

**TECHNICAL NEEDS ASSESSMENT
OF THE
INDUSTRIAL SECTOR IN BELIZE**

**SECOND NATIONAL COMMUNICATION
TO THE UNFCCC**

BELIZE CLIMATE CHANGE PROJECT

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

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SUMMARY

In partial fulfillment of its reporting obligations as a party to the UNFCCC Belize has recently undertaken completed its second national inventory of sources and sinks of green house gases. This eventually will form a part of Belize's Second National Communication to the COP of the UNFCCC. Complementing this national inventory are a number of prioritized vulnerability studies as well as a technical needs assessment of certain subsectors. This report addresses the technical needs assessment for the Industrial Sector.

The results of the second national greenhouse gases inventory revealed that the industrial sector contributed the least amount of GHG to Belize's total GHG emission. Approximately 2.2 Gg of GHG was produced by the sector in 2000. This is less than 1% of total GHG production. Within the industrial sector sugar production account for over 50% of GHG produced. The inventory also shows that with the exception of lime production all the other areas in the industrial sector produced NMVOCs as the GHG.

A technical needs assessment required an analysis of the various industries that contribute to the production of GHGs. This analysis shows that most of these industries are small in size and output with the possible exception of the sugar industry. It was also noted that most of these industries are comprised of only one or two factories as is the case of the brewery, distilleries, and sugar processing plant. These industries use processes that are standard and which are designed for future expansion. It was thus determined that there was little opportunity for technology transfer in this sector. Lime production is one area where technology transfer may lead to a reduction in GHG. In assessing the technical needs of this sector three activities were looked at. These are improved kiln design, fuel use management, and quality control management.

A list of criteria was developed as a basis to carry out the needs assessment. This consisted of three broad areas namely; development benefits, market potential and contribution to climate change. Each of these broad areas had a number of indicators to which a rating of one to three was assigned.

The results show a balance between the three activities that were assessed. An improved kiln designed would produce more efficient use of fuel since less heat would be required. By controlling the heating procedure this would contribute to a more consistent quality being produced.

It is recommended that the climate change focal point be strengthened to better serve as a technology information clearinghouse. To effect any technology transfer this would be facilitated by forming the lime producers into a cooperative.

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INTRODUCTION

The second national inventory of green house gases showed that emissions from the industrial sector continue to be released from the same sources as those for the first inventory. In 1994 the total GHG emission amounted to 1.73 Gg. This has increased to 1.81 and 2.20 Gg in the years 1997 and 2000 respectively. The inventory results show only two areas are sources of GHG's in the industrial sector in Belize. These are mineral production and food and drink manufacture. Mineral production includes lime production, and use of asphalt for paving. Food and drink manufacture include production of liquor, bread, processed meats, sugar and animal feeds. Table 1 summarizes the quantities of GHG emissions for each sub-sector for the years, 1994, 1997, and 2000.

Table 1 *Sources and quantities of GHGs from Industrial Processes for the years 1994, 1997 and 2000*

CATEGORY	SUBCATEGORY	GHG Produced	1994 Gg	1997 (Gg)	2000 (Gg)
Production of Lime	Limestone heating	CO ₂	0.29	0.28	0.26
Production and use of other mineral products	Road paving with asphalt	NMVOC	0.34	0.19	0.64
Food and Drink	Alcoholic Beverage Production	NMVOC	0.01	0.01	0.01
Food and Drink	Processed meat production	NMVOC	0.00	0.00	0.00
Food and Drink	Bread and other Food Production	NMVOC	0.03	0.03	0.03
Food and Drink	Animal Feed Production	NMVOC	0.01	0.01	0.01
Food and Drink	Sugar production	NMVOC	1.05	1.29	1.25
TOTAL			1.73	1.81	2.20

Except for limestone production, the other subsectors produced NMVOC's. The industrial sector in Belize accounts for only a small fraction of GHG's produced

(<1%). A number of these industries can have significant GHG emissions however, when other sectors such as agriculture and the waste sector are also considered.

Activities in the industrial sector are localized and tend to operate as point sources of pollution. For example rum production is limited to only four plants, two in Orange Walk, one in Belize City and one in Belmopan. Likewise lime production is limited to only one area of the country.

For the year 2004 these industries represented about 7% of GDP. Mining and quarrying activities was an estimated BZ 9.8 million while manufacturing of food products and beverages was an estimated BZ138.3 million. Total GDP for 2004 was BZ2071.2 million (www.cso.gov.bz).

REVIEW OF LEGISLATIVE AND INSTITUTIONAL FRAMEWORK

POLICY

The Government of Belize is committed to the sustainable development of the country. New investments, as well as the expansion of existing development projects, are actively encouraged by the Government. To facilitate these investors GOB has created the Belize Trade and Investment Agency (BELTRAIDE). The purpose of this agency is to provide guidance and support to potential investors, in the process, making Belize a very attractive country to invest in. The economic and social benefits (including environmental conservation, preservation and enhancement) of such investments play a major role in Government's decision to grant these investors incentives such as tax holidays, duty exemptions, EPZ status, etc.

Belize does not have legislation specific to technology transfer. However technology transfer is one of the tools that small developing countries can use to become competitive in a global environment. This is especially true if appropriate technologies from countries of similar geographic and socioeconomic standings are adopted. Use of technologies are integrated into various policies and strategies including the National Environmental Strategy Plan, and the Food and Health Security Policy.

National Environmental Protection Strategy Plan

The Department of the Environment is a department within the Ministry of Natural Resources and the Environment, responsible for fostering the prudent use and proper management of natural resources of Belize, the preservation, protection and improvement of the environment and the control of pollution, thus guaranteeing a better quality of life for present and future generations.

Objectives

The Department's principal objectives are to:

- Attain the widest range of beneficial uses of the Belizean environment without degradation, risk to health or safety;
- Seek the full participation of all ministries, departments and related agencies in the development and effective implementation of environment laws and policies;
- Enrich the public's knowledge and increase awareness of the importance of sound environmental practices;
- Assure all Belizeans safe, productive and aesthetically pleasing surroundings;
- Enhance the quality of renewable resources and approach the maximum attainable recycling of non-renewable resources;
- Enforce the provisions of the Environmental Protection Act.

Environmental Protection Strategies

The DOE operates on one-year implementation and five-year development plans. The department's major tasks are to recommend national policies to promote improvements in environmental quality, to recommend priorities among environmental programs and to assist in achieving international cooperation in dealing with environmental problems. The strategy of the Department includes the following points:

- (i) Strengthened coordination of environmental activities between government, non-governmental organizations and the private sector.
- (ii) Establish and enforce standards for industrial and commercial effluent pollution control.

(iii) Review and reform, as necessary, existing environmental legislation and regulations and strengthen their enforcement.

(iv) Increased environmental planning for key areas of development such as the coastal zone and marine environment.

(v) Establish an information system to store data and information on the environment and to facilitate in planning.

(vi) Ensure that the environmental impact assessment (EIA) process be undertaken, by both private and public sectors, for all environmentally sensitive projects.

National Food and Agriculture Policy (2002-2020)

For the Agriculture sector, Gob is firmly committed to sustainable rural development and sees the agricultural sector (including livestock and fisheries) as providing the economic base for enhanced economic growth of the country, in particular of the rural areas, whilst contributing to poverty alleviation. The agricultural and food policies are accordingly designed to make the agricultural sector more efficient and competitive, while at the same time, contributing to the improvement of the economic and social well being of the population.

The overall Government's agricultural policy is based on the following broad objectives:

- Promoting sustainable agriculture and rural development.
- Increasing the efficiency and competitiveness of the agricultural sector as a whole.
- Accelerating diversification in the production of exports.
- Increasing food production, enhance food security and improve the nutritional status of the population.

- Improving income generation, distribution and equity with enhanced participation of small producers, communities and indigenous groups.
- Strengthen inter-sectoral linkages, in particular with the social sectors of health and education, as well as with the strategy and action plan for poverty eradication.

Under these broad objectives the need for sustainable development of rural areas as well as protection of the natural resource are important to climate change. These sectors will be addressed as follows.

Sustainable Development of Rural Areas

- Establish a national rural development program to contribute to a sustainable increase in competitiveness of production activities, food security and social well being.
- Address the main policy, institutional and infrastructural weaknesses and constraints of small and mid-size producers.
- Improve human capital through training, organization and technology transfer.
- Foster micro-enterprise development to make more productive use of rural natural and human resources.
- Improve information systems to provide information on markets and opportunities for small producers and micro-enterprises.
- Strengthen development programs of indigenous groups and communities.

(v) Natural and Environmental Resources Management

- Promote an integrated approach to the use and management of natural and environmental resources for agricultural production, tourism and settlement development.
- Improve management of fishery and forestry resources to achieve an optimum combination of their productive, protective, recreational, scientific and educational capabilities.

LEGISLATIVE FRAMEWORK

Legislation specific to the industrial sector are non-existent. However, the environmental and labor laws are applicable to this sector and would guide how technology transfer would be used to encourage development and minimize any impact on the environment. Below are some of the legislation that would impact this sector.

The Environmental Protection Act (Chapter 328 of revised edition 2000)

The Belize Environmental Protection Act relates to the preservation, protection and improvement of the environment, the rational use of our natural resources, and the control of pollution.

Environmental Impact Assessment Regulations

This regulation was enacted in 1995. Its regulations govern the type and size of development that requires an EIA.

The Mines and Minerals Act (Chapter 226 of revised edition 2000)

The extraction of all non-renewable resources except petroleum is regulated by the Mines and Minerals Act (1988). The government owns all minerals under public and private lands, and, minerals are reserved from all future grants of state lands. The act provides for licenses and royalties for the taking of minerals, and prohibits the pollution of any river, stream or watercourse.

Standards Act (Chapter 295 of revised edition 2000)

The Standards Act is designed to establish standards for goods, services, processes and practices. It establishes the Bureau of Standards. Section six of the Act sets out the function of the Bureau to include the promotion and to encourage the maintenance of codes of practice, specifications and standards. This includes ensuring industrial efficiency and development. Section five allows inspectors to take steps to eliminate any process which may adversely affect the environment.

INSTITUTIONAL FRAMEWORK

The industrial sector is an aggregate of a number of industries with no linkage to each other. Several agencies regulate these agencies in relation to their processes and production methods. The following agencies are stakeholders in this sector.

Department of the Environment

The Department of the Environment (DOE) has been operating since 1989, but achieved full legal status with the enactment of the Environmental Protection Act, 1992 (EPA). It is a Department within the Ministry of Natural Resources and the Environment (MNRE). The DOE has a wide function in matters pertaining to environmental protection and the control of pollution. It is responsible for monitoring all activities that impact on the environment and health. The Environmental Protection Act mandates that the DOE require from industry the preparation of Environmental Impact Assessments and risk analyses, and to make suitable recommendations to mitigate the harmful effects of any proposed action on the environment. Its duties include: monitoring environmental health; advising the Government on the formulation of policies relating to the good management of natural resources and the environment; conducting studies and making recommendations on standards relating to the improvement of the environment and maintenance of a sound ecological system; through Inter-ministered Cooperation, and to foster the prudent use and proper management of the natural resources of Belize.

Several Statutory Instruments have been passed under the EPA. One such instrument is the Effluent Limitations Regulations, 1995, which, among other things, requires that Industry maintain a registry of pollutants and that industry meet certain standards for effluent discharges.

While the DOE's laws and regulations do not specifically mention the management of greenhouse gases, the Act provides for the enactment of regulations to control, prevent, and minimize the emission of GHGs.

Geology and Petroleum Department

The Geology and Petroleum Department is responsible for management of mining and quarrying in Belize. Mining licenses and permits are issued for the mining of material both on land as well as offshore. This includes mining of limestone beds for the manufacture of road material, sand and gravel for building and for land reclamation. The extent to which mining is regulated depends on the quantity as well as location. For quantities less than 15,000 cubic yards a permit is issued by the Department. For larger quantities a license has to be obtained which needs to be approved by the Minister responsible for mining. As a result small users such as the Caleros who normally use the spoils from these quarries have not been required to obtain a permit. Given the small amount that each Calero uses on an annual basis this may not warrant the issue of a permit.

Cooperatives Department

The mission of the Cooperatives Department is *"to enable the common person to generate income and self improvement through organized group enterprises based on cooperative philosophy and principles for sustainable development."*

This Involves:

- i. Promoting, educating and training groups seeking registration.
- ii Registering of cooperatives and credit unions
- iii Regulating and supervising cooperatives and credit unions including drawing up by-laws for societies, inspecting of records, auditing of accounts, and settlement of disputes submitted for arbitration and cancellation and liquidation of societies
- iv Promoting, supporting and assisting the development, management and monitoring of economic enterprises to ensure sustainable development

The role of the Cooperatives Department is to act as a catalyst committed to the consolidation, strengthening and development of credit unions and cooperatives in Belize by providing for the organization, education, supervision and guidance necessary for the mobilization of human and other resources in cooperative efforts, which will foster social and economic change.

The Government of Belize policies for the sector has six broad objectives:

- Assure the effective participation and full integration of women in cooperative development at all levels.
- Greater involvement of youths in the cooperative movement.
- Improve the management, economic and financial viability of cooperatives and credit unions.
- Strengthen the monitoring, inspection and supervision of credit unions and cooperatives
- Provide the legal environment, which will allow societies to operate as businesses.
- Increase the capacity of rural communities
- Enhance public confidence in credit union and cooperative enterprises.

These broad objectives provide new agenda for action in the sector. Government's policy will be directed at extending assistance in areas of education and training, technical and financial support in order to improve the management and contribute towards the viability of cooperatives by providing a climate, which affords credit unions and cooperatives a fair opportunity to compete with commercial enterprises.

Ministry of Works

The Ministry of Works is responsible for the construction, and maintenance of all public roads that are not within town or city limits. Major road works are normally contracted out to private road construction companies through a tender process.

The MOW retains overall oversight and regulatory responsibility including certifying the integrity and completion of the road works.

Through its Public Works Department the MOW carries out maintenance work on these roads including patching of potholes, painting of dividers and clearing of road shoulders. The importation and use of bitumen is controlled by the MOW and the importation of bitumen is usually assigned to one or two companies. These importing companies need to report on the quantity and type of bitumen being imported as well as the country of origin.

ANALYSIS OF SUBSECTORS FOR TECHNICAL NEEDS ASSESSMENT

The results of the inventory show that there were only two sources of GHGs within the industrial sector. At the same time all these activities with the exception of lime production emit NMVOCs as the GHG. For the 2000 reporting year, sugar production accounted for approximately 57% total GHG emission from this sector while lime production and road paving with asphalt accounted for 12% and 29% respectively.

Road Paving With Asphalt

Use of asphalt in road paving is dependent on road building programs of the Ministry of Works. The importation of asphalt is limited to one or two companies and is usually obtained from Guatemala or Mexico. The use of large quantities of asphalt does not occur on a daily basis but is instead used in batch processes. This area was deemed as having limited opportunities for technology transfer due to its limited application.

Food Processing

Food processing accounts for less than 2% (~ 0.01Gg) of GHG emission from the industrial sector. The one brewery and four distilleries are able satisfy the needs of the small Belize market. Beer production as well as rum production are virtual monopolies. Bakeries are limited in size as a result of the small consumer base. Most ovens are either butane or biomass (wood) burning with a limited number of electric ovens. Bakeries are also susceptible to shifting population preferences and as a result many of them have closed down. Likewise other food processing activities that are already established may find it difficult to incorporate new technologies due to the financial implications.

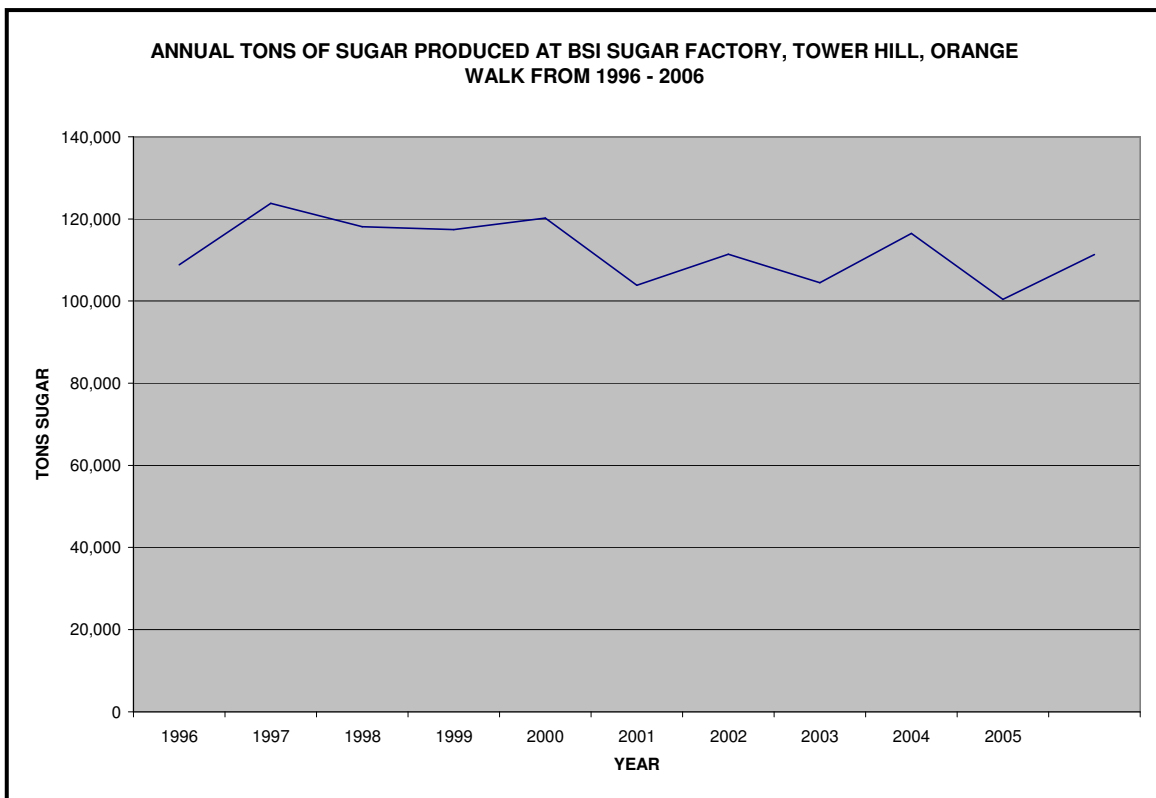
Sugar Production

For the last ten years sugar production has averaged approximately 110,000 tons ranging from a low of 100,435 tons in 2005 to a high of 123,782 tons in 1997. Sugar production is limited by the quota system under the LOME IV Convention.

World market price for sugar is significantly lower than the production cost of BSI and as such this sugar cannot compete on the open market. Belize, like other ACP countries, continues to rely heavily on the EU market to sell their sugar at a preferential price.

The installation of a co-generation plant at the Tower Hill Factory will allow for sugar production to be increased by at least fifteen percent. This increase would be primarily to ensure an adequate supply of bagasse for continuous year round energy generation.

An increase in sugar production is not expected to require any changes to present infrastructure at the sugar factory. In this respect therefore, changes in production levels is not expected to lead to any changes in the process. Technology needs is therefore expected to be low.



Lime Production

Lime production accounts for only 12% of total GHG emission from the industrial sector. The commercial production of this cottage industry is limited to only two communities on the Hummingbird Highway. Other producers are small scale activities for personal use. Recently lime has been in competition with dolomite that is mined in the Toledo District. It has lost a large chunk of the market to dolomite to the extent that lime production has actually decreased.

SELECTION OF PRIORITY AREA(S) FOR NEEDS ASSESSMENT

Based on the analysis of the various subsectors it is determined that the only activity for which a needs assessment is required would be lime production. For the other sectors the cost of adopting alternative technologies may not be offset by the benefits in terms of lower operating costs and reduction in GHG emission. These other sectors also emit NMVOCs while lime production emits CO₂.

CRITERIA FOR TECHNOLOGY NEEDS ASSESSMENT

In order to assess the technology needs of the lime production industry three broad based criteria groups were used. These are development benefits, market potential and contribution to climate change. These groups were further divided into a number of indicators as shown below.

1. Development benefits

- Job creation
- Wealth creation for the poor
- Capacity building
- Social acceptance
- Use of local resources
- Lead to efficiency improvement in industry
-

2. Market Potential

- Initial capital outlay
- Affordability
- Investment sustainability
- Low maintenance – durability
- Commercial availability and
- Replicability

3. Contribution to Climate Change

- No or low GHG emissions
- Minimal harm to the environment
- Low potential for leakage
- Enhance sinks and waste recovery

Selection Process

Three areas in the lime production sector were examined for potential benefits that might be derived through technology transfer. These are kiln design, biomass use for fuel and quality control and packaging. These three areas are briefly described.

Kiln Design

An improved kiln design could lead to a reduction in GHG production as well as to a reduction in the amount of fuel used during the calcination process. Most of the present kilns were not designed to minimize the use of fuel or to reduce GHGs. The present kilns used to convert the limestone to lime were designed to facilitate filling with raw material and to remove the finished product. Typically these kilns may have a rounded shape with the sides made of brick. While some of the kilns are lined with clay bricks some are made from the same limestone. The roofs of most of these kilns are exposed and are covered with zinc sheeting during calcination. An improved kiln design would allow for air used to cool the end product to be re-circulated to heat the raw material and therefore reduce the heat requirements.

The lime industry at one point was poised to be very competitive with a very stable market. The need for lime in the agriculture and aquaculture industry is very important. The aquaculture industry requires that the lime utilized in the industry is of a consistent quality. For this reason many of the shrimp farms discontinued buying lime locally as the quality was inconsistent.

Biomass Use for Fuel

During the production process wood is steadily burned for three to five days after which the lime is allowed to cool. The amount of fuel used is generally more than is needed for all the raw material to be converted to lime. By improving the kiln design less fuel may be needed for the process.

Fuel used for calcinations includes waste lumber from sawmills, felled trees from plantation clearing as well as lumber cut specifically for use in these kilns. As the boundaries of the forest in the vicinity of these kilns, have withdrawn, the caleros have had to look further away for a cheap wood supply. This has increased the fuel cost and as such the overall cost of production.

Lime burners seek to produce the highest quality quicklime from their limestone at the lowest possible costs. Fuel is one of the major production costs of lime burning and that, coupled with the increasing scarcity of fuel wood and the environmental impact of deforestation, requires that the burning process be assessed as to how much fuel it takes to produce a quantity of quicklime. There are a wide variety of kilns which can be used to perform these tasks and consideration needs to be given to the quality of lime required and the capital, labour and fuel available for the project.

Quality Control and Packaging

Monitoring of the product during the production process would allow for the end point to be more accurately determined. This would reduce the time as well as amount of fuel required.

Careful packaging as well as having a quality product could potentially allow for the lime to be sold in other markets apart from the traditional buyers.

These thematic areas were ranked based on a grading system of 1 to 3. High chance for applicability received a score of 3 while low chances of use of technology received a score of 1.

SELECTION CRITERIA	IMPROVED KILN DESIGN	FUEL CONSUMPTION MANAGEMENT	QUALITY CONTROL AND PRESENTATION
1. Development benefits			
Job creation	1	1	1
Wealth creation for the poor	2	1	2
Capacity building	3	2	3
Social acceptance	3	3	3
Use of local resources	3	3	2
Lead to efficiency improvement in industry	3	3	3
2. Market Potential			
Initial capital outlay	3	3	2
Affordability	3	3	2
Investment sustainability	3	3	3
Low maintenance – durability	3	3	2
Commercial availability	3	3	2
Replicability	3	3	3
3. Contribution to Climate Change			
No or low GHG emissions	3	2	3
Minimal harm to the environment	3	2	2
Low potential for leakage	2	2	3
Enhance sinks and waste recovery	3	3	3
TOTAL	44	40	39

CONCLUSIONS AND RECOMENDATIONS

The industrial sector provides few opportunities for technology transfer. This is further complicated by the small scale activities of the industrial sector in Belize. With the possible exception of BSI, the other industries tend to be very small.

CONCLUSIONS

- The industrial sector produces only a small percentage of the total GHG emissions as reported in the National GHG Inventories that have been prepared.

- Within the Industrial sector sugar production accounts for the greater portion of GHG emission

- The prevalent GHG emitted was NMVOCs with a small amount of CO₂ also being emitted

- With the exception of lime production all the other industries produced NMVOCs. The lime production industry produces CO₂.

- There are few areas for technology transfer within the industrial sector.

- Lime production is one of those areas where technology transfer may be possible

- Possible technology transfer activities include improving kiln design, reduction in fuel use, and setting up a quality control management system

- The assessment shows that these three activities can be put in place and that their combined actions would lead to greater efficiency in this sector.

RECOMMENDATIONS

1. The national climate change focal point and other relevant existing institutions should be strengthened to better serve as technology information clearinghouse. Stakeholders need to have a designated agency to disseminate relevant information on technology needs.

2. Government should promote private sector involvement in the transfer of the identified technologies. This involves creating the economic, cultural, social, environmental, growth environment that will facilitate the private sector in successfully investing in these new technologies.

3. Developed country Parties should assist Belize with technical and financial resources to ensure the effective implementation and transfer of prioritized technologies in a timely manner.

4. Government's policy direction must take into account the capacity needs in technology transfer consistent with the obligations assumed under the UNFCCC. The obligations arising out of the UNFCCC and its attendant legal instruments must be translated into national legislation.

6. Imported technologies must also be compatible with social, cultural, economic and environmental priorities. Where possible, the imported technology can be combined with local innovations to evolve new technologies.

7. General stakeholder participation must be ensured in the technology transfer processes.

8. With the assistance of the Cooperative department, the Lime producers Association should be revived. This would allow them to explore other markets as well as to set standards for product quality.

STAKEHOLDERS IN THE INDUSTRIAL SECTOR

The stakeholders in the industrial sector come from different industries which may not have any commonalities among them. These stakeholders however play an important role in the socio-economic development of the country. The list presented below is by no means exhaustive and other stakeholders are constantly being added as new industries emerge.

Government Departments

1. National Meteorological Service
2. Ministry of Natural Resources and the Environment
3. Ministry of Agriculture and Fisheries
4. Bureau of Standards
5. Central Statistical Office – Statistical Institute of Belize
6. Geology and Petroleum Department
7. Public Works Department

Industry Stakeholders

- 1 Casa Pan Dulce Bakery
- 2 G. Kee and Sons Bakery
- 3 Kee's Bakery
- 4 La Popular Bakery
- 5 Torres Bakery
- 6 Sunnyside Bakery
- 7 Belikin Brewery
- 8 Belize Minerals Ltd
- 9 Belize Mills Ltd
- 10 Travellers Ltd
- 11 Chef Meat Market
- 12 Lino's Meat Shop
- 13 Marudo's Meats
- 14 McKesey Meats
- 15 Rio Azul
- 16 Running W Brand Meats
- 17 Southside Meats
- 18 Cuello's Distillery Ltd.
- 19 L and R Liquors
- 20 Citrus Producers
- 21 Banana Industry
- 22 BSI
- 23 Papaya Producers
- 24 Belize Dry Cleaners

25 CISCO Ltd.

National and International Funding and Technical Agencies

UNDP

GEF

BEST

Help for Progress

BRDP

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