoto areas or 10 % of the land area. However, this area also includes soils with very high fertility where it is expected that the cultivation of agricultural crops has a higher probability. It was also estimated that socio-economic circumstances would also reduce the probability for reforestation and afforestation. Therefore, based on this analysis, the total Kyoto areas in Belize eligible as potential sites for CDM projects was reduced in the estimation to 19,106 ha. The baseline carbon sequestration potential for Kyoto areas in Belize is estimated at 376,928 tons of carbon.

The primary and secondary conversion of timber in Belize has been characterized as obsolete and inefficient. However, in the last 10 years, a few private sector companies have increasingly invested in modern and more efficient timber processing equipment that reduce waste during resawing of flitches to squared lumber as well as increase the useful lifespan of timber. Two companies have also carried out feasibility studies on the utilization of wood waste to generate energy. Nevertheless, the conversion ratio for most sawmills in Belize is below 50% and the greater part of timber residue from the conversion of round timber into lumber or other wood products is burnt. A significant volume of utilizable timber is also left in the forest as logging residue. Tighter legislation and regulations which promote more efficient utilization of timber during primary and secondary processing are required. For example, there is no legislation which regulates the operation of sawmills.

## 6.1. Barriers

The current and emerging pathways and mechanisms for technology transfer in the LULUCF sector are:

- Limited financial resources
- Absence of policies and institutions to process, evaluate, and clear mitigation projects
- Uncertainty regarding quantity of GHG abated and its permanence
- Longer periods to realize carbon benefits (e.g. hardwood timber plantations),
- Low economic returns for some technologies
- Absence of consideration of the economic value of environmental benefits
- Inadequate information on the costs and potential benefits
- Competing and perverse macroeconomic policies that favour conversion from forests to other land uses
- Insecure land tenure regimes
- Direct and indirect agriculture subsidies

In Belize, the existing institutions and arrangements are inadequate to meet the emerging challenges of promoting forestry-based mitigation projects. Like most of the Central American and Caribbean countries, the Government's Forest Department plays a predominant role in all aspects of forest protection, regeneration and management. Therefore, perhaps one of the most pervasive barriers to technology transfer in Belize at the institutional level is the limited financial support and technical capability of most institutions to generate information required for the planning and implementation of forestry mitigation projects. These limitations also extend to most NGO's and certain areas of the private sector as well. There is also inadequate capacity to participate in international research projects, and to adapt and transfer results of the research to the local level.

The emergence of improved monitoring methods could force reappraisal of the relative credibility of activities to manage carbon sinks. For countries like Belize, monitoring and verification are key elements in gaining the credibility needed to capture the potential benefits of forestry sector response options, particularly in reducing deforestation. Unfortunately there is less certainty placed on forest management and the least on conservation. There is a higher degree of certainty with respect to reforestation and afforestation. This can be considered a generic barrier to deforestation reduction initiatives.

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Personal Communication Mrs. Noreen Fairweather, Ag. Commissioner of Lands and Survey, Lands and Survey Department, MNRE

Personal Communication Mr. Wilber Sabido, Chief Forest Officer, Forest Department, MNRE

## **Annex 1. Strategic Action Plan of the FD 2005 to 2010**

**Strategic Result 1:** Forests sustainably managed to maintain and improve their ecological functions and to contribute significantly to the local and national economy

*Strategy No. 1.1 Ensure High Quality and Efficient Management of the Ranges (Program Area 1. Sustainable Forest Resources Management (SFRM))*

Strategic Activities:

- Conduct rapid resource assessments of the key timber and non-timber forest products through technical cooperation programs with international agencies.
- Prepare and implement Sustainable Forest Resources Management plans.
- Strengthen management capacity and resources at range level.
- Develop and implement a capacity building program for range personnel.
- Establish a coordination mechanism with the Lands Department as it relates to land use and the forest estate under the management of FD.
- Maintain an updated forest information system (FIS) to facilitate decision-making.
- Participate in the review of the definition of development of Forest Lands particularly on national and private lands within a broader land use policy and strategy.
- Review and amend the existing laws as it relates to community forestry, long-term forest licenses, salvage licenses, saw mills licenses, and co-management agreements and private protected areas.
- Establish a facilitating environment for the introduction and practice of certification with the assistance of International relevant agencies such as the Forest Stewardship Council, Rainforest Alliance, and World Wildlife Fund (WWF).
- Establish, modernize, and implement new policies, standards and procedures that will ensure the efficient management of the forests and its wildlife, thereby promoting a high quality of forest health and sustainable production.
- Initiate the development of national policies, laws and regulations for environmental goods and services to ensure their future value as income generating sources for the FD as well as establishing review mechanisms of existing contracts with the major utility companies.
- Continue the discussions on the establishment of Wetlands and Mangroves as a program of FD.
- Finalize and implement forest health strategy.
- Improve FD Technical capacity on forest health issues.
- Continue developing baseline for forest health.
- Identify and prioritize research related to pests and diseases.

*Strategy No. 1.2 Increased income generating and collection capabilities (Program Area 2. Forest Revenue and Exploitation Control (FR&EC))*

Strategic Activities:

- 1.2.1 Institute administrative fees and compliance bonds into forest licenses.
- 1.2.2 Establish system to reduce the level of arrears at the ranges.
- 1.2.3 Review current location of range offices to improve the efficiency of revenue collections and range management.

*Strategy No. 1.3 Establish a Law Enforcement Program to reduce incidences of illegal activities. (Program Area 7. Law Enforcement Program (LEP))*

Strategic Activities:

1.3.1 Maintain and improve coordination system with enforcement agencies.

1.3.2 Increase monitoring patrols and community outreach.

i. Forest Reserves

ii. Protected Areas (NPSA)

iii. National Lands

iv. Private Lands – (Pay half of royalties)

1.3.3 Control and reduce the number of chainsaw licenses and petty permits

1.3.4 Develop in-house capacity at FD to manage legal issues and advise on legal matters such as in Exploitation Control in Timber (e.g., sawmill regulations, review of forest rules, etc.) and NTFPs in the development of legislation and ancillary regulations

## **ii. Programs**

The demands of the globalization era will continue to dictate the ways in which resources are managed, produced and traded to the benefit of the nations and industries involved. The forest sector is no exception to this reality and should be prepared in conducting its business in this direction. The paradigm shift from traditional timber to the global needs for more bio-diversity resources such as wildlife, non-timber forest products, environmental goods and services and the demands of tourism for these resources needs to be considered seriously. This shift provides major opportunities for the Forest Department to increase its revenue generation capacity and thus secure its financial sustainability.

Also the Forest Department as the Focal Point for three international conventions (UNCBD, CITES, & RAMSAR) needs to proactively comply with these commitments that the GOB has signed and ratified.

**Strategic Result 2:** All programs streamlined to their core elements and harmonized for the efficient regulation and management of the forest.

Strategy 2.1 The strengthening of Forest Department's ability to respond proactively to internal and external thrusts through the integration of its programs: 1) Forest resource planning and management, 2) Forest Revenue and Exploitation Control, 3) Law enforcement, 4) Protected areas management (PAMP), 5) Wildlife, 6) Biodiversity, and 7) National and International Partnerships.

Strategic Activities: Protected Areas Management Program (PAMP) (Program Area 4).

2.1.1 Strengthen the PAMP in order to implement the policy and management guidelines developed by the NPAPSP under FD's mandate.

2.1.2 Revisit the co-management agreement framework to ensure that NGOs and CBOs understand their legal and social obligations and negotiate with partners for the sharing of the revenues from entrance and other fees.

- 2.1.3 Promote the establishment of a coordination mechanism for the management of protected areas among the GOB, NGOs, CBOs, and BAPPA members.
- 2.1.4 Establish and implement a national public awareness program on PAs.
- 2.1.5 Actively promote and institute cross-border cooperation in protected areas management (Trans-boundary PAs)
- 2.1.6 Review and amend existing legislation to incorporate recommendations of the NPAPSP project.

Strategic Activities: Wildlife (Program Area 5).

- 2.2.7.1 Under the Wildlife Program revise and expand current legislation to make provisions for the sustainable use of wildlife for tourism, educational and income generation purposes, to proactively meet the marketing demands of these sectors.
- 2.1.8 Establish a fee structure, permit system and certification as tools to regulate the use of the wildlife resources.
- 2.1.9 Develop and institute a wildlife policy that will include guidelines and procedures to regulate the use of wildlife resources and mitigate negative effects from human/wildlife interactions.
- 2.1.10 Establish a CITES office within the Forest Department

Strategic Activities: Biodiversity (Program Area 6)

- 2.1.11 Promote development of the National Biodiversity Policy and Legislation to integrate commitments under International Conventions and provide guidelines for biosafety and bio-prospecting.
- 2.1.12 Review and update relevant legislation (Forests Act, National Parks System Act, Wildlife Protection Act, and other relevant forest legislation and regulations) to identify gaps and areas of improvements, and make recommendations to address them.
- 2.1.13 Monitor threats to biodiversity with a particular focus on the protected areas system, critical habitats, and threatened species, etc..
- 2.1.14 Strengthen institutional capacity of FD to coordinate biodiversity research and monitoring
- 2.1.15 Create, implement, and expand a Clearing House Mechanism (CHM) that facilitates Biodiversity information-sharing to support decision-making.
- 2.1.16 Strengthen the National Herbarium in order to enable it to respond to current and future user needs.
- 2.1.17 Coordinate the implementation of a National Biological Corridors Program

*Strategy 2.2 Strengthened Strategic Alliances to facilitate the coordination and regulatory functions of the FD. (Program Area 7 National and International Partnerships)*

Strategic Activities:

- 2.2.1 Facilitate collaboration efforts with local organizations leading to the enforcement of the regulations and laws by the Forest Department.
- 2.2.2 Establish strategic initiatives for future involvement in national organizations that assist and impact directly on the Forest Department to respond to its future direction.

2.2.3 Negotiate status in regional organizations and initiatives such as TRIGOH, BEMAMCCOR, MBRS, MAR, etc., for financial support in order to increase Forest Department's ability to effectively participate in the activities of the tri-national natural resources management initiatives.

2.2.4 Strengthen FD's capacity to access available funds and technical resources from international conventions and organizations such as CBD, IABIN, CITES, RAMSAR, CCAD, IUCN, etc., and local and foreign universities.

### **iii. Resources**

**Strategic Result 3:** FD well-resourced at a level that will provide for the integrated and sustained management of the ranges and its programs.

Strategy 3.1 *Conduct a financial sustainability strategy for the FD in order to break-even within the next 5 years.*

Strategic Activities:

3.1.1 Develop and implement a financial sustainability strategy for the Department.

3.1.2 Review and revise all fees, and introduce new services and fees.

3.1.3 Creation and build-up of Development Fund for FD.

3.1.4 Maximize financing and Technical Cooperation opportunities from Multi-Lateral agencies – such as GEF, UNDP, The World Bank, IDB, FAO, EU, etc.

3.1.5 Establish strategic partnerships with various industry sectors to secure a fair share of revenue to support the management of the forest resources.

Strategy 3.2 *Develop and implement the most suitable Staffing and Organizational Structure with the appropriate levels of remuneration in sync with responsibilities, experience and qualifications. (Refer to Organizational Structure Matrix – Table 2)*

Strategic Activities:

3.2.1 Develop a cadre of professionals (Permanently Established Staff) dedicated to carry out the strategic functions of the department.

3.2.2 Develop plan for general workers absorbed by the private sector (Tourism, Timber) or other Government agencies.

3.2.3 Improve the coordinating mechanisms for Staff Administration directly under the responsibility of the Ministry.

3.2.4 Establish performance-based Human Resource Management Systems (HRMS) linking performance with rewards.

3.2.5 Improve communication between Program Managers and ranges.

Strategy 3.3 *Efficient use and management of vehicle fleet, equipment, buildings, and other operational resources directly under the responsibility of FD.*

Strategic Activities:

3.3.1 Improve the coordinating mechanisms between FD and General Administration directly under the responsibility of the Ministry.

### **iv. Institutional and Organizational Strengthening – Process Management**

**Strategic Result 4:** An effective and efficient organization with updated legislation, regulations, etc., with improved management of the forest resources.

Strategy 4.1 *Update legislation, regulations, policies, standards, procedures, etc., to improve the regulation and management of the forest resources*

Strategic Activities:

- 4.1.1 Carry out pilot projects to conduct preliminary valuation of forest resources in order for the FD to improve its decision-making vis-à-vis the maximization of the benefits from the proper use of the forest resources.
- 4.1.2 Improve compliance monitoring and enforcement of regulations and laws of the FD.
- 4.1.3 Introduce and develop capacity for evaluating resource management effectiveness under the mandate of the FD.
- 4.1.4 Secure technical cooperation programs with multi-lateral agencies for a comprehensive review of legislation and development of modern legislation and regulations
- 4.1.5 Publicize the role of FD to increase its visibility

**v. Institutional Structure**

**Strategic Result 5:** A dynamic organization with leadership equipped with a high sense of ownership, decision-making capability, flexibility and potential to become economically sustainable.

Strategy 5.1 *FD to consider strategic options that would make it viable and sustainable in the context of globalization and its challenges for financial sustainability.*

Strategic Activities:

- 5.1.1 Senior Management of FD and the Ministry to seek advice on the best possible option for the Institutional Structure that FD will need in order to be financially sustainable over the long term, taking the recommendations of the NPAPSP project into consideration.

Conduct a qualitative assessment of the GHGI of the LULUCF Sector and relevant sub sectors in order to identify the main GHG contributors with the potential for growth.

Identify appropriate mitigation technology and the barriers to their application in the Belizean scenario