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This document has been prepared by Elizabeth Emanuel, consultant, and Charmaine Gomes, Coordinator of the Sustainable Development Unit at the ECLAC subregional headquarters for the Caribbean, in the framework of the activities of the project ECLAC/German Cooperation project "Sustainable Energy in the Caribbean".

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Abstract

Energy represents a fundamental input for modern economies and social life. The world today faces two main threats related to energy, namely inadequate and insecure supplies and global warming due primarily to the over-consumption of fossil fuels. Like many other Caribbean countries, Grenada, Saint Lucia and Saint Vincent and the Grenadines are almost entirely dependent on imported petroleum as their primary socurce of energy.

In this regard, many countries in the subregion have taken a strategic approach to long-term planning in the energy sector towards creating higher levels of efficiency on both the demand and supply side as well as promoting diversification in the energy mix. Grenada, Saint Lucia, and SaintVincent and the Grenadines have developed national energy policies that seek to improve energy efficiency and conservation in all sectors, promote the use of alternative sources to petroleum such as liquefied natural gas (LNG) and develop renewable energy technologies based on the countries' indigenous supplies. Saint Vincent and the Grenadines has also developed its first energy action plan that identifies specific actions to be taken in the short, medium and long term.

As in other Caribbean countries, transport and electricity generation account for the largest consumption of energy in these three countries, with both sectors accounting for approximately 90 per cent of national energy consumption. The transport sector, which comprises land, air and maritime modes, represents a critical component of any country's national development. One of the most fundamental attributes of the sector is the ability to move persons, goods and services between spatial locations at the local, regional and international levels.

Within this context, this study was conducted to present mechanisms to improve energy efficiency (EE) in the transport sector in Grenada, Saint Lucia and SaintVincent and the Grenadines. For each country, the report presents a brief description of current trends in energy consumption generally as well as energy issues in the transport sector and programmes, initiatives and regulatory mechanisms currently in place that are contributing to energy efficiency in this sector. The report also presents a range of recommendations that can be adopted by the countries as they pursue more sustainable practices and look towards improving and advancing energy efficiency in the transport sector.

The national energy policies of these three countries include a focus on the transport sector and outline actions for increased efficiency and fuel diversification in this sector. However, comprehensive national transport policies that incorporate these energy goals do not exist. Fortunately, collaboration among the various sectors has begun in each country. Through the promulgation of the energy policies, multi-sectoral committees and working groups have been created, which could provide a model for the development of comprehensive transport policies that address issues related to energy as well as land use and finance.

Recommendations to promote energy efficiency and fuel diversification in the transport sector are presented in three categories: policies to encourage transport system efficiency (land use and urban planning); policies to encourage vehicle efficiency (increasing energy efficiency in freight, increasing fuel economy of new vehicles, and influencing driver behaviour); and institutional arrangements linking transport and energy. These recommendations include the development of national transport and spatial planning policies ensuring that they support the goals of the energy policy. To facilitate more accurate assessment of the transport sector, it is recommended that countries prioritise the collection and analysis of data relating to their transportation energy consumption. This will then lead to better planning and management of the sector. Other recommendations include financial and tax incentives and mandatory labelling programmes which may exist in other sectors that address, for example, heating and lighting, but which are needed specifically for the transport sector. Other recommendations include improving efficiency in public and private passenger and freight vehicles through fuel quality standards, driver education programmes, and vehicle maintenance requirements.

I. Introduction

Energy represents a fundamental input for modern economies and social life. The world today faces two main threats related to energy. These are inadequate and insecure supplies at affordable prices and global warming due primarily emissions that result from over-consumption of fossil fuels. Coupled with this is the challenge that the prospects for global energy markets heighten concerns around energy security and the impact of climate change on energy-dependent small island States such as those in the Caribbean. Small island developing States (SIDS) are unique because of their small size and geographical location. Furthermore, SIDS also are vulnerable to the high cost of imported fossil fuels.

Most Caribbean countries are almost entirely dependent on imported petroleum as their primary socurce of energy. Also, in the majority of these countries, transport and electricity generation account for the largest consumption of petroleum. In this regard, many countries in the subregion have taken a strategic approach to long-term planning in the energy sector towards creating higher levels of efficiency on both the demand and supply sides as well as diversification of the energy mix either through the use of alternative sources such as liquefied natural gas (LNG) or through the deployment of renewable energy (RE) technologies based on the countries' indigenous supplies. The thrust by governments towards diversfication of the energy mix in almost all Caribbean countries is being aggressively pursued as a means of advancing energy security and promoting international competitiveness and affordability of energy supplies at the domestic level as well as to the productive sectors.

The transport sector, which comprises land, air and maritime modes, represents a critical component on national development in any country. One of the most fundamental attributes of the sector is the ability to move persons, goods and services between spatial locations at the local, regional and international levels. The efficient management of the sector can provide tremendous economic and social gains to a country through indirect and direct employment as well as induced development which ultimately leads to wealth creation and growth.

Globally, the transport sector has the highest final energy consumption of all sectors (about 20 per cent of world energy consumption in 2011 (IEA, n/d) and, without any significant policy changes, is forecast to remain at this level. This scenario is no different for Caribbean countries. The Organisation of Eastern Caribbean States (OECS, 2013) stated that these countries rely on imported fuel for

electricity generation, as well as for transportation and other services. The estimated energy mix comprises approximately 50 per cent of all imported fuel allocaed to land and water transport, 30 to 40 per cent for electricity generation and 10 to 20 per cent for residential cooking and commercial heating. Due to the fact that more than 50 per cent of imported oil is used for transportation, this sector also contributes to the majority of greenhouse gas (GHG) emissions in these countries. For Saint Vincent and the Grenadines this is slightly different as they enjoy the benefits of having part of their electricity generated by hydroelectric power plants.

Ensuring the movement of passengers and goods between different areas is fundamental to the prosperity of any economy and for the welfare of its people. However, despite its benefits to the economy, the transport sector is also the source of a range of negative impacts. The combustion of fossil fuels produces emissions that contribute to environmental problems such as air pollution and noise at the local level, while, at the global level the contribution of carbon dioxide (CO_2) and other GHGs to global warming is the main problem. In the transport sector, these impacts may be addressed through the promotion of greated energy efficiency and could be articulated in national transport policies which, as a matter of priority focus on technology improvements, traffic organization and modal shifts.

For the three countries examined in this report, the implementation of energy efficiency measures is a priority. With respect to the transport sector, all transport modes continue to show increases in activity with concomitant fuel use and will continue to do so in the future as countries advance their economic growth prospects. Road transport (passenger cars and freight trucks), in particular, will continue to dominate overall demand for oil as a source of energy in the transport sector in all three countries. Air travel and shipping are expected to continue to grow particularly as all three countries continue to put programmes in plans to expand their tourism sectors.

Since the transportation sector, on average, consumes approximately half of the fuel imported into these countries, the sector represents one of the main challenges for energy security and climate change mitigation. Improving energy efficiency in this sector is therefore a matter of urgency. Thus, it is necessary to identify priorities and develop and implement strategies (both technical and non-technical) for transport energy efficiency and fuel diversification within these countries. The strategies proposed in this report will be aligned to the national energy and transport policies where they exist and where possible will take into account the specific policy and regulatory framework existing in each country. In addition, the strategies proposed also will address reduction in CO_2 emissions to enable these countries to play their part in reducing their carbon footprint.

This report presents mechanisms to improve energy efficiency (EE) in the transport sector in three countries, namely Grenada, Saint Lucia and Saint Vincent and the Grenadines. For each country, a brief description of current trends in energy consumption generally as well as energy issues in the transport sector is presented as well as programmes, initiatives and regulatory mechanisms currently in place that are contributing to energy efficiency in the transport sector. The report also presents a range of recommendations that can be adopted by the countries as they pursue more sustainable practices in the transport sector and look towards improving and advancing energy efficiency in that sector.

A. Profile of the energy sector in Grenada – Issues and challenges

1. Energy supply and demand

Grenada is a tri-island Caribbean nation encompassing the islands of Grenada, Carriacou and Petite Martinique. Although this tri-island state is small in terms of landmass (344 km^2), it contains abundant sources of renewable energy such as solar, wind and geothermal.

The energy sector in Grenada is not unlike other Caribbean countries where there is high dependence on fossil fuels. The electricity generation sector accounts for approximately 40 per cent of Grenada's energy consumption, with the transport sector accounting for slightly less[1]. Grid access is over 99 per cent. The electrical utility has an installed capacity of about 50 MW and peak demand of about 30 MW. Key electricity market indicators are presented in Table 1.

TABLE 1
KEY ELECTRICITY INDICATORS 2008 - 2011 – GRENADA

Key Market Indicators	2008	2009	2010	2011
Peak Demand (MW)	28.9	29.5	30.83	30.29
Net Generation (MW)	189.82	195.39	201.40	196.82
Sales including Street Lighting (GWh)	172.50	177.33	184.78	180.88
Number of customers at year end	41 222	42 928	42 699	44 249
Average Consumption Domestic (kWh)	1 897	1 833	1 901	1 835
Average Consumption Commercial (kWh)	18 124	17 576	17 795	17 155
Average Consumption Industrial (kWh)	156 352	157 434	169 345	163 906

Source: International Renewable Energy Agency, 2012.

The total primary energy supply (TPES) of the country consists of the following fossil fuel products:

- Diesel
- Kerosene
- Liquefied petroleum gas (LPG)
- Gasoline

The TPES in 2009 was 4.2 peta-joules of energy and oil imports accounted for 93 per cent of TPES of Grenada in 2009. The other 7 per cent included solid biofuels, mainly charcoal for cooking and solar.

In terms of energy consumption, the transport, electricity and domestic sectors use primary energy. Transport and electricity generation together consume about 90 per cent of the energy supplied by fossil fuels. At the end use level, about 12 per cent of total commercial energy supply in Grenada is estimated to be consumed by households for electricity and cooking. About 7 per cent is consumed by businesses, industry and the public sector in the form of electricity and about 25 per cent is lost mostly as heat through generation.

Electricity consumption is dominated by the commercial sector which accounts for about 57 per cent of all electricity sold, followed by the domestic sector, which consumes about 38 per cent, industrial usage about 3 per cent and street lighting about 2 per cent. Electricity supply is reliable and 99.5 per cent of the population has electricity access.

The oil import bill in Grenada represents about 7 per cent of the total import bill and 76 per cent of total annual export revenues. The high energy import bill contributes to the balance of payments deficit and places demands on foreign exchange reserves and exchange rates.

Installed capacity is 52.4 MW and this consists of 45.9 MW at the main generating plant in the capital, Saint George's and 2.8 MW at Saint George's University. The other 3.7 MW is installed at

[1] National Energy Policy of Grenada.

Carriacou and Petite Martinique. This installed capacity has remained constant since 2007 and between 2007 and 2011 this capacity was met with an increasing demand in electricity increasing from 27.1 to 30.2 MW. Generation increased from 165 GWh to 201 GWh in 2010. In addition to this diesel power, approximately 0.1 MWp of photovoltaic generation capacity is installed islandwide, representing about 0.3 per cent of peak demand.

Peak demand in electricity in 2010 was 30.8 MW, all of which was serviced by 52MW of diesel power. Growth in the demand for electricity is projected to double by 2028. Doubling of generating capacity to meet this demand using imported fossil fuels would have an adverse impact on the economy of Grenada. However this paves the way for increasing the role of renewable energy in the energy mix in the country to meet future energy demands in a sustainable way. Renewable energy will therefore play a critical role in reducing dependence on imported fossil fuels while at the same time reducing the oil import bill and increasing energy security.

The price of electricity (tariff structure) in Grenada is high at about US$ 0.40/kWh, although this price is at the lower end of the scale compared to other Windward Islands[2]. The tariff structure in Grenada consists of a fuel charge, a non-fuel charge, value-added tax (VAT) and an environmental levy paid only by the residential sector. The price of electricity reduces the competitiveness of the Grenadian economy. Generally, the volatility of the price for fuel in the international market has a significant effect on the local market. The Global Competitiveness Report (WEF, 2010) identifies the quality of electricity supply and the price of electricity as important contributors to economic growth. Within this context it may be important to reduce production costs and the average price of electricity to consumers. Lowering energy costs will be of fundamental importance to the economic development of the country and the long-term competitiveness of its productive enterprises. The retail price of electricity in Grenada is a combination of fixed and variable charges per unit, with some additional capacity charges and taxes added.

2. Policy and regulatory framework

The electricity market in Grenada is dominated by a private company, Grenada Electricity Services Limited (GRENLEC) which is a vertically integrated company. GRENLEC currently has a monopoly in generation, transmission and distribution although the Government has intentions of restricting the power sector to decouple generation from transmission and distribution. GRENLEC is the sole provider of electricity and operates diesel power plants.

WRB Enterprises[3], (through its subsidiaries Grenada Private Power and Eastern Caribbean Holdings) owns 61.4 per cent shares in GRENLEC. However, WRB is in the process of selling its shares. This sale presents the Government of Grenada with a unique opportunity to develop a new framework for the operation of the electricity sector.

As a means of initiating the transition to a low carbon economy to promote economic development and improve international competitiveness, the Government of Grenada approved its National Energy Policy in 2011. The National Energy Policy in large part provides the framework for advancing renewable energy technologies and energy conservation and efficiency strategies. It seeks to effectively address the country's energy constraints and needs both in the short and long terms. This policy framework therefore sets the stage for putting forward recommendations for Government consideration through this report that would allow for eliminating and/or reducing the barriers to the deployment of renewable energy technologies and energy conservation and efficiency strategies.

The Government of Grenada is also pursuing the GREENADA Vision 2030, which was approved in 2012. The GREENADA Vision is a plan to make Grenada "one of the first countries in the world to go virtually 100 per cent green in its energy sector" by 2030.

[2] National Energy Policy of Grenada.

[3] A US-based company that is a strategic partner in electricity generation in many Caribbean countries – see http://wrbenterprises.com.

In order to implement the National Energy Policy and to pursue the GREENADA Vision 2030, the energy sector requires an appropriate regulatory framework to meet the range of challenges that exist. The Electricity Supply Act (ESA) of 1994 provides GRENLEC with a licence to operate until 2073, creating and maintaining a monopolistic electricity market. The Act also gives GRENLEC the mandate to harness hydro and solar power in any part of Grenada free of charge. This sets a tone for creating a monopolistic market for renewable energy as well and could reduce prospects for advancing renewable energy development. In 2012, with the intention of WRB to sell its shares in GRENLEC, a window of opportunity was opened to the Government in that it could devise a new framework to support the deployment of renewable energy.

The amendments to the ESA will enable the energy sector to have the flexibility and capacity to adopt and adapt to, emerging technologies that will support its policy goals. The increase in oil prices has stimulated technological advances in developing alternative energy sources and improving efficiency in energy production and consumption, and has also resulted in changing personal behaviour patterns to implement energy conservation. Emerging technologies which could become relevant to the development of the energy sector in Grenada over the planning timeframe to 2020 include the employment of fuel cells and efficient solid state thermoelectric converters for solar energy. Unforeseen advances also could come from "disruptive" technologies, which have the potential to significantly alter energy production, distribution and use in a positive manner.

Of importance as well is the non-existence of an independent electricity regulator in Grenada. Currently, the electricity market is self-regulated by GRENLEC under the ESA. Grenada is participating in the Eastern Caribbean Electricity Regulation Project (ECERA), which was launched in Grenada in November 2013[4]. By so doing, Grenada will enable independent regulation for the uptake of renewable energy technologies, especially the appropriate, economically viable pricing tariff for the stakeholders involved. The participation in ECERA also calls for the revision of ESA and will assist in removing the current barriers to renewables as a result of the current ESA.

3. Renewable energy and indigenous energy sources

Grenada does have indigenous energy resources and various studies in renewable energy potential have been undertaken in the country[5]. Preliminary seismic data of the geology in offshore waters of Grenada strongly suggest that the island's exclusive economic zone may contain hydrocarbons. With respect to renewable sources of energy, preliminary geochemical data indicate that Grenada may possess geothermal resources of medium enthalpy in the Mount Saint Catherine area.

Increased development of renewable energy technologies in Grenada will represent a strategic response to energy security and economic and environmental challenges. The use of renewable energy has a number of benefits, including reduction in dependence on imported petroleum and the associated foreign exchange import costs, reduction in GHG emissions associated with burning of fossil fuels, and long-term sustainability of supply. The main renewable energy resources for Grenada include geothermal, wind, solar, and waste-to-energy. The Government has established a target for renewable energy to supply 20 per cent of the country's energy by the year 2020. This is presented in its National Energy Policy as "20 per cent of all domestic energy usage (electricity and transport) will originate from renewable energy sources by 2020".

Currently, GRENLEC has submitted a proposed development strategy for geothermal energy to the Government of Grenada for the installation of a 20MW geothermal plant to be operational by 2015. Grenada has the highest penetration rate of grid-connected solar photovoltaic systems in the Eastern Caribbean. This has been due to the work of Grensol, a local company (privately owned supplier and installer of solar photovoltaic (PV) systems) established in 2005 to provide PV systems to private individuals; coupled with a dynamic voluntary customer interconnection policy implemented by

[4] Government of Grenada - http://www.gov.gd/egov/news/2013/nov13/04_11_13/item_1/genada_host_launch_ecera_project.html.
[5] Energy Policy and Sector Analysis in the Caribbean (2010–2011) describes some of these studies.

GRENLEC that encouraged the demand for customer-owned generation. Up to 2012, there existed a negotiated grid connection agreement for 1:1 net metering provide by GRENLEC, that stipulated that no individual installation could exceed 1 per cent of GRENLEC peak demand. This agreement was an interconnection policy developed by GRENLEC and allowed customers in the commercial and domestic sectors to install grid-tied renewable energy systems to a maximum installed capacity of 300 kWh and this was achieved through a fixed net metering system. Since then, GRENLEC has changed its net metering policy to net billing type policy (or a buy-all/sell-all policy) resulting in only two customers now agreeing to supply power to the grid under this net billing system. This net billing system was introduced because of the current nature of the tariff mechanism whereby customers with self-generation do not pay their fair share of the fixed cost of operating the system.

Other than PV, solar water heating is used in private residences, hotels and other commercial entities but there is scope for more widespread penetration of this source of energy for heating. GRENLEC is actively pursuing large scale solar PV and hopes to break ground on the installation of 2 - 4 MW of capacity in 2014.

There also is potential for wind power especially on the eastern corridor of the island and over the last five years, GRENLEC has been recording wind data on at least three different sites.

4. Energy conservation and efficiency

The focus of energy conservation and efficiency must be both on the demand and supply side. Energy efficiency and conservation represents the best immediate hope to reduce the nation's use of oil and the attendant negative environmental impacts. Many schools of thought have advocated for energy conservation to be considered to comprise energy efficiency and renewable energy. The National Energy Policy calls for the need to increase the efficiency of the energy sector in the generation, transmission and distribution of electricity, in the use of energy in the transport sector, and in the consumption of electricity by industrial, commercial and residential consumers. This calls for renewed national efforts to conserve energy and use it as efficiently as possible. On a micro-level, energy consumption cost is a significant component of firms' operations and can influence profitability. Investment in proven energy conservation measures can reap financial and environmental benefits, and contribute to enhanced economic competitiveness of firms.

Generation and fuel efficiency in Grenada is above 40 per cent. The generation technology is less than ten years old and comprises internal combustion engines running on diesel fuel. Although these types of generators generally are reliable and easy to maintain, their typical generation efficiency is between 30 and 40 per cent. The level of efficiency can be improved by updating the equipment to new, more efficient systems or by adding heat recovery steam generators to drive steam turbines. GRENLEC supply-side energy efficiency has been mixed over the last few years and it is notable that the company has been able to significantly reduce distribution losses from over 13 per cent of net generation in 2000 to about 9 per cent in 2008.

Improvements in efficiency directly reduce the demand for power, which reduces use of fossil fuels and facilitates progress toward low-carbon communities. Improvements in energy efficiency can lead to economic activity and growth without requiring new energy generation capacity to be added. Utilities always have the opportunity to decrease fossil fuel use, and hence minimise carbon emissions by making efficient use of existing capacity. Supply requires efficient use of fuels in generation, minimisation of transmission losses, and reliable measurement at the point of use.

Of particular importance is the scope for utilising efficient energy technologies in manufacturing and other productive sectors, improving efficient energy use in the public sector, and increasing public awareness of the importance of energy conservation. The country would also benefit from an energy policy framework that promotes energy conservation and efficiency through the provision of incentives and disincentives to promote conservation and efficiency.

Notwithstanding the above, since the mid-2000s residential and commercial customers have been making investments in energy efficient lighting, primarily in compact fluorescent lights (CFLs) and

since 2012 in light-emitting diodes (LEDs). For example, in 2007, Cuba donated CFLs to the Government of Grenada and there was an islandwide programme of replacing incandescent bulbs at the residential level with the CFLs. The Ministry of Energy continues to provide tips in energy conservation to consumers and the commercial sector on an ongoing basis. Heightened activities in this area usually occur annually during the Caribbean Community (CARICOM) Energy Week.

5. The transport sector

In Grenada, the transport sector is the second largest energy consuming sector and is highly dependent on imported transport fuels such as gasoline and diesel. Currently, the country does not have a transport policy are there is urgent need for a legal framework to govern the transport sector; neither does it have a department or ministry of transport. Whilst this is necessary for the efficient management of the transport sector, currently the sector is managed by a transport board.

The transport sector had approximately 27,000 registered vehicles with an annual average increase of 1,200 vehicles. Forty percent of these registered vehicles are cars and about 27 percent are sport utility vehicles. Currently no ethanol blends are used in the gasoline and there are no hybrids, natural gas or electric powered vehicles. While the market for imported used vehicles is significant, the importation of new vehicles as a proportion of total vehicle imports has been rising from 61% in 2006 to 77% in 2008. Import duties on cars are about 55% and value added tax of about 15% also is added to that.

With respect to public transport, there is a public transport system and public buses consume approximately 10 gallons of gasoline per day.

The average price of diesel in 2012 was US$ 1.20 per litre and US$ 1.24 per litre of gasoline. Currently low sulphur diesel is being introduced into Grenada as a means of reducing the country's overall energy consumption as well as the country's carbon footprint.

To date there have been no significant studies undertaken on the use of energy in the transport sector or the use of alternative fuels in the sector. Notwithstanding this, the National Energy Policy 2011 does state the intention of the state to facilitate the introduction of electric vehicles into the market and to utilise biofuels as an alternative source of energy.

The Grenada National Energy Policy states that there is need to shift to cleaner and more efficient transport means and fuels and proposes the following goal: "Establish an affordable and reliable public transport sector and increased use of more efficient public and private vehicles and transport alternatives to reduce energy consumption." To achieve this goal, the Energy Policy proposes a range of actions, including the following:

- Create the appropriate tax regime to encourage importation of fuel efficient vehicles, the development of the supporting infrastructure and ethanol and other "green fuels" (e.g. biodiesel, including algal oil);
- Ensure the development and introduction of vehicle emission and fuel efficiency standards;
- Consider the introduction of mandatory annual quotas for dealers regarding hybrid, full electric and other more efficient and alternative vehicles;
- Promote alternative public modes of transport (review the national transportation plan and create a sustainable transportation strategy);
- Support pilot projects to assist road and sea fleets in reducing fuel consumption;
- Assess the potential for ethanol and biodiesel (from national or regional sources) supply and use in Grenada and explore the mandatory introduction of standards for ethanol content in gasoline (e.g. E30) and for biodiesel content in diesel (e.g. B2).

Additionally, in 2010, the Government launched a public sector energy conservation programme towards reducing energy consumption in electricity and transport in the public sector by 10 per cent.

It is felt that although this programme is focused on transportation, there is greater need for an assessment of the size of the government's fleet, the efficiency of the fleet and the way vehicles are deployed generally.

B. Profile of the energy sector in Saint Lucia – Issues and challenges

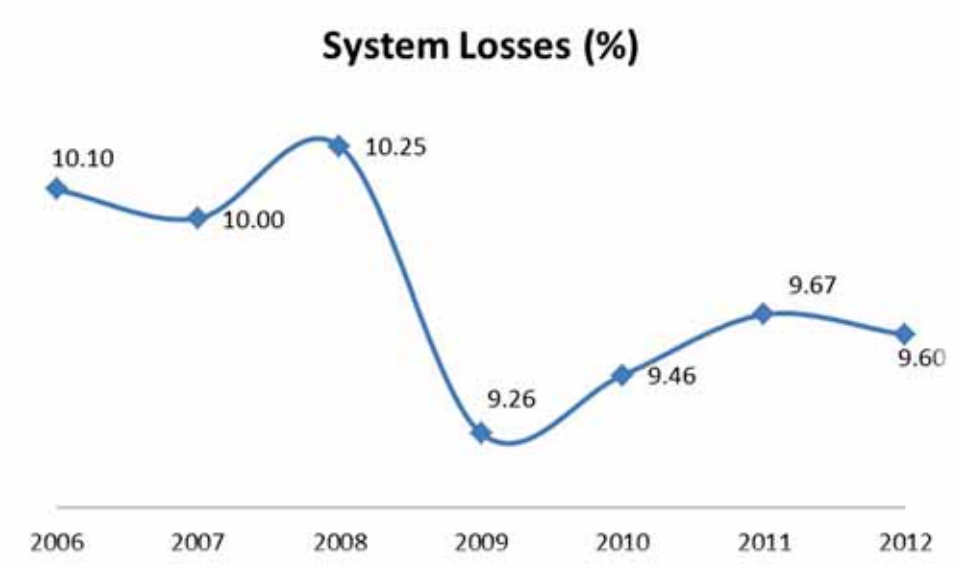
1. Energy supply and demand

Saint Lucia is an island in the Caribbean Sea on the boundary with the Atlantic Ocean. Part of the Lesser Antilles, it is located north/northeast of the island of Saint Vincent, northwest of Barbados and south of Martinique. It covers a land area of 620 km^2 and has an estimated population of 173,765 (2009 census).

The energy sector in Saint Lucia is similar to that of other Caribbean countries as there exists a high dependence on fossil fuels. This sector is dominated by the electricity and transportation sub-sectors, which are the largest users of energy. Grid access is over 98 per cent. The electrical utility has an installed capacity of about 88.4 MW and total primary energy supply is 126.0 kilotonnes of oil equivalent (KTOE). Electricity generation is characterised by total dependence on diesel-powered generators.

Saint Lucia's 2008 peak demand was 54 MW, with net generation of over 350 GWh. By 2028 peak demand is projected to increase to approximately 115 MW, with net generation increasing to around 650 GWh (a rate of increase of 3.2 per cent)[6]. System losses[7] were 9.6 per cent in 2012 compared to 10.1 per cent in 2006[8] (figure 1).

FIGURE 1
SYSTEM LOSSES 2006 – 2012 – SAINT LUCIA



Source: LUCELEC Annual Report 2012.

[6] Saint Lucia National Energy Policy.
[7] System losses are total electric energy losses in the electrical system.
[8] LUCELEC Annual Report 2012.

Saint Lucia is a net importer of fossil-based energy with the power and transport sectors relying completely on imported oil derivatives. All economic sectors have been affected by increasing and volatile oil prices over the last couple of years, all of which have negative impacts on the country's balance of trade. The effects of energy supply interruptions and oil price shocks on economic performance are therefore of major concern given the island's almost complete dependence on imported energy.

The island enjoys a very high electrification rate of about 98 per cent[9]. In the recent years there has been significant expansion of the 11kV distribution network. With respect to rural electrification, the distribution network has expanded and its carrying capacity increased at numerous points.

The price of electricity (tariff structure) in Saint Lucia ranged in 2013 from US$ 0.34/kWh for domestic consumers to US$ 0.39/kWh for commercial consumers and hotels[10]. The high price of electricity reduces the competitiveness of the economy. Generally, the volatility of the price for fuel in the international market has a significant effect on the local market. The Global Competitiveness Report (WEF, 2010) identifies the quality of electricity supply and the price of electricity as important contributors to economic growth. Within this context it may be important to reduce production costs and the average price of electricity to consumers. Lowering energy costs will be of fundamental importance to the economic development of the country and the long-term competitiveness of its productive enterprises.

2. Renewable energy and indigenous energy sources

With respect to renewable energy and indigenous energy resources, a range of preliminary studies have been undertaken in Saint Lucia[11], showing that the island possesses significant potential for the development of solar, wind, geothermal and biomass energy. Hydropower and waste-to-energy (WTE) are also viable options that can be explored. Despite very considerable renewable energy potential, the only renewable resource that is currently in use is solar energy for heating water and a small percentage of PVs. The actual renewable energy potential of Saint Lucia has not yet been fully quantified. The Government has a strong interest in employing renewable sources of energy and has set a target of 30 per cent of electricity generated by 2020 to be derived from renewable sources. This is expected to be advanced with the revision of the Power Supply Regulation which will be amended to make Saint Lucia Electricity Services Limited (LUCELEC) responsible for ensuring that this quota is achieved either through its own generation or purchasing renewable electricity from adequate generation facilities.

With respect to solar energy, Saint Lucia receives an almost constant supply of surface solar radiation throughout the year. This, in addition to a fairly high temperature which averages near 28°C, provides an excellent environment for the use of energy from the sun. As a result, solar energy can be used for both electricity generation and heating. Solar water heating in particular holds much scope for use in both the domestic and hotel sectors. Solar PV potential is estimated at 36 MW of installed capacity. Currently, there is 0.07 per cent of solar PV on the grid with 10,000 square metres installed (solar footprint). There are many barriers to the uptake of solar PV and solar water heaters, chief among them being the price of equipment and the initial capital investment that also includes installation.

Saint Lucia lies in the path of the north-easterly trade winds which create a good regime for wind energy exploitation. The best wind sites can be found on the east coast and on the northern and southern tips of the island.

Geothermal energy is considered to be a viable alternative for electricity generation due to the island's volcanic nature. Most of the volcanic activity on the island is concentrated in the south-west part in the town of Soufriere. The fumaroles at the Sulphur Springs are a manifestation of the location of geothermal potential. Geothermal energy is expected to provide a significant and reliable energy

[9] CARICOM Regional Energy Policy.
[10] Rates available at: http://www.lucelec.com/content/energy-rates.
[11] Many of these are described in the Energy Policy and Sector Analysis in the Caribbean (2010–2011).

source for Saint Lucia in the near future. One environmental concern that has surfaced is the need for the development of the geothermal potential of the country to be developed in an environmentally sound manner as the Piton Management Area World Heritage Site is near the potential source of geothermal energy.

Although the majority of the rivers in Saint Lucia are quite small, there is some potential for mini hydro power applications, such as those that can be used in the agricultural industry. Preliminary research has also suggested that the Roseau dam could be used to produce electricity.

Consideration also is being given to the development of biomass energy especially from plant and animal materials. For example the waste from pigs is being considered for use in biogas digesters (GEF-IWCAM 2011).

Consideration is also being given to the waste-to-energy potential of the country. Direct waste utilisation through incineration or gasification is being strongly considered. Waste from the Deglos Sanitary Landfill is being considered for conversion to an energy source as well. The capture of landfill gas, if undertaken, would not only produce a fuel source, but would also directly reduce the amount of methane being emitted to the atmosphere.

Saint Lucia has participated in a number of renewable energy initiatives regionally. For example, the country has been involved in the Eastern Caribbean Geothermal Development Project (Geo-Caraibes) funded by the Organization of American States (OAS). This project addresses the development of geothermal energy on the islands of Dominica, Saint Lucia, and Saint Kitts and Nevis and seeks to reduce the risk-costs linked to geothermal utilisation and create the conditions for its commercial development in the region. The country is part of the Global Sustainable Energy Island Initiative (GSEII), a consortium of international non-governmental organizations and multi-lateral institutions that supports small island States and potential donors by bringing RE and EE projects together. Saint Lucia signed two multilateral environmental agreements that indirectly support the development of RE, namely the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol.

3. Policy and regulatory framework

Saint Lucia's electricity market is dominated by the Saint Lucia Electricity Services Limited (LUCELEC) which is the sole electricity provider on the island. LUCELEC operates power stations equipped with diesel generators and has an installed capacity of approximately 88.4 MW. It is a vertically integrated company and currently has a monopoly in generation, transmission and distribution. According to the 1964 Power Supply Regulation, LUCELEC holds a universal licence for generating, transmitting, distributing and selling electricity until 2045. This monopoly enjoyed by LUCELEC provides it with an exclusive license to operate and to be the sole provider of electricity until 2045. The company has wide coverage in that it supplies power to nearly all the commercial, industrial, and domestic establishments in Saint Lucia. Owing to the rising tariff on energy, considerable requests to deregulate the industry and end LUCELEC's monopoly have been made by consumers.

LUCELEC is a publicly held company and its shareholders comprise: Light and Power Holdings Ltd. (20 per cent), First Citizens Bank Ltd. (20 per cent), National Insurance Corporation (16.79 per cent), Castries City Council (16.33 per cent), Government of Saint Lucia (12.44 per cent), and individual shareholders (14.44 per cent).

In June 2010, the Cabinet of Saint Lucia approved the official National Energy Policy (NEP). In essence, the policy provides for private participation in electricity generation, encourages the establishment of small-scale renewable energy systems and proposes the establishment of an Independent Regulatory Commission for the electricity sector. Another key objective of the policy is to create an enabling environment, both regulatory and institutional for the introduction of indigenous renewable energy to the national energy mix towards achieving greater levels of energy security.

While the 1964 regulation was superseded by the 1994 Electricity Supply Act (ESA), LUCELEC's exclusive licence was preserved by this new Act. Currently the ESA is the main piece of legislation that governs the operations of the power sector on the island. As such, LUCELEC is largely responsible for setting tariffs and ensuring its own standards of service as is set out in the Electricity Supply Act.

The ESA is currently being updated to facilitate a more competitive environment. One of these amendments will require LUCELEC to set up separate cost centres for the generation, transmission and distribution of electricity in order to ensure that costs related to each of these different operations are accurately determined. Additionally, the revised regulation is expected to stipulate that LUCELEC's long-term expansion plan take into account renewable energy projects. The Minister with responsibility for energy can intervene at the policy level to regulate the actions of LUCELEC. Further, major policy decisions may be taken by Cabinet or the Prime Minister.

Currently, Saint Lucia does not have an independent electricity regulator although there are plans to put one in place. Like Grenada, Saint Lucia participates in the Eastern Caribbean Energy Regulatory Authority (ECERA) and by so doing enables independent regulation for the uptake of renewable energy technologies, especially the appropriate, economically viable pricing tariff for the stakeholders involved. The participation in ECERA also calls for the revision of the Electricity Supply Act and will assist in removing the current barriers to renewables as a result of the current Act.

4. Energy conservation and efficiency

Energy conservation and efficiency should address both the demand and supply sides. Energy efficiency and conservation represent the best immediate hope to reduce the nation's use of oil and the attendant negative environmental impacts. Many schools of thought have advocated for energy conservation to be considered to comprise energy efficiency and renewable energy. Saint Lucians, both residential and commercial customers, have been making investments in energy efficient lighting, primarily in CFLs and in LEDs. Also the government continues to make information related to energy conservation and efficiency available to consumers. For example, under the EU SFA-2006 Energy Programme, the Government developed an energy efficiency guide entitled "Save Energy Costs – A Guide" (GOSL 2010) that provides easy and simple tips to reduce the consumption of energy. This user-friendly guide was originally targeted for the commercial and hotel sector. However, given the useful content and simple information contained therein, it can be used by households which are looking for the most effective way to save energy and reduce the country's carbon footprint.

5. Transport sector

Like other OECS countries, the transport sector is the most energy consuming sector in the Saint Lucia, accounting for over 50 per cent of total fuel imports. With respect to land transport, the country in 2013 had approximately 62,000 vehicles. The country recently began introducing electric cars. Like Grenada, Saint Lucia also has introduced low sulphur fuel. Vehicle distribution over the period 2009 to 2013 is presented in table 2.

TABLE 2
COMPOSITION OF VEHICLES FOR LAND TRANSPORT IN SAINT LUCIA 2009 - 2013

Type of Vehicle	Number of Vehicles				
	2009	2010	2011	2012	2013
Goods Vehicles	11,748	11,831	12,021	12,140	12,293
Taxis/Hires	3,695	3,461	3,595	3,765	3,904
Motorcycles	854	839	856	888	939
Private Vehicles	32,452	35,834	37,452	38,978	40,210
Passenger Vans	3,655	3,419	3,440	3,461	3,507
Tractor Trailers	38	153	153	153	156
Earth Moving Equipment/Tractors	290	202	224	244	262
Other	1,268	872	873	874	874
Total	54,000	56,611	58,614	60,523	62,145

Source: Ministry of Infrastructure, Port Services and Transport.

Saint Lucia also has developed standards for low suphur diesel fuel and are currently developing standards for petrol.

According to the OECS, an estimation provided by vehicle importers and dealerships indicates that about 25 per cent of imports are new to practically new cars and that more than 50 per cent of all registered vehicles are 10 years or older.

The Government has recognised the key linkages between the transport and energy sectors and has implemented strategies to advance sustainability in the transport sector. Chief among these is the introduction of fiscal incentives to facilitate the importation of hybrid cars. The National Energy Policy addresses transport and energy efficiency and is the main policy framework in the country that focuses on transport energy efficiency. The policy suggests ten options for improving efficiencies in the transport sector.

The short-term policy options listed are:

- Maintaining a level of adequate taxation on motor vehicles as well as taking measures to ensure improved vehicle maintenance in order to promote energy efficiency in the transportation sector.
- Introducing beneficial tax systems to promote the purchase of more energy-economical vehicles, including the new generation of hybrid vehicles.
- Ensuring obligatory vehicle inspection and regular maintenance which will promote safety, reduce the level of harmful emissions and promote energy efficiency.
- Facilitating the improved training of automotive mechanics and driving instructors with respect to energy efficiency and conservation.

Medium to long-term energy efficiency options identified for the transport sector include:

- Improved road maintenance, repairs and construction.
- Maintaining a taxation regime which allows international fuel price movements to be fully reflected in the price paid at the pump in order to discourage wasteful consumption of fuel.
- Conducting an in-depth analysis of energy conservation options in the transportation sector which will be periodically updated by the ministry with responsibility for transportation.

Engaging in transport planning to:

- Better integrate energy and environmental strategies into urban planning.
- Improve traffic management by utilising all feasible measures, such as computer-controlled traffic lights, which will make it possible to smooth the flow of traffic through Castries and the northern corridor.
- Explore options, including the use of a scheduled ferry transportation service between Gros Islet and Castries, to relieve the heavily-burdened northern corridor; and investigate the option of moving heavy commercial loads between Port Castries and Vieux-Fort by barge.
- Determine the feasibility of measures such as restrictions on circulating traffic and the introduction of special urban road charges to restrict access of private motor cars to the Castries city centre, while making the public transportation system more efficient and promoting its increased usage.

C. Profile of the energy sector in Saint Vincent and the Grenadines – Issues and challenges

1. Energy supply and demand

Saint Vincent and the Grenadines is a nation composed of a mountainous main island and the northern Grenadines, including several small inhabited islands, including Bequia, Union Island and Canouan. Saint Lucia lies to the north, Barbados to the east, and Grenada to the south of the island chain. It covers a land area of 150 km^2 (of which 133 km^2 is the island of Saint Vincent) and has an estimated population of 104,200 (2009).[12]

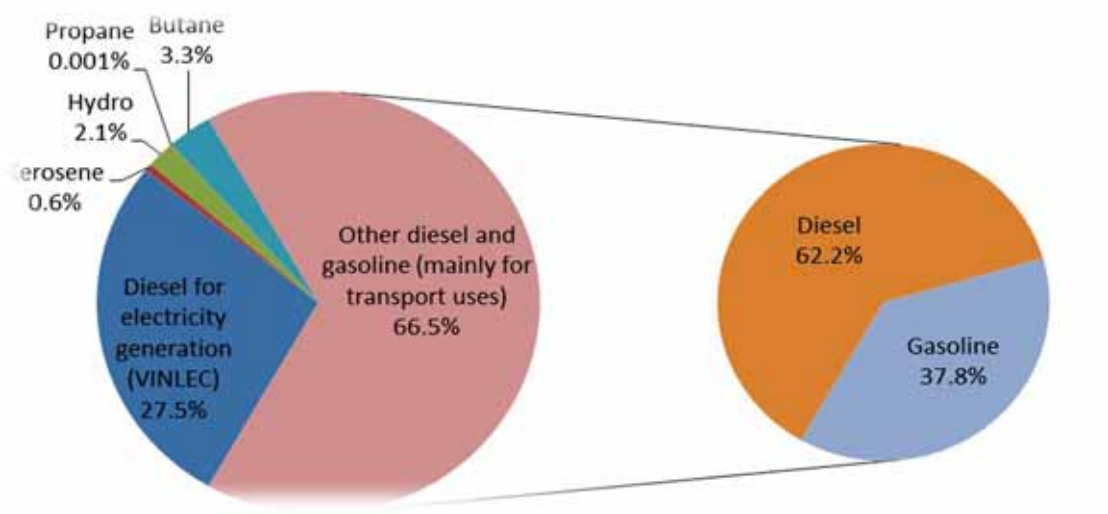
Because of its small size and a lack of large industrial activities, Saint Vincent and the Grenadines has a low demand for energy. It is almost completely dependent on imported petroleum products such as gasoline (transport), diesel (transport and electricity generation), kerosene (cooking) and butane/LPG (cooking, water heating and industry). Among the Saint Vincent and the Grenadines islands, only Saint Vincent has indigenous hydro resources, which are exploited for electricity generation. Saint Vincent and the Grenadines has a total installed capacity of 49 MW (2009). St.Vincent Electricity Services Limited (VINLEC) has the exclusive rights for providing electricity in the country, which has 99 per cent electrification.

The transport sector is the largest consumer of energy, accounting for more than 66 per cent of total energy consumption, the domestic and commercial sectors account for 30 per cent consumption from electricity generation and the remainder consists of kerosene and LPG consumption for residential cooking and some industrial activities. Within the transport sector, maritime activities account for the largest consumption of energy. Saint Vincent and the Grenadines'residential and commercial sectors, including the Government, are the largest consumers of electricity. There are few industrial activities on the island, and consumption for street lighting is minimal. Total consumption went from 74.6 GWh in 1998, to 122.9 GWh in 2008 which is a 70 per cent increase in 10 years.

The total energy consumption (of fossil fuels) went from 64,840 tonnes of oil equivalent (TOE) in 2002 up to ~91,000 TOE in 200813. Diesel and gasoline alone account for more than 90 per cent of the energy matrix of Saint Vincent and the Grenadines, with the share of renewable energy at about 2 per cent of total energy consumption (figure 2).

[12] Energy Action Plan for Saint Vincent and the Grenadines 2010, Energy Policy and Sector Analysis in the Caribbean (2010–2011).
[13] Energy Action Plan for Saint Vincent and the Grenadines 2010.

FIGURE 2
ENERGY MATRIX OF SAINT VINCENT AND THE GRENADINES BY ENERGY SOURCE IN 2008
(Percentages)



Source: Energy Action Plan for Saint Vincent and the Grenadines, 2010.

Fuel prices are comparable to those of other island States in the region and have shown an upward trend since 2005. In August 2009 the price was EC$ 10.61 per imperial gallon for gasoline. The price for LPG used in approximately 20,000 households mainly for cooking purposes also increased in early 2006. However, with the implementation of the Energy Cooperation Agreement (PETROCARIBE) signed by the Government in 2005, these price increases were effectively curtailed through the introduction of cheaper LPG supplies under the Agreement.

All fuel prices to end-consumers have a three-month delay and therefore do not reflect current variations of prices in the import market. Between January 2005 and January 2006 prices were kept constant (under government control regulations) despite significant cost increases for the purchase of fuels, leading to government subsidies of EC$ 6 million in total.

Electricity tariffs are relatively low compared to those of other countries in the region. These tariffs are composed of a unit cost per kWh, a minimum base charge for domestic and commercial consumers, a demand charge for commercial and industrial customers, and a fuel surcharge per kWh, which varies monthly depending on fuel costs (in April 2006, the fuel surcharge was EC$ 0.372/kWh). In addition, a 15% Value-Added Tax (VAT) is levied on kWh consumption of over 200 units for domestic consumers, and on the total consumption for commercial and industrial consumers. Average consumer costs for electricity were EC$ 0.85/kWh in mid-2009.14

Peak demand in Saint Vincent alone has risen from less than 14 MW in 1998, to 20 MW in 2008 which is a 40 per cent increase over a ten year period. Peak demand in the Grenadine islands (with the exception of Mayreau) has shown similar increases. Peak demand in Canouan has increased by about 60 per cent.

2. Renewable energy and indigenous energy sources

Saint Vincent and the Grenadines has substantial renewable energy sources to provide for heat (solar thermal, biomass), electricity (wind, geothermal, hydro, and solar) and possibly fuel (biomass).

[14] Energy Action Plan for Saint Vincent and the Grenadines 2010.

While these resources offer the potential to supply a large share of future energy needs, only hydro and solar (hot water heating systems) energy are being utilised.

The share of renewable energy (exclusive of non-commercial biomass, charcoal and solar thermal energy) was about 2 per cent of total energy consumption in 2008. Hydro power is used only on the island of Saint Vincent where it contributed an estimated 5 per cent to the total primary energy consumption.

Saint Vincent has a total installed capacity of 5.6 MW, of which only about 5.2 MW are available. It is currently providing around 20 per cent of VINLEC's gross electricity production. Due to varying precipitation over the year, the constantly available capacity (firm capacity) is far lower than the rated capacity and amounts to about 2 MW at present.

According to preliminary studies prepared with support from the German Agency for Technical Cooperation (GTZ) within the context of the Caribbean Renewable Energy Development Programme (CREDP), further potential exists for additional hydro power exploitation through rehabilitation and expansion of existing plants and development of new sites. A feasibility study conducted in 2009 for the rehabilitation of the Richmond and South Rivers plants, and the development of a second plant along the Colonaire River, downstream of the existing South Rivers plant demonstrated that these would be technically and economically feasible.

The conservatively estimated, unused hydro power potential is in the range of 5 to 10 MW from the rivers of Wallibou and Buccament. There are plans to install river flow gauging equipment at the Wallibou River in 2010 in order to record the long-term flow characteristics of the river.

The use of solar water heaters is not widespread. Solar heaters are imported from Barbados and are commonly found in large residential buildings. Use of this technology could be significantly expanded.

There is considerable wind energy potential mainly on the eastern side of Saint Vincent and Bequia, and on all of the smaller islands. Wind power has been traditionally utilised to grind grains. With assistance from CREDP/GTZ, VINLEC has identified potential wind sites for small wind parks and has been collecting data on wind speeds and directions. Currently, VINLEC is considering the options of partnering with a private investor to build a wind park at Ribishi Point or building the facility on its own.

Biomass resources are mainly exploited in a non-sustainable manner through the use of charcoal. There are no biogas plants or other applied technologies that make use of biomass resources in a modern way. The potential to extract oil from coconuts or other seeds (like Jatropha curcas, also known as "Barbados nut" in the region) and use this oil either in its pure form, or transform it into biodiesel, has so far not been examined. In 2009 GFA Envest GmbH in collaboration with Caribbean Bio-Energy Technology Ltd. concluded a feasibility study that examined the use of available agriculture and municipal biomass resources for the production of electricity using biogas plants. One of the conclusions of the report of the study was that while considerable biomass residues are currently available in Saint Vincent and the Grenadines, their quality is not sufficient for imminent use in biogas plants. The report further examined the possibility of operating a biogas plant based on a mixture of input substrates consisting mainly of energy crops that can be produced on available idle agricultural land in Saint Vincent and the Grenadines, and by a shift in markets of actual cultivated land. A source of development funding for implementation of an initial phase of a recommended biogas plant is needed.

Geothermal power offers the potential to supply all of the base load electricity demand on mainland Saint Vincent and, through interconnections, to the Grenadine islands and to other neighbouring islands. The Government has undertaken a number of preliminary investigations of

geothermal resources in Saint Vincent over the last 15 years and in November 2013 the Government launched its geothermal energy initiative that is being implemented by a private contractor15.

Currently the Electricity Supply Act does not allow for the engagement of independent power producers (IPPs) in Saint Vincent and the Grenadines, unless they have been authorized by VINLEC with the consent of the Ministry responsible for electricity supply. This act would need to be modified to allow the development of new generation facilities using new wind and geothermal resources.

3. Policy and regulatory framework

The Office of the Prime Minister sets the energy policy for the country through several government offices. The National Energy Committee comprises stakeholders from various government ministries and state institutions, and serves to advise the Government on energy situations and policy, including developing the national energy policy. The Energy Unit is mandated to implement energy policy, especially for the development of renewable energy and energy efficiency.[16]

In March 2009, the nation's energy policy, entitled "Sustainable Energy for Saint Vincent and the Grenadines: The Government's National Energy Policy", was approved and in 2010, the first edition of the Energy Action Plan for Saint Vincent and the Grenadines was developed.

The 1973 Electricity Supply Act is the guiding regulatory instrument for energy in Saint Vincent and the Grenadines. The Act provides Saint Vincent Electricity Services Limited the exclusive license to provide the public with electricity for 60 years (until 2033). The Act also stipulates that VINLEC can, with the Minister's approval, issue a license to any other parties that wish to generate, transmit, and distribute electricity, for independent power providers and self-generation. Of the inhabited islands, only the private islands of Palm and Mustique have independent power production as part of their respective resorts.

St. Vincent Electiricty Services Ltd. is owned by the Government and is the only provider of electricity generation, transmission and distribution to the islands of Saint Vincent, Bequia, Canouan, Union Island, and Mayreau. It operates as a corporation. Currently, there is no regulator that exercises oversight over VINLEC or the energy sector in general.

4. Energy conservation and efficiency

Energy conservation and efficiency should address both the demand and supply sides. On the supply side, line losses and unmeasured consumption accounted for 8.7 per cent of the total consumption in 2007, showing a downward trend since 1998. Also most of VINLEC's diesel generators need to be modernised in order to increase efficiency.

On the demand side, there is high potential for energy conservation and efficiency in the manufacturing industry as well as in the commercial and domestic sector. In 2010, the Government, using funding from the European Union's Special Framework of Assistance 2006, implemented an energy efficiency study to identify areas for possible energy savings in 75 government-owned buildings. The project also included the development of an energy conservation and awareness programme to promote energy conservation and efficiency behaviour among government employees in the work place.

5. Transport sector

As stated above, the private and public transport sector is the largest consumer of energy, with more than 25,382 vehicles registered in Saint Vincent and the Grenadines in July 2009 and 9.7 million imperial gallons of diesel and 6.4 million imperial gallons of gasoline consumed in 2008. A steady

[15] Think Geoenergy - http://thinkgeoenergy.com/archives/16978.
[16] Energy Policy and Sector Analysis in the Caribbean (2010–2011).

increase in consumption by this sector is forecast mainly for diesel[17]. Most of the vehicles are privately owned sedans, but there is also a significant quantity of mini-vans operated by privately owned public transport business.

In December 2009, there were approximately 1095 vessels operating in the waters of Saint Vincent and the Grenadines, utilising fuel from Saint Vincent and the Grenadines. Of these, 50 ships (including 9 local Roro passenger ships and 12 cargo ships) were registered with the Maritime Administration; 745 were fishing vessels, of which 738 were propelled by gasoline outboard engines and 7 by diesel engines. There was an estimated 200 private vessels of which 15 had diesel engines and there was an estimated 100 small commercial yachts. Within the transport sector, the maritime sector is a large consumer of energy.

Between 1998 and 2008, about 1400 cars were imported every year on average, with a high share of second-hand older vehicles, which have high fuel consumption (low mileage per gallon). Also, there is a tendency to import large-size vehicles which also have higher fuel consumption. Small light-weight cars with efficient low fuel consumption engines and motor-cycles are not very common.

Reducing the percentage of vehicles with high fuel consumption, monitoring emissions and promoting regular engine maintenance would increase the efficiency of the transport sector in Saint Vincent and the Grenadines. Furthermore, improvements in the public transport system, road conditions, and traffic management could also increase efficiency in the sector.

The transportation goal as articulated in the National Energy Policy seeks to produce an: "Efficient, environmentally clean and cost-effective transportation" and is supported by eight policy areas related to transportation as follows:

1. Improve fuel conservation and efficiency for the land and marine transport sectors.
2. Minimise the detrimental impact of petroleum product consumption in the transport sector on land, atmosphere and marine environment.
3. Provide the basis and sufficient incentives for improvements of the public transport system as alternative to individual vehicle use.
4. Improve road conditions and traffic management as to avoid congestion and prioritise public transport buses.
5. Investigate consequences and benefits of substituting the use of gasoline by LPG for taxis.
6. Take adequate measures to minimise the import of outdated and high-consuming second-hand cars.
7. Introduce a taxation system that gives incentives for the use of fuel-efficient passenger cars and other vehicles.
8. Introduce regular motor check-ups to avoid unnecessary emissions and limit the fuel consumption to the lowest possible level.

The goal for the transport sector documented in the Energy Action Plan is to "Reduce projected consumption of fossil fuels in the transport sector by 10 per cent by 2015 and 15 per cent by 2020." The Plan includes specific actions for three broader areas of action as described below.

1. Reduced fuel consumption of vehicles. The Government will:

- Provide the public with specific fuel consumption guidelines for different vehicles commonly imported to Saint Vincent and the Grenadines.

[17] Energy Action Plan for Saint Vincent and the Grenadines 2010.

- Revise the motor vehicle taxation system and base it principally on fuel efficiency instead of engine size.
- Reconsider its policy of subsidising fuel to encourage greater use of fuel-efficient vehicles
- Assess whether the current environment levy on imported second-hand vehicles is effectively addressing the issue of energy efficiency.

2. Transport strategy:

- The Ministry of Transport will develop a comprehensive long-term transport strategy to curb energy consumption in this sector, including rush-hour regulations, staggered business hours, and access and use of heavy load vehicles to the road infrastructure during rush hours. It will highlight measures that will reduce the number of road transports, introduce new public buses and regulate public transport routes throughout the island, improve the current road network and make recommendations for innovative traffic management.
- The Government, in cooperation with VINLEC, will study the potential for introducing hybrid and electric vehicles into the island and will consider introducing electric vehicles into its own fleet.

3. Biofuels for transport:

- The Government will study the setup of a national (and possibly regional) biofuels production chain, which may include gasoline/ethanol and diesel/biodiesel fuel blends.

In 2014, the country started preparation of its first national transportation policy.

II. Approach and methodology

The preparation of this report was facilitated by a comprehensive desk review of relevant documents and consultations with key officials in the public and private sectors as well as with civil society organizations towards gathering information on:

- The profile of the energy sector in Grenada, Saint Lucia and Saint Vincent and the Grenadines with a particular focus on factors of relevance to energy efficiency in the transport sector. It must be noted that details and data on the transport sector were limited due to lack of transport policies in each of the countries as well as limited collection of transport data.
- Suggested policy options and recommendations that could effectively improve the energy efficiency of the transport sector.

This report presents a range of policy options that could be considered by the governments of the three countries as they seek to advance both energy efficiency and alternate/renewable energy priorities in their transport sector bearing in mind that this sector is the largest consumer of energy, taking into account reduction of GHG emissions and the need to advance the notion of sustainable transportation.

III. Results – Progress towards achieving transport energy efficiency in Grenada, Saint Lucia and Saint Vincent and the Grenadines

In general, governments continue to face challenges in the coordination of transportation and energy policy at all levels, from local to national. There are many barriers that exist in the coordination of energy and transport policy. It is clear that the three countries under study face many of these challenges and are confronted by these barriers such as:

- Coordinating transport and energy policy among agencies
- Low levels of awareness amongst the general public on transport energy efficiency and the benefits of sustainable transport
- Low levels of awareness among policymakers on the interrelated impacts and challenges of energy and transportation and possible solutions
- Difficult economic climate resulting in limited long-term investments in sustainable transportation.
- Lack of reliable and consistent data on the transport sector.

Due to limited data it was difficult to quantify transport energy efficiency in the three countries under investigation and therefore challenging to estimate the value of energy efficiency improvement in the transport sector.

Notwithstanding, a brief SWOT analysis of the transportation sector in Grenada, Saint Lucia and Saint Vincent and the Grenadines vis-à-vis energy efficiency and fuel diversification was conducted and is presented in table 3.

TABLE 3
SWOT ANALYSIS OF THE TRANSPORTATION SECTOR IN GRENADA, SAINT LUCIA AND SAINT VINCENT AND THE GRENADINES WITH RESPECT TO ENERGY EFFICIENCY AND FUEL DIVERSIFICATION

STRENGTHS	WEAKNESSES
• Existence of National Energy Policy that includes transportation goals • Presence of renewable energy sources • Comparatively small distances to be covered within countries • Government taking a leading role in energy efficiency • Increasing collaboration among agencies with responsibility for finance, energy, transportation, and planning • Increasing collaboration between government and the private sector	• Lack of transportation policy that focuses on energy goals • Lack of spatial planning policies that link transport and energy • Inefficient public transportation system • Lack of fiscal/tax incentives to use energy efficient vehicles • Lack of standards for emissions and fuel efficiency • Inadequate data on transport and energy use • Inadequate capacity for research and validation of products • Insufficient /limited technical expertise in transport energy efficiency • Limited information on alternative vehicles – e.g. electric cars/hybrids
OPPORTUNITIES	**THREATS**
• High and fluctuating oil prices that provide an incentive to invest in energy efficiency • Increasing regional cooperation • Internationally-funded regional projects on energy efficiency • Increasing availability and affordability of energy efficient solutions for the transportation sector • Increasing public awareness of importance of energy efficiency • No-cost increases in efficiency through changes in behaviour	• Need for new infrastructure for alternative transport fuels • Fuel subsidies that reduce incentive for energy efficiency

Source: Author's compilation.

Furthermore, a quantitative assessment was undertaken using key transport and energy efficiency indicators to assess each country's movement towards a sustainable transport sector. This is presented in the table 4.

An analysis of the three countries shows that the implementation of energy efficiency measures remains a priority for all countries. All countries have recent energy policies (and Saint Vincent and the Grenadines has an energy action plan) that address issues of energy efficiency and fuel diversification in the transport sector. The development of these policies demonstrates the commitment by the governments to achieving energy efficiency goals in all sectors of the economy. However, these countries currently lack transport policies. It is important to develop national transport policies which include issues related to energy efficiency, fuel diversification and also land use.

Financial incentives and public information both help to change behaviour towards increased energy efficiency. In all the countries, while these exist in other areas of the economy (building, lighting, heating), there is a dearth of these incentives in the transportation sector. In fact, certain subsidies for some types of fuel are deterrents and mitigate against energy conservation and efficiency.

TABLE 4
MATRIX OF INDICATORS OF TRANSPORT ENERGY EFFICIENCY IN GRENADA, SAINT LUCIA AND SAINT VINCENT AND THE GRENADINES

Indicators of Transport Energy Efficiency	Grenada	Saint Lucia	Saint Vincent and the Grenadines
National energy policy that includes energy efficiency and fuel diversification in the transport sector	√	√	√
National transport policy that includes the notion of energy efficiency and fuel diversification	X	X	X
Ministry/department of transport to guide transport sector decisions	X	√	√
National land use policy that makes provision for sustainable transport	X	X	X
Energy efficiency incentives to the transport sector	X	≈	≈
Fiscal/tax incentives for energy efficiency in the transport sector	X	≈	≈
Public education and information on transport energy efficiency	≈	X	≈
Current fuel diversification in the transport sector	X	X	X
Comprehensive time series data on transport (e.g. road networks, motor vehicle registration, ports, air, maritime, growth in shipping etc.)	X	X	X
Economic studies of transport sector	≈	≈	≈
Existence of public transportation region	√	√	√
Legislation related to vehicular emissions and fuel efficiency standards	≈	≈	X
Prepared investment packages focussed on sustainable transport solutions	X	X	X

Key: √ = exists; ≈ = somewhat present; X = does not exist

Source: Author's compilation.

Another challenge in all countries is in the inadequacy of data and information on the transport sector particularly related to energy as well as a lack of regulations and standards in the sector. As such, Table 4 underscores the critical need to provide guidance and some possible policy recommendations to advance sustainable transport prospects in all three countries.

IV. Recommendations - Main policy considerations to promote energy conservation and efficiency in the transport sectors in Grenada, Saint Lucia and Saint Vincent and the Grenadines

This section focuses on the main policy considerations that could be adopted by the three countries towards advancing energy efficiency in the transport sector. There has been much analysis of policies for sustainable transportation in governments and research institutions globally. In road transport, energy efficiency can be improved by means of technical and non-technical measures. It is clear that no one measure will provide the solution and that action is needed simultaneously on a range of criteria.

The recommendations presented in this report are categorised as follows and will include both technical and non-technical measures:

- Policies to encourage transport system efficiency (such as land use and urban planning)
- Policies to encourage vehicle efficiency (increasing energy efficiency in freight, increasing fuel economy of new vehicles, influencing driver behaviour)
- Institutional arrangements linking transport and energy.

A. Policies to encourage transport system efficiency

Development and implementation of national transport policy

Consideration is to be given in each of the three countries to develop national transport policies that are effectively aligned to their energy policies and spatial plans and advance the notion of

sustainable transport. The Energy Policy of all three countries shows the linkage with transport and energy and includes energy efficiency as a guiding principle.

In developing the national transport policy, it is recommended that each country focus on developing strategies that will discourage the importation of inefficient motor vehicles by linking the tax regime to mileage per gallon and the engine capacity; encourage measures such as energy conservation, including efficient traffic management; carpooling; park and ride; an efficient public/urban mass transit transport system; encourage non-motorised transport; and promoting vehicle and road maintenance programmes. A second area of emphasis in the transport policy would be fuel diversification which is an important goal within each country's National Energy Policy.

As the countries focus on advancing sustainable transport practices there must be consideration of moving people, goods and information in ways that reduce the impact on the environment, the economy, and society. These practices comprise using more energy-efficient transport modes; improving transport choices; using cleaner fuels and technologies; using information and communications technologies and enlightened urban and regional planning to reduce or replace physical travel; and developing sustainable transport policies.

The development of a sustainable land transport systems for each of the countries also will require reference to a range of indicators for sustainable transport, including: fixed and flexible urban transport routes; efficient public transport as a national priority; private motorised vehicle ownership; accessibility of public transport vehicles and infrastructure; passengers carried by public transport; government fleet and energy efficiency in government fleet; investment in public transport; road safety; and the age, fuel consumption, and pollution reduction technologies of vehicles in the public transport fleet.

The development of the policy also will be accompanied by a robust monitoring and evaluation framework that includes indicators and targets. Possible indicators related to transport energy efficiency may include: percentage of energy efficient vehicles, percentage of fuel efficient vehicles as a percentage of total vehicles on the roads, age of vehicles etc.

Development and implementation of spatial planning policy

The development and implementation of a spatial planning policy can have significant implications for improving energy efficiency in the transport sector and considerations should be given to including a transport and mobility component in urban planning. Road transport for example is space-intensive due to the fact that the road network and ancillary facilities occupy large amounts of land. The long-term development of land transport therefore represents an important aspect of spatial planning for all three countries. Consideration in any spatial planning policy should include the need to minimise traveling requirements by developing mixed-use communities where work places are in closer proximity to residences, and by promoting tele-working and tele-commuting as a substitute for physical movement of persons.

In the case of new developments, consideration should be given to incentivising mixed-use developments whereby retail, commercial, and residential areas are developed together to reduce the need for vehicular trips. In essence all countries will be encouraged to adopt a long-term vision for land use that integrates transportation goals and the move to a greener more sustainable transportation sector.

The development of the policy also needs to be accompanied by a robust monitoring and evaluation framework that includes indicators and targets.

Traffic management

Traffic congestion may result from a number of causes including volumes of traffic that exceed the capacity of the roads, road obstructions and inefficient traffic management systems. These may result in the achievement of slower speeds, longer trip times, and increased queueing. The negative effects of traffic congestion include the loss of productive time of motorists and passengers, increased air pollution and vehicular wear and tear, and interference with passage of emergency vehicles. All countries have indicated that traffic can be an issue at times. Within the transport policy for all countries

and certainly over the short to medium term, consideration should be given to a range of measures to improve traffic flows in the road transport systems. Measures that can be considered include road maintenance, more efficient traffic management techniques; junction improvements; promotion of higher vehicle occupancy; parking restrictions; intelligent transportation systems; and flexible work and school hours to reduce peak traffic flows.

Advancing international discussions on the green economy and green transport into local policy

Green transport as it relates to fuel efficiency for public and private vehicles is a critical component for both energy and transport policies. Efforts and consideration should be made in the energy sector to promote green transport, which also includes the use of clean fuels to minimise pollution. Natural gas is an alternate fuel to gasoline and diesel which is being actively explored for public transport fleets in the short term and for private vehicles in the longer term.

Data collection and management in the transport sector

It is recommended that countries prioritise the collection and analysis of data relating to their transportation energy consumption to enable the characterisation of transportation systems. This would facilitate better analysis of the transport sector and help to better focus sustainable transport initiatives.

Financial and Fiscal Incentives/Disincentives

Financial and fiscal incentives provide a very useful mechanism for the promotion of energy efficiency in the transport sector. A fiscal incentive that could be considered by each government is to reduce the tax to be paid by consumers when purchasing energy efficient equipment through the removal of VAT and some import duties on fuel efficient cars. Tax credits are recommended here as they are considered better than subsidies, and also because they are less costly to the government. Note that a disadvantage of tax credits is that they do not lower the barrier of the initial upfront payment, and therefore do not help low-income households, quite unlike subsidies. Another area for consideration would be the imposition of a luxury tax on fuel inefficient vehicles. This is essentially a consumption tax for luxury imports or "non-essential" goods that could range between 15 and 60 per cent as is done in many developed countries. The tax is calculated on the CIF price.

Also, taxes on traditional fuels can be considered whereby increasing these taxes would increase the fuel costs and thus provide an incentive to reduce fuel consumption through purchasing more efficient vehicles, using more fuel-efficient driving styles and perhaps reducing vehicle usage, thus reducing traffic volume. The increase in fuel taxes can be related to the external costs associated with the air pollution and CO2 emissions resulting from the use of fuels.

Mandatory labelling for new appliances, new cars and buildings as well as devising minimum energy efficiency standards for new cars

These regulations could take the form of efficiency standards. As is common in developing and emerging countries, labelling is often among the first measures to be introduced and can encourage consumers to purchase more efficient vehicles and suppliers to ensure that there are greater quantities of efficient vehicles on the market. With respect to cars and other vehicles, consideration should be given to introducing car labels for fuel consumption (l/100km and /or km/l) and CO_2 emissions (g/km). This is a simple measure as most car manufacturers on the global market have such information already available. This measure should be promoted along with adequate information campaigns. This could also be tied to other fiscal and financial incentives. Currently in Grenada and Saint Lucia, there is a single tax for both large and small vehicles so that small cars and larger vehicles pay the same duty and fuel efficiency is not taken into account.

Also, it would be important for any labelling programme to be designed with the specific aim of providing consumers with information, which would enable them to compare the energy efficiency of different options available for purchase. Consideration should be given to opt for labelling standards for both passenger and freight vehicles. It will be important to include bureaus of standards in such an initiative.

Modal Shift

An important policy goal in transport energy efficiency is to shift passengers and freight from roads to more sustainable modes of transport such as bicycles, efficient public transport, and shipping. There are challenges to achieving modal shift which are as a result of unsustainable land use planning, such as urban sprawl and dispersed rural populations with associated vehicle dependency. Additionally, public transport is often perceived as less attractive in terms of the quality and price of services provided. All these issues would need to be addressed in considerations for modal shift. If any of the three countries want to focus on modal shift, key issues that need to be taken into account, include improving public transport services and infrastructure and increasing its attractiveness to potential passengers through information campaigns and improving practical features, such as lower fares.

B. Policies to encourage vehicle efficiency

There are several key policies that should be considered by the countries in this study to improve vehicle efficiency. These key ones are:

- Improving operational efficiency
- Improving energy efficiency in freight

Of course, the average fuel consumption and CO2 emissions of national vehicular fleets can be reduced if consumers buy smaller and less powerful cars. However, while increasing the fuel economy of new vehicles is a main policy option to encourage vehicle efficiency, it is not a viable option in the Caribbean as cars are not manufactured in the region.

Improving operational efficiency

There are several measures that can improve the operational efficiency of all vehicles on the road. Consideration should be given to implementing a vehicle lifetime or "scrappage" policy being mindful of unintended impacts to the import/export market for used vehicles and parts. Other recommendations include adopting fuel-quality standards; and designing driver education and training programmes to improve driving habits which are known to raise a vehicle's effective fuel efficiency by as much as 35 per cent.

Improving operational efficiency of cars

In general, technical measures for improving energy efficiency of road vehicles can be grouped into the following categories:

- Combustion engine efficiency improvements.
- Powertrain efficiency improvements (advanced gearboxes)
- Alternative propulsion systems (hybrid, fuel cell, battery-electric)
- Weight reduction
- Reduction of resistance factors: improved aerodynamics, low rolling resistance tyres, low viscosity lubricants
- Energy efficient auxiliaries: improved air conditioning systems, water pumps, electric power steering, etc.

Tyres play a significant role in fuel efficiency and in improving the operational efficiency of cars. Approximately 20 per cent of a motor vehicle's fuel consumption is used to overcome rolling resistance of the tyres (IEA, 2005). The amount of rolling resistance is a function of the level of inflation of the tyres and the technical rolling resistance of the tyre material. Additional fuel is required when tyres are underinflated. To this end, all three governments should consider the following:

- Adopting new international test procedures for measuring the rolling resistance of tyres, with a view to establishing labelling, and possibly maximum rolling resistance limits where appropriate, for road-vehicle tyres.
- Adopting measures to promote proper inflation levels of tyres. This should be achieved by making the fitting of tyre-pressure monitoring systems on new road vehicles mandatory.

Improving energy efficiency in freight

There are three main policy options that should be considered by the governments as they seek to improve energy efficiency in freight. These are:

- Improving the energy efficiency of freight vehicles by providing incentives such as rebates and tax credits for the purchase of fuel efficient freight vehicles
- Improving freight logistics by providing incentives for higher cargo volume per trip, and for two-way shipping (that is, ensuring that vehicles transport cargo on return trips)
- Providing driver education and training. This may be achieved by requiring freight drivers to attend courses that educate them on methodologies to improve a vehicle's operational efficiency through measures such as reducing speeding, minimising gear changing, and scheduling regular maintenance. Additionally, programmes can be implemented which raise the awareness of freight companies and drivers about the link between fuel-efficient driving practices and safe operations, as well as, the fact that saving 10 per cent on fuel costs can increase a freight company's bottom line by 15-35 per cent.

Additionally, technical options for improving energy efficiency in freight and buses that can be considered are:

- Low rolling resistance tyres
- Engine improvements
- Reduction of air resistance
- Hybrid for buses and distribution trucks

Implementing eco-driving programmes

The main elements of eco-driving, otherwise referred to as fuel efficient driving style, are:

- Optimising gear changing.
- Avoiding vehicle idling by turning the engine off when the vehicle is stationary
- Avoiding rapid acceleration and deceleration
- Driving at efficient speeds. The most efficient speed for most cars is between 60 km/h and 90 km/h. Above 120 km/h, fuel efficiency falls significantly in most vehicles.

While it is well known that driver training is an effective tool, there is a high cost to covering all drivers. As a result, consideration should be given to including eco-driving in the driving licence examination thereby instilling the eco-driving message in future licensed drivers.

Depending on their initial driving style, drivers of passenger cars may achieve fuel savings of between 5 and 25 per cent directly after an eco-driving course. It is estimated however, that the long-term average improvement is of the order of 3 per cent.

Implementing public awareness and communications campaigns

All countries have at various times developed public education material related to energy efficiency in the transport sector. Both Grenada and Saint Vincent and the Grenadines have brochures and flyers on energy efficiency issues and tips of energy efficiency and conservation in transport. Consideration could be given to increasing awareness (beyond CARICOM Energy Awareness Week

held annually) by developing and implementing communication campaigns that directly or indirectly publicise practical driving tips. This has been successful in many countries internationally. Of course these communication campaigns will need to be supported by information and will need to involve other key stakeholders such as automobile associations, industry associations and consumer organizations.

In implementing public awareness and communications campaigns, the guidelines/tips presented below could be considered for public consumption and dissemination.

Acquisition of vehicles

- When purchasing a vehicle, think function, not fashion. Purchase vehicles of appropriate size and attributes according to needs. The type of vehicle selected and its specific characteristics will determine its fuel consumption and level of emissions.
- Harmful emissions can be reduced through purchase of alternative fuel vehicles, or through conversion where appropriate, or through the use of catalytic converters. Catalytic converters ensure the optimal combustion of fuels in the vehicle's engine, thereby reducing vehicular emissions.
- Select/purchase vehicles that are fuel efficient and durable. When purchasing vehicles, fuel consumption information should be obtained along with other vehicle specifications.

Maintenance and operation of automobiles

- Perform preventative maintenance regularly to ensure optimal operation. Better vehicle maintenance can translate into reduced fuel consumption, leading to savings. In addition, studies estimate that a poorly tuned engine can increase fuel consumption by at least 15 – 20 per cent.
- Monitor fuel consumption and vehicle maintenance records regularly.
- Perform daily inspections to check tyre pressure, oil and coolant levels and to identify possible signs of fluid leaks. Operating a vehicle with just one under-inflated tyre by 6 psi can reduce the life of the tyre by 10,000 km and increase the vehicle's fuel consumption by 3 per cent.
- Ensure that CFC-based air conditioning systems (that may still be found in vehicles older that ten years) are maintained by repair shops that capture, clean and recycle used CFCs.
- Replace defective catalytic converters or their components (such as oxygen sensors) in motor vehicles. These devices ensure the optimal combustion of fuel in the vehicle's engine. The vehicle remains fuel-efficient and produces a minimal amount of air pollutants such as carbon monoxide and particulates.
- If an engine idles more than a minute, more pollution is created than if the vehicle was to be turned off and re-started. Idling wastes fuel and money and excessive idling can be hard on the engine.
- Agencies can strive to rationalize their fleet and pooling arrangements by maximizing use. Maximizing the usage of all vehicles has significant financial benefits in reducing the size of vehicle pools.
- Encourage good driving habits through vehicle operator awareness programmes and promote eco-driving. This can result in reduced fuel consumption and emissions. Smooth stopping and slow acceleration burns less petrol.
- Minimize air conditioner use, where appropriate. Operating an air conditioner in hot weather can increase fuel consumption by more than 20 per cent. Consider using the vehicle's ventilation system options such as sunroof and tinted glass.

- Adopt fuel conservation driving habits such as gradual acceleration, strict adherence to speed limits, and anticipation of traffic movements. Allocate sufficient time to reach the destination and drive at the posted speed limit. Increasing highway cruising speed from 80 km/h to 96 km/h will increase fuel consumption by about 20 per cent.
- Plan routes that avoid potentially busy areas. This can reduce fuel consumption by minimizing the total travel time, distance and idling.

Maintenance and operation of aircrafts

- When procuring new aircraft ensure that they are fuel-efficient.
- Undertake fuel saving measures such as selecting optimal flight altitude, flight speed and flight route.
- When constructing new airports and runways locate them away from residential areas as much as possible to reduce the impact of aircraft-generated noise.

Maintenance and operation of marine vessels

- Always sand and scrape boast on shore at dry docks away from the water and in designated work areas to prevent the release of noxious paint and varnish particles into the surrounding air and water. An alternative is to use a vacuum sander to collect and store the dust before it can contaminate water.
- Avoid the use of anti-fouling paints that contain toxic metals such as copper, mercury, arsenic or tributyltin (TBT). These all have severe impacts on human health and underwater ecosystems.
- Take precautions not to overfill tanks. If fuel or oil spills onto the boat or dock, make sure and dry it and not hose it into the water. If fuel or oil spills into the water do not disperse with detergent or soap as this will cause deposits on the seafloor where it will become more toxic.
- Stow all loose items, plastic bags, drink cans and other articles properly so they do not blow overboard. Never discard garbage overboard.

Disposal of vehicles

- Hazardous materials such as waste oil and lubricants, solvents and batteries should be disposed of properly or recycled if possible. If facilities are not available for collecting and recycling, these wastes should be disposed of safely.
- Ensure that maintenance contractors follow sound disposal practices according to environmentally responsible contract clauses.

C. Institutional arrangements linking transport and energy

Interaction between governmental institutions

Energy efficiency policies for the transport sector encompass the policy domains of ministries of environment, transport, energy, and the economy. Thus, GHGs are traditionally the domain of environment, while solutions in the area of energy supply and end use are part of the responsibilities of ministries of energy and transport. Implementing fiscal and other financial policy measures to promote energy efficiency generally is the responsibility of finance ministries. Consideration should therefore be given within each country for closer cooperation between these ministries as well as good mutual understanding of the relation between energy efficiency policy and other policy targets under the responsibility of the various ministries. The various multi-sectoral energy committees created for the development and/or oversight of the national energy policies are a good first step.

Also, because many of the actors involved (car manufacturers and oil companies) are international companies operating in an international market, effective energy efficiency policies and

transport policies should make provisions for international coordination or even harmonisation and international agreements that affect both the energy and transport sectors.

Public procurement

Public procurement can be used to advance the use of alternative and hybrid vehicles across the economy. The principle behind the use of public procurement is that through the larger collective buying power of the public sector it could be possible to establish a market which is able to absorb the initially higher costs of new technologies. The use of hybrid vehicles in government is currently being considered by the Government of Saint Vincent and the Grenadines.

One key benefit of public procurement is that it will make the more fuel efficient vehicles more competitive in terms of cost compared to conventional vehicles; the result is that there will likely be an increased up-take of new, more fuel efficient vehicles. These benefits will then be passed on consumers, and the wider society.

Data collection for the transport sector

To facilitate analysis of the transport sector, national statistics offices should collect additional data for this sector. Sample new parameters include, but are not limited to, per vehicle type of fuel (including electricity for electric vehicles), per vehicle fuel efficiency, number of passengers carried by public transport, number of businesses with flex hours and volume of traffic on the road at different times.

Creation of a platform for research and innovation

Research and innovation should be seen as an important component in advancing transport energy efficiency. The need to undertake research and innovation on issues related to smart infrastructure solutions, for example in spatial planning, is clear as well as the need to deploy innovative traffic management and information systems, efficient logistics, and construction and maintenance technologies. Of less importance to this region will be research and innovation on equipment and systems for vehicles that will make them smarter, more automated, cleaner and quieter, while reducing the use of fossil fuels.

V. Conclusions

Grenada, Saint Lucia and Saint Vincent and the Grenadines have taken important preliminary action towards increasing energy efficiency in the transport sector by the development of national energy policies that include strategies for transportation and mobility. The goals of increasing energy efficiency and fuel diversification in the transport sector are part of overarching policies to address these issues in all sectors of the economy. Each of the three countries has already embarked on energy efficiency initiatives.

These current efforts will result in increased energy security due to greater energy diversity, improved balance of payments due to a lower oil bill, and reduction in fuel costs for the consumer. Furthermore, less reliance on fossil fuels will result in better protection of the environment and a reduced carbon footprint. While the contribution by these countries to global climate change is small, reducing the countries' carbon footprints is a win-win situation since it occurs concurrently with other important economic and social benefits.

Notwithstanding the above, there is need for increased and improved analysis of the transportation and mobility sectors, particularly on the linkages between transportation and the economy. While this report presents a range of recommendations and strategies that countries can consider or may already be considering, the study would have benefitted from increased data and information on the transport sector in each of the countries, especially since the transport sector accounts for the highest consumption of imported fossil fuels.

Countries must begin to advance gains in energy efficiency by focusing more on the transport sector. Globally, the transport sector is on the brink of a new era of smart mobility where infrastructure, transport means, travellers and goods will be increasingly interconnected to achieve higher levels of mobility, higher safety and fewer environmental and operational impacts.

Globally, there is a strong shift in focusing energy efficiency on transport and mobility compared to focusing primarily on the electricity sector and demand side management initiatives. Right here in the region, organizations such as ECLAC are committed to provide support and advise its Member States to better drive and advance initiatives in energy efficiency in mobility.

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