National Issues Report on Key Sector of Energy of Energy (Mitigation) For Saint Lucia

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Content

Why energy is a key sector for the country?

Energy is vital to the economic, social and physical development of Saint Lucia. Energy services are required for electricity generation, water supply, agricultural production, transportation and telecommunications. With the exception of unquantified usage of solar water hearers and biomass for domestic cooking, all energy consumed in Saint Lucia is from imported fossil fuels. Given Saint Lucia's almost total dependence on imported energy, meeting local energy demands have serious implications for the island's balance of trade and foreign exchange reserves.

The recent developments in energy at the global level have led to a number of planned and ongoing regional initiatives. These include a greater interest in renewable energy in most countries including increased technical and financial support for such projects. Given the significant amount of foreign exchange reserves spent on imported fossil fuels, countries such as Saint Lucia are seeking to increase the contribution of non-fossil energy into the energy mix. In addition, a number of countries have entered into agreements for energy supplies, such as the Petrocaribe Agreement which seeks to provide petroleum from Venezuela to the Caribbean under more favourable terms and conditions.

Adequate storage and distribution infrastructure exist on the island. Energy security concerns are therefore limited to security of supplies and the ability to pay for them. In this regard, regional agreement among CARICOM countries and the Government of Trinidad, who is the main supplier, adds to confidence in energy security for conventional energy. However, in the long term, this security is threatened by the volatility of the international oil markets as well as pressures anticipated from declining reserves. For these reasons, Saint Lucia should explore the exploitation of indigenous energy resources such as solar, geothermal, wind and biomass, all of which will also address greenhouse gas mitigation.

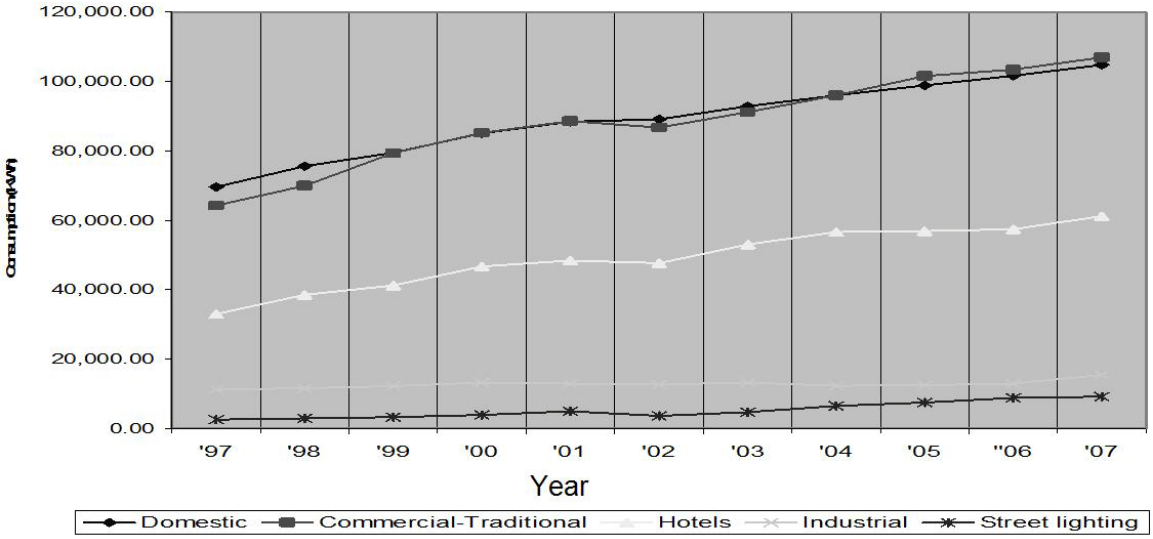
A national greenhouse gas emissions inventory for Saint Lucia was conducted in 1994 and 2000 as part of the First and Second National Communications respectively. However, as this is carried out on an ad-hoc basis with the use of international consultants, there has been some "memory loss" between the two periods. There is therefore need for a data repository that would store the inventory, information sources, assumptions and methodologies used for future reference. There is also need for building capacity in these areas. Under the Second National Communications, which is currently being prepared, some attempt is made to structure the deliverables to ensure that local capacity is developed, particularly in cases where external consultants are engaged. In addition, the national Climate Change Focal Point proposed to expand its energy information database which currently comprises annual energy balances to include data and information to support decision making for investments in the energy sector and the impact of those investments.

DESCRIPTION OF THE ENERGY SECTOR

Energy Access, Status and Trends

About 99% of the population lives in dwellings supplied with electricity. In comparison with countries at a similar stage of development, Saint Lucia has a low energy intensity. In 2001, the per capita primary energy consumption was estimated at about 18.9 million Btu, compared with the average per capita consumption of 38.46 million Btu for the OECS states excluding Anguilla for which no data is available. Electricity consumption by sector between 1997 and 2007 is presented in Figure 1 below.

Figure 1: Electricity Consumption by Sector, 1997-2007



Source: Saint Lucia Electricity Services Ltd.

During this period, electricity production grew steadily from 240 GWh to 345GWh, and the general trend in Figure 1 is expected to continue. In 2007 the installed capacity was 76MW.

In the transport sector, the vehicle population, which is well serviced with petroleum distribution centres, was approximately 44, 100 (*Pers. Comm* Ministry of Communication, Works, Transport and Public Utilities 2009), giving an average of 1 vehicle per 3.8 persons. There has been a steady growth of vehicle ownership, with average annual imports of 2800 vehicles between 2000 and 2006.

The major use of non-electrical energy in the domestic sub-sector is for cooking. National census data reveal a shift away from the use of charcoal and fuelwood towards liquefied propane gas (LPG) as the primary cooking fuel, between 1980 and 2001. In

1980, while 68 percent of households used wood or charcoal, only 12.1 percent relied primarily on this fuel source in 2001 (Saint Lucia Department of Statistics).

In 2001 Saint Lucia imported about 140 413 Tons of oil equivalent (TOE), at a cost of some US$25 million or 20% of the island's total export earnings. About 30% of this is used for electricity generation.

Table 1: Importation of Petroleum Products – 2001

Fuel	**Quantity**			
	Imperial gallons (IG)	Barrels (BBL)	Tonnes of Oil Equivalent (TOE)	Barrels of Oil Equivalent (BOE)
Leaded Gasoline			NA	NA
Unleaded Gasoline	10,344,434	295,808	36,680	264,318
Gas Oil (Non Elec. Generation)	3,015,339	86,226	11,985	86,367
Kerosene			NA	NA
LPG	13,390,120	70,548	6,558	47,260
Lubricants	101,760	2,909	404	2,914
Lubricants (lb)	10,226		4.50	32
Bitumen	NA	NA	NA	NA
Fuel Oil				
Spraytex	420,798	12,033	1,672	12,052
Av-jet	6,286,128	179,757	23,907	172,279
Av-gas				
Gas Oil (For Electricity Generation)	14,893,580	425,895	59199	426,591
Total			**140,413**	**1,011,816**

Source: National Energy Balances.

The unverified imports for 2007 is 172, 246 TOE and projections are for a steady average annual growth of about 3%.

Primary Energy resource potential

Saint Lucia has no known petroleum reserves or potential, and all secondary energy is imported, mainly from Trinidad. Imported petroleum accounts for about 98% of the gross commercial energy supplies. Except for wind and geothermal energy, indigenous energy sources (hydropower, fuel wood and charcoal) are limited, have a low potential, and are not yet fully developed. However, solar energy promises some economic potential in the form of domestic water heating and crop drying, with the former gaining in applications due to government tax incentives and private sector financing arrangements.

Transmission, distribution and storage

Refined petroleum products are imported into the island by the petroleum marketing companies, Sol EC Ltd. and Texaco, and Hess Oil St. Lucia Company Limited (HOSL). All petroleum products are stored at the Hess oil storage facility in the north of the island under a common carrier arrangement with the marketing companies who operate a total of 19 petrol stations around the island. Hess Oil also supplies the electricity company with fuel. Liquified petroleum gas is stored at the depot in the south of the island and distributed through the petrol stations and local retail outlets island-wide.

The Saint Lucia Electricity Services Ltd. (LUCELEC) has concentrated its generation capacity at its Cul de Sac power plant with sub- stations at five locations around the island. Transmission is through a 66KV ring which circumscribes the island with step down voltages supplied to the population centres.

Brief description of the regulatory framework and business and investment environment

Electricity Supply is regulated by the Electricity Supply Act of 2001 which grants LUCELEC the sole right to generate, transmit and distribute electricity on the island. This monopoly position is further supported by a guarantee rate of return of at least 15% of the average of the company's debt and equity. This arrangement provides no incentive for LUCELEC to accommodate independent power producers, co-generation operations or grid-connected renewable energy systems in which the Company has no commercial interests.

The price of petroleum products is regulated under an arrangement which fixes the mark up for the storage facility and retail outlets, but allows the taxes to fluctuate to ensure fixed prices at the pump. Adjustments to the retail price are triggered by pre-determined changes in world crude prices as well as by public policy.

Emission trends

Greenhouse gas emissions come mainly from the use of fossil fuels. To date only two calculations on national emissions were done. Under the First National Communications, 1994 was used as the base year for calculating Saint Lucia's Greenhouse Gas Inventory, while 2000 was used for the Second National Communications. The inventory figures are presented in Table 2 below:

Table 2: Greenhouse gas Sources and Sinks

Greenhouse gas sources and sinks	1994 Co_2 Emissions (Gg)	2004 Co_2 Emissions (Gg)
Energy	268	347
Land Use Change and Forestry	84.6	21.2
Biomass	7	7.9
Total Emissions	**359.6**	**376.1**

Source: Saint Lucia First National Communications and GHG Inventory for the Second National Communications.

PROPOSED MITIGATION OPTIONS FOR THE ENERGY SECTOR

In 2001, Saint Lucia approved a Sustainable Energy Plan which sets clear targets for renewable energy, energy efficiency and reduction in greenhouse gas emissions. Implementation of the plan and achievement of the targets would have resulted in climate change mitigation. The Plan sought a reduction in greenhouses gas emissions of 12% of the 1994 baseline by 2005 and by 35% of the baseline by 2010. These targets were based on real projects for the country which to date have not been implemented. The projects included the development of a wind farm of approximately 13.5 MW and approximately 10 MW of geothermal energy. Energy efficiency and conservation measures were also included in the plan, but the primary GHG reductions were associated with the wind and geothermal initiatives. Although the targets have not been met, the projects are still feasible and with advances in technology and a greater acceptance of renewable energy there may be even greater potential. The targets for the electricity sector set in the Sustainable Energy plan are presented in table 3 below. The options for climate change mitigation in the energy sector in Saint Lucia include the use of solar, wind, geothermal and biomass energy. In addition, increased energy efficiency and conservation, especially in the domestic and hotel sectors, are also good options.

Table 3: Electricity Sector Targets[1]

Year	**Target Peak Demand** (% reduction from baseline)	**Target Installed Capacity** (% reduction from baseline)	**Target Renewable Energy Installed** (% of total installed capacity)	**Diesel Fuel Consumption** (% reduction from baseline)	**GHG Emissions** (% reduction from baseline)*
2005	51 MW (5% reduction)	75 MW (5% reduction)	5 MW (7% of total)	436 579 barrels (12% reduction)	166 197 tons of carbon equiv. (12 % reduction)
2010	55.7MW (15% reduction)	77.4 MW (15% reduction)	17 MW (20% of total)	392 823 barrels (35% reduction)	149 539 tons of carbon equiv. (35 % reduction)

Source: Saint Lucia Sustainable Energy Plan.

[1] The estimated GHG emissions from the Electricity sector in 2005 was extrapolated to be 188.86Gg.

Solar Energy

Saint Lucia's location at approximately 14 degrees north of the equator means that it is well positioned to take advantage of solar energy. The island receives an almost constant amount of surface solar radiation from month to month and is therefore able to generate electricity using photovoltaic (PV) technology. The island also enjoys a tropical maritime climate with a fairly constant high air temperature averaging near 28ºC. Temperatures seldom rise above 33ºC or fall below 20ºC. This means that the country can also take advantage of solar energy for passive heating.

Solar water heating holds much scope for use in both the domestic and hotel sectors. Currently a solar water heater for a household in Saint Lucia costs in the range of US$1,500 - $ 2,600. There is some financial support for purchasing, such as hire purchase schemes and financing through banks and credit unions. Government has also put in place concessions for solar water heaters by allowing first time purchasers to claim up to Eastern Caribbean (EC) $6,500 (US$2,407.40) on their income tax returns.

Whilst the use of solar water heaters is spreading due to some financial support, the cost of photovoltaic systems continues to pose a challenge. The cost of a photovoltaic system installation producing between 7000-14000 kWh per year is estimated at starting at EC$9,250 and may exceed US$37,000.00 depending on the technology used. On the global market the cost of photovoltaics is reducing and this, coupled with a more encouraging regulatory environment for independent power producers, has lead to increased interest in Saint Lucia. The local electricity company, which has exclusive rights to generate, sell and distribute electricity, has entered into an agreement with a local company which installs photovoltaic technology. This agreement allows for net-metering of electricity produced by PV for 10 installations in the first instance. The installations allowed thus far must be less than 10 kW. This means that owners of a PV system can produce electricity for their homes whilst remaining connected to the grid and can even feed their excess electricity into the grid. This recent development shows that there is potential for greater use of PV technology in the country. In addition, government has granted duty free concessions to all technologies intended to harness renewable sources of energy and this, coupled with the net metering initiative, holds prospects for an expansion of PV technology.

Recent growth in the number of companies and technicians entering the field of solar energy also shows that there is scope for expansion of the sector locally. The products and services offered includes a wider range of passive solar heating technologies, solar environmental and other specialized lighting applications and energy conservation services complementary to the use of solar energy. The Government is also promoting solar energy with the planned introduction of 4 new PV demonstration projects These projects will be located on public building with maximum visibility to help raise public

awareness and education on the benefits of solar technology, thereby encouraging wider applications.

Wind Energy

Saint Lucia lies in the northeast Trade Wind belt which provides a favourable regime for wind energy development. Although currently there are no major projects where wind is captured for electricity production on the island, preliminary analysis points to a promising future. In 2003, a study was undertaken by the local electricity company which investigated 34 sites on the island. Based on the results the utility concluded that the south east of the Saint Lucia presented the most favourable conditions for wind energy development. Additional studies undertaken by the company with the assistance of the Caribbean Renewable Energy Development Programme (CREDP) have focused on the three top sites for wind energy development.

The Utility, with the assistance of CREDP, has been looking into the construction of a 12 MW wind farm at one of the sites and the experts believe that there are enough resources for this to be upgraded to a 24 MW wind farm at a later stage. Wind monitoring is being carried out at the site at a height of 10 metres above the ground. The data obtained show an annual average wind speed of 6.46 m/s which is deemed sufficient for a wind farm. Based on estimates provided by the CREDP, construction costs of a 12 MW wind farm in Saint Lucia in 2006 were approximately Euros 12,000,000 or US$ 18,000,000. The estimates of energy production could potentially result in 11,5000 tonnes of CO_2 being avoided.

Geothermal Energy

Saint Lucia is a volcanic island with the potential to develop geothermal energy. The scientific data shows the existence of a high-temperature geothermal system in the south-western part of the island. The geothermal energy there can be used as direct heat or can be used to produce. As geothermal energy is very reliable and non-intermittent it can be used as base load power stations which could replace the diesel powered stations normally used in Saint Lucia.

Several studies have been conducted on geothermal energy in Saint Lucia and exploitation during the 1980's produced enough steam to demonstrate the viability of geothermal energy exploitation. However, the low pH of the geothermal fluids presented very acidic conditions and this unfavourable geochemistry of the resource has been a key factor in limiting development in the past. Scientific advancement and adequate funding can address this problem. The Government of Saint Lucia remains committed to geothermal development.

Estimates on how much geothermal energy can be developed in Saint Lucia vary. However, most experts recommend a modular approach to development beginning with a 10-20 MW geothermal plant. World Bank figures for geothermal production estimate that a 20 MW binary geothermal plant cost US$4,100 per KW in 2005. Although this figure was predicted to decrease by 7% by 2010, given the current increase in global prices, the 2005 prices may still be applicable today. This suggests that the cost of a 20 MW binary geothermal plant for Saint Lucia would be in the range of US$ 82,000,000.

Waste to Energy and Biomass Energy

There is potential for energy to be derived from waste in Saint Lucia, especially given the development of the Deglos Sanitary landfill. The operators of the landfill have been approached by several proponents of different technologies for this cause. However the potential and cost will depend not only on the amount of waste generated but the technology used. The cost and potential for energy from biomass will also depend on the technology being considered.

Energy Conservation and Efficiency

The Sustainable Energy Plan highlighted many areas for energy conservation and efficiency in Saint Lucia. Although this may result in a number of small individual initiatives being undertaken, together their accumulative impact on the national greenhouse gas emissions would be significant. Measures recommended include the move to energy saving lighting and energy efficient appliances and equipment. The domestic, hotel and industrial sectors could all benefit from these measures. The introduction of energy audits by Energy Service Companies (ESCos) would better help to identify where opportunities exist and to make recommendations on what measures can be employed. The architectural design and construction of new buildings can also play a vital role in making new and existing building more energy efficient.

As can be gleaned from the above, mitigation options are varied and include:

- Cleaner fuels;
- Geothermal energy;
- Wind Energy;
- Solar energy (both passive and photovoltaic applications);
- Energy efficiency and conservation;
- Co-generation; and
- Waste to Energy applications.

Related technologies have matured to the commercialization stage. There are, however three key barriers.

Firstly, given the small local energy market, the scale of mitigation technologies applicable tends to be uncompetitive when compared to current market prices. Secondly, the current policy and legal climate discourages new entrants into the power sector, thereby limiting the entry of mitigation technologies not favoured by the current power producer. Finally, bearing in mind that the initial cost for mitigation technologies is high compared to conventional power production technologies and the returns flow mainly from fuel avoided costs, the legislated rate of return on capital investments for the power company allows for returns higher that what would flow from investments in conventional power technologies for the same outputs.

Taken together, these are significant barriers which must be addressed to facilitate easier deployment of mitigation technologies in the power sector.

KEY ISSUES IN ASSESSING INVESTMENT AND FINANCIAL FLOWS TO ADDRESS CLIMATE CHANGE MITIGATION IN THE ENERGY SECTOR

Data availability and other relevant information constraints

Even within the small size of Saint Lucia's energy sector, there are significant mitigation opportunities deserving of closer analysis. At the outset, however, mitigation targets or a time based mitigation scenario should be set to give a context to the effort. In this regard, the targets in the Sustainable Energy Plan (See Section 3 above) will serve as a useful starting point. Further considerations will include:

- pronouncements in the Draft Energy Policy for Saint Lucia;
- recommendations to flow from the Second National Communications currently under preparation;
- any commitments that may be imposed by COP 15 or subsequent decisions of the Parties to the UNFCCC;
- generation expansion plans of LUCELEC, including its plans to exploit renewable energy resources;
- net metering arrangements between LUCELEC and small scale solar energy producers;
- opportunities for, and quantification of efficiency and conservation initiatives;
- technology assessments; and
- any forestry expansion recommendations that may flow from the water sector analysis.

The mitigation projections will be based on quantified mitigation opportunities and assessments of success potential within the proposed time lines. Given that success potential is a qualitative assessment based on technology availability and transfer, investment capital and supporting policy or regulatory frameworks, the mitigation projections will be determined through a mixture of mathematical analyses and subjective considerations, with opportunities for collaboration and consensus throughout the process.

Obviously a wide range of data will be required to support the mitigation targets to be set. In this regard, data and information on mitigation technologies, costs, acquisition and assimilation potential and possibility for integration into existing generation and distribution infrastructure will be required if the projections are to be real and implementable. Table 4 below is a list of the data and information requirements considered at this point to be necessary, but not necessarily sufficient to support developing a realistic mitigation scenario.

Table 4: Data and information requirements to assess mitigation technologies

Mitigation Technologies/ Opportunities	Data and Information requirements for Analysis and Decision making	Availability	Sources
Cleaner Fuels (e.g. using LPG or CNG in the power and transport sectors)	Availability	Yes	From petroleum industry sources
	Conversion costs	Yes	From experts
	Storage and bulk supply	No	Information may be available from other countries using LPG or CNG for power generation
	Distribution facilities	No	Related costs may be available from other countries with these facilities
	Operation and maintenance costs	No	From experts
Geothermal Energy	Field potential	Enough to support further exploration decision	Previous assessment reports
	Appropriate technology, given conditions related to World Heritage status of geothermal field	Yes	From experts
	Investment costs	No, but can be sourced	From investors and experts
Wind Energy	Wind regime	Enough to support investments	Caribbean Development Bank, LUCELEC, Ministry of Physical Development
	Capacity displacement potential	No	From industry experts
Solar (including PV)	Solar insolation	Yes	Global database
	Investment Costs	yes	Market information
Co-generation	Exploitation opportunities		Research and assessments needed
	Energy yields	No	Assessments needed, but expert knowledge may yield required results
	Impact on Utility	No	To be researched
Waste to Energy	Landfill yields	No	To be researched
Energy Efficiency and Conservation	Equipment efficiency standards	Yes	Available from equipment manufacturers
	Effectiveness of ESCOS	No	To be researched
	Policy and regulatory framework	Yes	Policy documents
	Audits/effectiveness of conservation programmes	No	Research needed

As should be clear from Table 4, the required data is generally not available from local sources and there are no immediate plans to invest in related data collection and analysis. For the purposes of the IFF assessment, indicative investment and financial flow data should be adequate to make determinations on mitigation technology options, with more accurate determinations made as part of any implementation decisions. In addition to the above, the cost of delivering power for each mitigation option must be ascertained and decisions taken to ensure that economic competitiveness is not compromised. In this regard, opportunities for grant financing or carbon credit flows to offset initial investments are to be assessed. Further, costs related to technology transfer and capacity building must be internalized in financial analyses to ensure that hidden costs are avoided. These represent data and information gaps also.

Proposed Methodological Approach for the Sector

As can be seen in Table 4 above, data and information are available to support initial decision making for key mitigation technologies. In this regard, what is needed at this time is the appropriate policy environment to promote the adoption of related mitigation technologies. In those cases where data required to support decision making is not available it will be necessary to enter into partnerships with technology providers and experts to fill the gaps.

The IFF assessment will focus on four main areas in the energy sector, electricity generation, hydrocarbon supply, transportation and energy efficiency measures. Currently, St. Lucia has almost universal coverage of electricity supplied by a monopoly company which depends on imported diesel for electricity generation. There have been efforts towards electricity generation using renewables but to date there have been no renewable projects except for some very small private projects. The use of hydrocarbons for energy use other than electricity energy is also an important area for climate change mitigation. This includes the use of gasoline, kerosene, liquified petroleum gas (LPG), Compressed Natural Gas (CNG) and diesel. The transportation sector which currently contributes significantly to Saint Lucia's greenhouse emissions is expected to grow and according to preliminary studies is expected to become the number one contributor to the greenhouse gas emissions. The energy efficiency sub-sector was selected as the area has been largely understudied but could hold significant potential. The ongoing mitigation component of the second national communication should provide information that will assist the IFF assessment of the energy sector. As these projects may occur simultaneously it expect that there will be dialogue between the two initiatives and synergies will be built.

PROPOSED APPROACH/RECOMMENDATIONS FOR CONDUCTING THE ASSESSMENT OF INVESTMENT AND FINANCIAL FLOWS TO ADDRESS CLIMATE CHANGE MITIGATION IN THE ENERGY SECTOR

Institutional arrangements

The energy planning portfolio in Saint Lucia is not clearly defined. To address this deficiency, the National Energy Policy proposes the following arrangement:

Assignment of Energy Planning to a Ministry of Government

The Ministry in charge of Energy Planning shall have responsibility for formulating and monitoring the implementation of the national energy policy, strategy and the resulting plans. This implies policy formulation and implementation, research, data and information collection, storage and dissemination, market intelligence, efficiency and conservation policies and standards, safety issues, demand side management programmes and promoting private sector participation and investments.

Ministry responsible for Public Utilities

The Ministry in charge of Public Utilities shall serve the consumers' interests by ensuring that they are provided with an efficient, reliable and cost-effective energy service. It will also act as the principal body to issue licences for electricity services and installations.

Energy Policy Advisory Committee

Government should establish an Energy Policy Advisory Committee to provide advice on energy-related issues and activities by, *inter alia*, creating a discussion forum among state institutions and the private sector. It will further advise on, and make proposals for the required policies and actions to ensure that the overall objectives of the energy sector reform are achieved in the shortest possible time.

In pursuing this body of work, innovations and policy options for the transport sector, which is the second highest contributor to national greenhouse gas emissions, should be integrated into the scenarios, technology selection and economic analyses to ensure a comprehensive approach to the national mitigation initiatives.

The Sustainable Development and Environment Section (SDES) of the Ministry of Physical Development and the Environment will lead the IFF initiative and will identify and contract suitable expertise to provide the data required for the assessment. Expertise to be contracted will be guided by the data requirements identified in Table 4

above. It is envisaged that the following entities will assist with assessing the investment and financial flows needed to meet the agreed mitigation targets:

Entities	Roles
Ministry of Physical Development and Environment (SDES)	• Overall responsibility for conducting the IFF assessment • Provision of energy sector data • Provision of policy documents for review • Contracting and managing the work of local experts • Data and information gathering from external sources • Support SDES with the IFF assessment
Energy sector IFF Team Leader (to be contracted)	• Compile and synthesize inputs from team members • Ensure quality and completeness of inputs and outputs • Prepare IFF report for the energy sector
St. Lucia Electricity Services Ltd. (LUCELEC)	Provision of data and advice: • Generation expansion data • Demand growth forecasts • Investment flows • Technology options
Energy Service Companies	Inputs include: • Technology assessments • Investment and financial flow assessments • Assessment of co generation, efficiency and conservation potential
Financial Expert	• Assessment if IFF for selected technologies and mitigation options.

National sources of finance and investments for the energy sector

Fuel imports, storage, and distribution are private sector initiatives as is power generation, transmission and distribution. Consequently, investments in the energy sector have been from private sources and are likely to remain so in the foreseeable future. These include investments in solar water heating as well. Notwithstanding, government has invested indirectly by allowing duty free imports of technologies designed to harness renewable sources of energy as well as income tax relief for private investments in solar water heating.

With regards to investments in greenhouse gas mitigation technologies, there is a role for government to become involved securing grant funding for demonstration projects and to help finance exploratory projects to harness renewable energy sources, particularly the country's geothermal potential. At the commercial level, Government should also become more involved in pursuing grant funding and carbon offset capital flows to reduce initial capital costs and by extension, the economic feasibility of mitigation technologies and options.

Conclusion

Saint Lucia's contribution to global greenhouse gas mitigation will be small. Therefore, the pursuit of related policies and investments should not have climate considerations as the main driver, but rather by the economics of mitigation technologies, which will include the availability of grant and carbon funds. In addition, technological advancement at the national level and energy security should also be guiding forces. In this regard, a national mitigation policy and investment programme should be pursued as a matter of high priority.

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