



Report

Energy and Transport in the Context of a Green Economy



Ministry of Water, Land, Environment and Climate Change

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Draft

List of Acronyms

AAJ	Airports Authority of Jamaica
Boe	barrels of oil equivalent
CERE	Centre of Excellence for Renewable Energy
CFL	Compact Fluorescent Lamp
CIPORE	Caribbean Information Platform on Renewable Energy
E10	Ethanol-10: a mixture of 10% ethanol and 90% gasoline
GCT	General Consumption Tax
GDP	Gross Domestic Product
GOJ	Government of Jamaica
JDIP	Jamaica Development Infrastructure Programme
JPSCo	Jamaica Public Service Company
JUTC	Jamaica Urban Transit Company
LNG	Liquefied Natural Gas
LPG	Liquid Petroleum Gas
MBM	Montego Bay Metro Limited
MBTE	Methyl tertiary-butyl ether
MTW	Ministry of Transport and Works
MW	Megawatt
NHT	National Housing Trust
NIC	National Irrigation Commission
NMIA	Norman Manley International Airport
NWC	National Water Commission
PAJ	Port Authority of Jamaica
PCJ	Petroleum Corporation of Jamaica
SIA	Sangster International Airport
SME	Small and Medium Enterprises
UNCED	United Nations Conference on Environment and Development
UNCSD	United Nations Conference on Sustainable Development
USA	United States of America
WSSD	World Summit on Sustainable Development

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Introduction and Context



The United Nations Conference on Sustainable Development (UNCSD) – known as the Rio + 20 Conference – will bring together world leaders, along with thousands of participants from governments, the private sector, non-governmental organizations and other groups to shape how we can reduce poverty, advance social equity and ensure

environmental protection throughout our world. Rio+20 will take place in Brazil on 20-22 June 2012 to mark the 20th anniversary of the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro (known also as the Rio Summit), and the 10th anniversary of the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg. The Rio + 20 Conference will result in a focused political document that will demonstrate the commitment of the international community to achieving sustainable development.

The official discussions will focus on two main themes:

- How to build a green economy to achieve sustainable development and lift people out of poverty, including support for developing countries that will allow them to find a green path for development
- How to enhance institutional frameworks to improve international coordination for sustainable development and to increase the effective implementation of political commitments for sustainable development

Themes of Rio + 20

- A green economy in the context of sustainable development poverty eradication
- The institutional framework for sustainable development

The preparations for Rio+20 have highlighted seven areas which need priority attention: decent jobs, energy, sustainable cities, food security and sustainable agriculture, water, oceans and disaster readiness. These will form the basis of discussions and decisions at the conference. Governments are expected to adopt clear and focused practical measures for implementing sustainable development, based on the many examples of success that have been seen in the two decades since the Rio Summit.

In preparation for Jamaica's participation at the Rio+20 Conference, stakeholders in key sectors such as energy and transport (spanning the public, private and youth sectors) will be consulted to provide input and propose a range of strategies that can be used to build its green economy

as well as employ more sustainable practices in consumption and production with the aim of having the dual effect of reducing the high levels of poverty experienced in the country... thereby moving the country onto the path of sustainable prosperity.

This Baseline Report is being prepared to support this process. The report reflects key definitions on the green economy, and explores existing frameworks and conditions that would facilitate, contribute to or hinder the implementation of a green economy, and to a limited extent, the development of an international framework for sustainable development. The report includes national strategies, plans, policies and assessments that are relevant to contributing to the green economy. The baseline report will be:

- used to prepare relevant materials such as PowerPoint presentations that will feed into the discussions to take place during the stakeholder consultations
- a comparative tool that will be used to capture views expressed in the stakeholder consultations within the light of existing information, and help to identify gaps

This Baseline Report – as well as information from the stakeholder consultations – will be used to prepare Jamaica’s National Report on the Energy and Transport Sectors within the context of a Green Economy.

Definitions of the Green Economy

Globally, many concepts and definitions of the green economy are emerging. It has been defined by the United Nations Environment Programme as “an economy that results in improved human well-being and social equity, while reducing environmental risks and ecological scarcities” (UNEP, 2011). Discussion within the Caribbean is taking place to facilitate the emergence of the region’s own unique development pathway towards a green economy. In the Caribbean, the green economy is generally being used to represent both an approach to development as well as a vision of an economy in which the three pillars of sustainable development – social, economic and environmental development – are in synergy and working at the community, national and regional levels. Both these definitions show a path towards a new economy model that is based on ecologically compatible use of resources, economic efficiency and social justice, embodied in seven key sectors as shown in Figure 1.



For Jamaica, the relevance of the concept of the green economy is embodied in the country’s national development plan, Vision 2030 Jamaica. Under Vision 2030 Jamaica, the green economy is closely related to that articulated by UNEP and further states that “*the rules for Government, business, investors and consumers will have to be rewritten to ensure that environmental considerations become integral factors in socio-economic decision-making*”, thereby moving the country into the realm of the green economy. Additionally for enterprises, it proposes that the country’s productive enterprises move beyond simply minimizing their negative impacts on the natural environment, and begin to base new jobs and industries on the sustainable use of natural resources as well as the country’s unique environmental assets (for example, further developing renewable energy sources, promoting higher levels of organic agriculture and exploring the genetic potential of the country’s endemic species).

Key Strategies on the Green Economy for Energy and Transport in Jamaica

For Jamaica, the relevance of the concept of the Green Economy is embodied in the country's national development plan, Vision 2030 Jamaica. Under Vision 2030 Jamaica, the green economy is closely related to that articulated by UNEP and further states that "the rules for Government, business, investors and consumers will have to be rewritten to ensure that environmental considerations become integral factors in socio-economic decision-making", thereby moving the country into the realm of the green economy. Additionally for enterprises, it proposes that the country's productive enterprises moves beyond simply minimizing their negative impacts on the natural environment, and begin to base new jobs and industries on the sustainable use of natural resources as well as the country's unique environmental assets (for example developing renewable energy sources, promoting higher levels of organic agriculture and exploring the genetic potential for the countries endemic species).

Within this context Jamaica is able to propose a range of strategies that can be used to build its green economy and which also will have the dual effect of reducing the high levels of poverty experienced.

In the area of transport key strategies/proposals articulated in Vision 2030 Jamaica include:

- Reducing the impact of the transportation sector on the natural environment by pursuing sustainable transport practices that could include: better traffic management strategies for reduce air pollution, development of policies that would support reduction in ship-borne wastes as well as the introduction of invasive species in ballast water as well as identifying opportunities that would allow for the reduction in the use of fossil fuels in the transportation sector.

In the area of energy conservation, efficiency security, key strategies/proposals include:

- Facilitating the implementation of Jamaica's recently promulgated National Energy Policy 2009 – 2030. This long-term national energy policy, when fully implemented, is expected to create a modern, efficient, diversified and environmentally sustainable energy sector that provides affordable and accessible energy supplies with long-term energy security that contributes to the country's competitiveness.
- Diversifying the country's energy supply by creating a stable regulatory framework to effectively facilitate the deployment of renewable energy technologies such as those related to wind, solar, and biomass among others, thereby simultaneously reducing the country's need to spend foreign exchange on the importation of fossil fuels.

- Exploring opportunities for energy conservation and efficiency that would involve households and businesses aggressively and continuously adopt energy conservation and efficiency practices towards reducing the carbon footprint; ensuring that the Government of Jamaica becomes the leader in energy conservation and efficiency and sets the standard for all other sectors; modernizing the country's energy plants
- Recognizing that biofuels present an emerging opportunity because they form part of the multi-faceted approach towards increasing energy security and reducing the use of fuel sources that pollute the natural environment for use as transportation fuels, in electricity generation and other energy needs
- Creating an energy-from-waste sector that produces clean energy from indigenous materials towards helping Jamaicans to use less petroleum, ease the oil bill burden on the country, reduce greenhouse gas emissions, reduce the amount of land used for disposal sites and improve waste management generally.

Existing Frameworks and Conditions that Would Facilitate Movements to the Green Economy

- Existing National Energy Policy
- Existing Renewable Energy Policy
- Other energy sector policies (biofuels, energy-from-waste)
- National and long term sector plans for the energy and transport sectors under Vision 2030 Jamaica
- Focus on Renewable Energy – movement from 5.6% in 2008 to 10% in 2011
- Vision 2030 Jamaica National Development Plan and its two national outcomes for energy and transport
- Already existing best practices – e.g. use of ethanol in gasoline
- Attempts to revive more environmentally friendly transport options such as rail
- Examples at the private sector employment of environmentally-friendly practices and well as the successful incorporation of environmental issues into operations (e.g Jamaica Broilers)
- Excising mechanisms to facilitate public private partnerships
- A green procurement framework that needs to be revised to better facilitate more environmentally-friendly consumption and production practices within the public and private sectors

Other Frameworks that could be explored included:

- Promulgation of a National Transport Policy for Transport that takes into account issues and actions related to:

- Importation and use of energy-inefficient motor vehicles (based on type, size, age and fuel use)
 - More efficient and adequate public transportation system in KMA and other urban and rural areas
 - Efficient movement of traffic in urban centres
 - Efficient land transport modes for cargo and passengers
 - Levying taxes on petrol at appropriate levels to encourage conservation
 - Provision of adequate infrastructure for transition to alternative energy vehicles
 - Increasing mass transit opportunities and utilization
 - Undertaking studies and conduct consultations with stakeholders on taxation levels for petroleum fuels (such as gasoline, diesel, kerosene, natural gas) with a view to instituting a system designed to enhance efficiency and conservation. This system will be consistent with regional and international trends and best practices
 - Research and development of alternate fuels for the transportation sector (e.g. liquid fuels from organic matter and CNG)
 - Facilitating the use of more fuel-efficient vehicles in the transport sector as well as the use of diesel, CNG when it becomes available and bio-fuels
 - Introducing National Vehicle Emissions Standards and Regulations to reduce vehicular emissions
- Public finance and fiscal measures that promote green forms of transportation
 - Greater investments in research and development in green economy issues and well as sustainable energy and transport
 - Building the capacity of public sector officials in the area of the green economy
 - Greater investments in cleaner technologies for industry

Situational Analysis – Jamaica’s Energy Sector

Framework for the Energy Sector

Jamaica has provided almost all its citizens with access to electricity; 90% of households have access to electricity to meet their day-to-day needs. However, the power generation sector that provides electricity to households, businesses, industries and municipalities, accounts for almost a quarter of the country’s petroleum imports/consumption and is characterized by high cost, low reliability, low power generation efficiencies and high system losses.

In general, the Jamaican economy is characterized by high energy intensity and low efficiency and is almost completely dependent on imported oil, which provides approximately 90% of the nation’s energy needs. Petroleum consumption is concentrated in three areas, namely: power generation, bauxite/alumina and transport, with the latter using automotive fuels (gasoline and diesel oil) which are the most expensive fuel.

Traditionally, Jamaica has depended on petroleum supplies from Venezuela, Mexico, and Trinidad & Tobago, supplemented by purchases on the spot market. However, our long term energy security is threatened by diminishing global oil reserves vis-à-vis demand and long-term sustained rising oil prices, political uncertainties in key oil-producing regions; and the potential impacts of natural disasters on oil production and transportation infrastructure.

The country has embarked on a comprehensive program of energy efficiency improvement and energy diversification to provide high-quality, affordable, environmentally-friendly energy and to reduce the country’s dependence on high-cost imported oil. This program is targeting the high price of electricity to businesses and other end users through strategies to improve efficiencies in the conversion of primary fuels to electricity and in its transportation, distribution and use to make the Jamaican economy more competitive in the regional and international market place.

This program began with the recognition of the important role that the energy sector has in the sustainable development of Jamaica. *Vision 2030 Jamaica – National Development Plan* sets out fifteen national outcomes that are designed to enable a major transformation of Jamaica from a middle income developing country to one which affords its citizens world class standards in key areas such as health, education, nutrition, basic amenities (such as energy and water supply) and access to environmental goods and services (clean air, freshwater etc). One of the fifteen national outcomes is “Energy Security and Efficiency” to “provide a secure and sustainable energy supply for our country.” This outcome is to be accomplished by implementing

two national strategies: to diversify the energy supply and to promote energy efficiency and conservation.

To support the National Development Plan, the Government of Jamaica developed the country's first long-term energy policy, the National Energy Policy 2009 – 2030, which was promulgated in November 2010. The policy is designed to ensure that Jamaica achieves by 2030: *“a modern, efficient, diversified and environmentally sustainable energy sector providing affordable and accessible energy supplies with long-term energy security and supported by informed public behaviour on energy issues and an appropriate policy, regulatory and institutional framework.”*

To accomplish this vision, the policy articulates seven goals which are aligned to the following seven priority areas:

1. Energy conservation and efficiency
2. Modernizing the country's energy infrastructure
3. Development of renewable energy sources such as solar and hydro
4. Security of energy supply through diversification of fuels as well as development of renewables
5. Development of a comprehensive governance/regulatory framework
6. Enabling government ministries, departments and agencies to be model/leader for the rest of society in terms of energy management
7. Eco-efficiency in industries

The mechanism to implement the National Energy Policy includes the development of sub-policies that address specific aspects of the comprehensive energy policy. Sub-policies have been developed for renewable energy; energy conservation and efficiency; biofuels; carbon trading; energy-from-waste and electricity. Also, the implementation of the National Policy is implemented through a series of three-year action plans to operationalize the policy, creating specific actions to implement the strategies presented in the policy. A national energy action plan for 2009-2012 was developed, identifying priority areas of action for the first three years covered by the Policy. Key areas of focus within this plan included:

1. The introduction of liquefied natural gas (LNG) as Jamaica's main fuel to diversify the country's fuel sources and reduce the overwhelming dependence on petroleum thereby reducing costs and introducing a cleaner fuel into country's fuel mix
2. Energy conservation and efficiency
3. Further development of renewable energy sources, with particular focus on solar, wind, hydro and bio-fuels
4. Modernizing the country's energy infrastructure to improve efficiency of generating and distributing electricity

5. Improved energy efficiency in the public sector
6. Creating a comprehensive governance framework

Energy and the Green Economy

A green economy can be thought of as one which is **low carbon, resource efficient** and **socially inclusive**. The energy sector has a key role to play in each of the seven sectors of a green economy, as shown in Figure 1 above.

Renewable energies – Renewable energy sources diversify a country’s energy supplies and reduce its dependence on non-renewable fossil fuels which will eventually be depleted. Renewable energy sources are also cleaner than fossil fuels, emitting fewer greenhouse gases and other air pollutants that are responsible for harming human health. The development of renewable alternative energy technologies is an integral part of Jamaica’s National Energy Policy as well as its National Renewable Energy Policy. Jamaica continues to explore opportunities for the use of renewable energy as part of the energy mix. By 2011, 10% of Jamaica’s energy sources was made up of renewable energy – solar, wind etc.

Green transport – Fuel efficiency for public and private vehicles is a critical part of both the energy and transport policies. Efforts in the energy sector to move toward green transport also include the use of clean fuels to minimize 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.

Green buildings – With respect to energy, green buildings involve increased energy conservation and efficiency among government entities, factories, offices, homeowners and hoteliers. The ultimate green building (with respect to energy) would be a carbon neutral building that would use no energy from the national power grid.

Sustainable agriculture and forests – Making the most efficient use of non-renewable energy resources is a key element of sustainable agriculture. Perhaps more importantly, the development of biofuels such as ethanol and biodiesel – a key strategy to increase the use of renewable energy and increase fuel diversification – creates new opportunities to diversify the agricultural industry and enhance its social and economic impact in the country. The development of biofuels is being done in partnership with the ministries responsible for agriculture and land use to address issues such as the conflicts between land and water use for food versus biofuels. Also, the energy sector is responsible for encouraging a reduction in fuelwood consumption and the accompanying deforestation. The creation of fuelwood forests is another intervention which contributes to reduced removal of natural forests for fuel wood.

Water services – Water obtained from aquifers using electric/petroleum-fueled deep well pumps requires the use of energy. This is of particular concern in the agriculture sector, which uses 75% of the country's water. Implementing water-conserving irrigation systems will not only result in less water being consumed for agriculture but will also reduce the energy needs of the agriculture sector as well.

Waste management – Energy-from-waste is an effective method of waste management and waste volume reduction with the added benefit of generating clean energy. Potential exists for the development of renewable energy sources which can be exploited from municipal solid waste (MSW) as well as from wastes generated from agri-business and wastewater treatment. Energy-from-waste can make a significant contribution to achieving renewable energy targets while at the same time, treating waste that cannot otherwise enter a waste minimization or recycling/composting programme. Waste-to-energy processes can reduce the incoming volume of waste by about 90 percent, thereby reducing the need for land space to create new dumpsites. Furthermore, combusting municipal solid waste rather than depositing it in a dumpsite results in a reduction in greenhouse gas emissions.

Clean technologies – Mechanisms will be provided to encourage the bauxite/alumina industry to take greater advantage of co-generation potential to supply energy to the national grid. New technologies also need to be introduced to reduce the energy cost of alumina production to make it internationally competitive. Greater application of combined heat and power (CHP) concept, already used in the this industry will be encourage to enable capture of waste energy, reduce cost and at the same time allow for export of surplus electricity to the national grid

Profile of Jamaica's Energy Sector

Energy Use

Jamaica currently consumes about 60,000 barrels of oil per day to meet its diverse needs. Over the past decade, the level of annual oil imports moved from 23.6 million barrels in 1999 to about 22.1 million barrels in 2009¹, representing an overall average annual decline of one percent (1%) per annum.

The energy sector in Jamaica is dominated by imported petroleum, which meets 91% of the nation's energy needs. Due to the energy intensity of the aluminum/bauxite industry in Jamaica, per capita energy consumption is high when compared with most developing countries. Jamaica's per capita energy consumption during the period 2004 – 2008 is shown in the table below. Without including the consumption of the bauxite sector, the per capita energy consumption would be approximately 3 percentage points lower.

¹ Ministry of Energy and Mining, Oil Import Statistics, 2009

Energy Consumption per Capita (BOE ²)				
2004	2005	2006	2007	2008
9.2	10.56	11.2	10.3	9.8

Source: Energy Economics and Planning Unit, Ministry of Energy and Mining, 2009

In 2008, three areas, namely bauxite/alumina (34.6%), power/electricity generation (23.1%), and transport (21.5%) accounted for the largest share of petroleum consumption by volume or 79% of the oil consumption (see Figure 2). In terms of cost, the transport sector is the single highest. Growing demand for automotive fuels (gasoline and diesel oil) is at a rate of 4.3% per annum. In 2008 the automotive fuels consumption was estimated at 5.6 million barrels of oil equivalent - BOE (21.5% of oil demand which cost about 31% of foreign exchange expenditure).

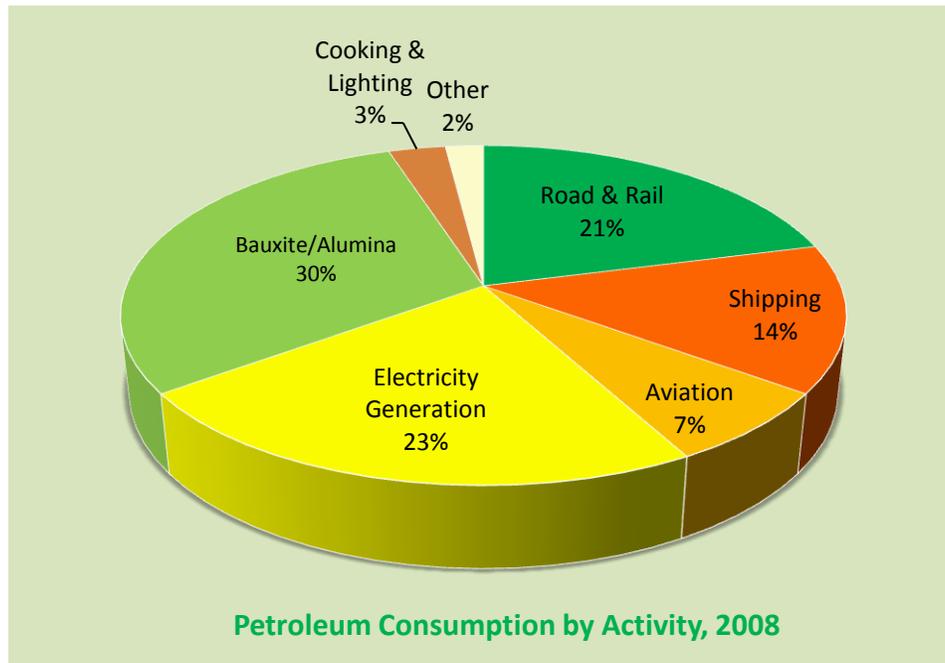


Figure 2: Petroleum Consumption by Activity, 2008

The table below shows the petroleum import levels over the past five years, and the utilization by sector.

INPUTS	2005	2006	2007	2008	2009
Total Fuel Imports (M BOE)	27.33	29.16	29.09	27.80	22.10
For Electricity	6.55	6.39	6.65	6.27	6.66
For Bauxite Industry	9.80	9.55	8.81	9.39	3.39
For Road and Rail	6.25	6.37	6.08	5.84	5.90

² Barrels of Oil Equivalent

INPUTS	2005	2006	2007	2008	2009
Transportation					
Other (shipping, aviation and other manufacturing)	4.73	6.85	7.55	6.30	6.15
Growth	--	6.7%	-0.2%	-4.4%	-20.5%
Cost of Fuel Imports (M US\$)	\$1,397	\$1,837	\$2,007	\$2,706	\$1,350
Composite overall cost per barrel of crude	\$55.51	\$59.77	\$61.64	\$97.34	\$61.09

Source: Ministry of Energy and Mining Oil Import Statistics 2009

Renewable Energy

Jamaica is relatively advanced in the development of renewable energy, surpassing a number of Caribbean countries. Compared to 5.6% in 2008, currently, 9% of the country's energy supply mix comes from renewable sources such as wind, mini-hydro, solar and biomass (mainly fuelwood, ethanol from sugar cane used in E10, and bagasse used in co-generation facilities).

Electric Power Generation

Efficiency of energy conversion and use is low. The conversion efficiency of old steam generation plants is less than 30%. About 40% of the generation capacity is over 30 years old and need to be replaced). The proportion of diesel oil based generation capacity in the total generation capacity mix (34%) is high and requires expensive fuel. System losses in transmission and distribution represent 23% of total output (as estimated by the Office of Utilities Regulation).

While Jamaica Public Service Company (JPSCo) retains a monopoly on the transmission and distribution of electricity the production regime has been liberalized to include generation of electricity by private producers for their own use or for sale to the national grid. In 2008, total generating capacity in Jamaica was approximately 818 megawatts (MW), which included 217 MW capacity provided by private power partners and independent power producers.

The transmission system includes a network of more than 1200 km of 138 kV and 69 kV lines. The primary distribution system operates at voltages of 12 kV, 13.8 kV and 24 kV and altogether there are more than 12,000 km of distribution lines (see Figure 3).

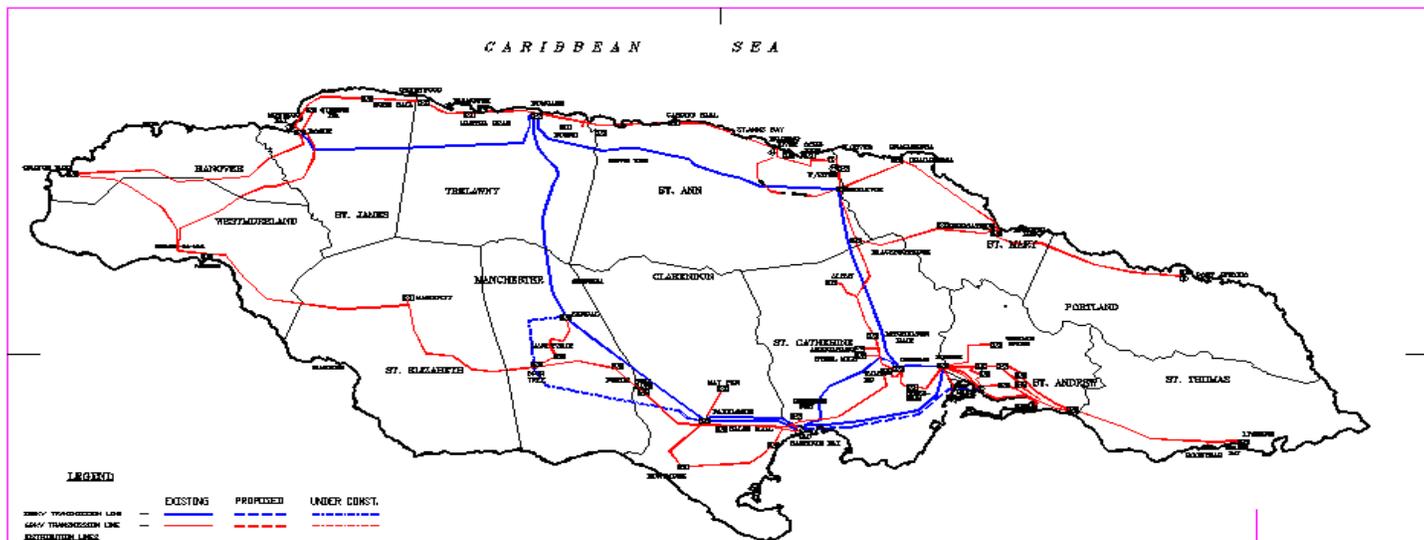


Figure 3: JPSCo Transmission System

Assessing Jamaica's Progress in the Energy Sector towards a Green Economy

Recent efforts implemented in the energy sector which contribute to the sectors of a green economy are described below.

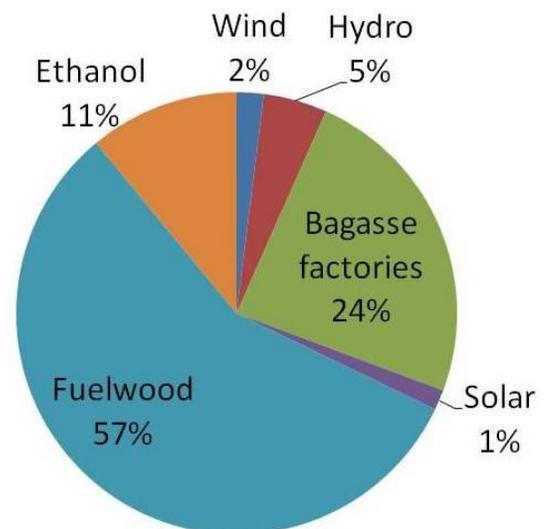
Renewable Energies

As noted above, 9% of the country's energy supply mix comes from renewable sources. Figure 4 shows the contribution of different sources to the renewable energy total.

Figure 4: Jamaica's Mix of Renewable Energy Sources

Recent progress in the development of renewable energy include the following:

- In 2008, the J\$1-billion Development Bank of Jamaica-Petrocaribe SME Energy Fund to help renewable energy projects among small and medium-sized enterprises was launched.
- The Petroleum Corporation of Jamaica (PCJ) established the Centre of Excellence for Renewable Energy (CERE) in 2006 to ensure that Jamaica will regularly implement new ideas and methods in renewable energy.
- Jamaica became part of the Caribbean Information Platform on Renewable Energy (CIPORE), the information and communication system for the exchange of Renewable Energy information for the region. It provides information on renewable energy projects for the thirteen participating Caribbean territories.
- The GOJ facilitated the expansion of this industry by the following concessions.
 - Reductions of import duty from 30% to 5% on all renewable energy equipment.
 - Zero rating for GCT purposed on renewable energy equipment.



Solar

- In early 2012, Canadian company Solamon Energy Corporation announced plans for a US \$450 million solar power plant in Jamaica, the largest in the Caribbean. The system will consist of three 50-acre plots in different parishes that, when conjoined, will provide 60MW of clean electricity.

- Two demonstration photovoltaic schemes supplying non-grid electricity to 45 homes in deep rural Jamaica have been established; these communities are Middle Bonnet in St. Catherine and Ballymony in St. Ann.
- It is estimated that more than 5000 solar water heater units are now installed in Jamaica. The surge has been due mainly to the Demand Side Management / World Bank funded programme. Under this programme special financing arrangements were made available to purchasers.
- The National Housing Trust (NHT) is offering concessionary loans for solar water heaters to encourage the application of solar energy technology. Water heating currently accounts for up to 30 per cent of a domestic electricity bill.
- In 2009, the (then) Ministry of Energy and Mining, in collaboration with the Ministry of Education, started a programme to explore the use of solar energy at 34 educational institutions.

Co-generation

- A cogeneration implementation strategy was drafted with special focus on the sugar industry utilizing bagasse as one of its main sources in the energy mix.
- A total of 23.2 MW of cogeneration capacity was brought on stream of which 12.2 MW was produced by Jamaica Broilers and 11 MW by Jamalco. Subsequently, the Jamaica Broiler's production was suspended and Jamalco reduced its available export capacity to approximately 6 MW as a result of the expansion in production capacity of 250,000 tons.

Wind

- The Government of The Netherlands, as part of its overall policy objective to meet its target of reducing 6% of its greenhouse gas emissions below 1990 levels, collaborated with the Petroleum Corporation of Jamaica (PCJ) and Renewable Energy Systems Ltd. in to develop a 20.7 MW wind farm project in Wigton, Manchester. This system averages 7 MW due to variation in wind speed. This was a Clean Development Mechanism project under the Kyoto Protocol. In the three years since it began operations in April 2004, the Wigton Wind Farm has sold €424,763 (J\$39 million) of carbon credits. A further €251,490 (J\$23 million) generated is yet to be verified. Wigton Wind Farm Phase II was opened in 2011, providing an additional 14 megawatts (MW) of renewable energy.
- A small 225 KW wind system was introduced at Munro College in 1996, initially selling to JPSCo; however this system has since encountered technical problems and no longer provides supplies to the grid.

Hydro

Government rehabilitated six of the mini-hydro plants that were privatized to JPSCo, and now account for 22 MW of capacity to the system.

Biofuels

- In 2005, a US\$10 million ethanol plant was commissioned and re-commenced production and export of fuel ethanol to the USA, using Brazilian feedstock.
- Jamaica became a participant in the Tri-Lateral Co-operation in the area of Bio-fuels which will see technical assistance and support from the governments of Brazil and the United States of America to help satisfy our domestic demand from locally produced biofuels including bio diesel.
- The Government created the Bio-fuels Task Force, a brainchild of the Ministries of Energy and Agriculture to pursue options that will benefit both the Energy and Agriculture sectors.

Green transport

Recent progress in the energy sector to promote green transport includes the following:

- The Government took a decision to phase out MTBE³ as an octane enhancer in gasoline and to replace it with ethanol, creating E10: a mixture of 10% ethanol and 90% gasoline. A full roll-out of E10 gasoline to service stations island-wide was implemented in 2009. Motorists now have access to E10 gasoline in both the 87 and 90 octane grades.
- The Ministry of Energy and Mining has been holding discussions with Ministry of Transport towards promoting vehicle fuel efficiency.

Green buildings

Progress made to support energy conservation and efficiency includes the following:

- The final draft National Energy Conservation and Efficiency Policy was prepared in 2010 and is awaiting approval by Cabinet.
- In October 2009, Jamaica's decades-old building code was replaced with a new National Building Code bringing the country's construction practices in line with international standards, while promoting safety. The new code comprises eleven application documents which will be used in conjunction with international codes developed by the International Code Council tailored to suit Jamaican conditions.

The new code will require architects and engineers to design, build and renovate buildings and factories to incorporate energy efficient lighting and cooling systems and building

³ Methyl tertiary-butyl ether is a water-soluble additive to gasoline that can easily render large quantities of groundwater non-potable.

material and employ energy-efficient construction methodologies. Additionally, the construction industry will be held to the standards outlined in the code.

- Jamaica received a technical cooperation grant of approximately US\$450,000 from the Inter-American Development Bank to support the government ministries and agencies in energy conservation and efficiency. Energy assessments for all government facilities have begun as well as the preparation of investment packages to support energy conservation and efficiency.
- The PCJ has carried out energy audits and implemented energy efficiency and conservation projects in the health and educational sector. Partnerships being planned with the National Water Commission (NWC), National Irrigation Commission (NIC) and the Port Authority of Jamaica (PAJ) to develop and implement energy efficiency and conservation projects.
- The government provided GCT exemption on over 30 items to increase energy efficiency and conservation.
- Under the Cuba-Jamaica Compact Fluorescent Lamp (CFL) Project, the Government of Jamaica distributed 4 million compact fluorescent light bulbs to replace high energy use incandescent lamps to Jamaican households and institutions.

Sustainable agriculture and forests

Recent progress in the energy sector to support sustainable agriculture and forests includes the following:

- Liquid petroleum gas (LPG) has replaced fuel wood as the primary household fuel in 84% of Jamaican homes, improving the standard of living and easing the rate of deforestation for fuel supplies.
- The development of the biofuels sector – as described in the sections discussing renewable energies and waste management – is contributing to sustainable agriculture efforts.

Waste management

Recent efforts to obtain energy from waste include the following:

- In 2009, the Petroleum Corporation of Jamaica (PCJ) entered into an agreement with a private sector company and partners for the establishment of two waste-to-energy plants using fully proven and appropriate technologies. When the plants are established, they will generate up to 65 MW of electricity from garbage at the Riverton dump in Kingston. The

project as proposed will see the construction of one 45 MW facility that will generate 358 gigawatt-hours (GWh) of electricity a year and one 20 MW facility producing 141 GWh. Annual savings in fossil fuel are projected to be some 700,000 barrels or US\$60 million.

- Approximately 600,000 tonnes of bagasse - equivalent to about 940,000 barrels of oil at a value of US\$37.5 million - are used per annum (as of 2003) in cogeneration in Jamaican sugar factories.
- The Scientific Research Council has been involved in the development of biogas plants using animal wastes in the agricultural, small manufacturing, educational and residential sectors. A total of 250 of these plants are in operation across the island, though cultural barriers are still to be broken in order to gain full acceptance of biogas as a fuel for cooking
- In 2000, work was completed on a 20 m³ bio-digester at the Vere Technical High School campus. Using a feedstock of mainly pig slurry gas is produced to energize a chicken brooder, canteen and laboratory burners. The Ministry of Mining and Energy and the school administration jointly funded this project. Plans were formulated to continue this kind of collaboration to construct and refurbish plants across the island.
- The Jamaica Pig Farmers Association, the Ebony Park Academy and other partners have been working to manage wastes from pig farms across the country. Pig farms produce an estimated 195,000 kg of manure per day and without proper disposal, this waste can pose a potential threat to Jamaica's fresh water supply. Currently, four farms employ biodigesters to help manage manure, and several others are currently under construction. These biodigesters have the potential to refine the raw manure into useful fertilizer and some will capture methane gas, which can augment or completely replace a farmer's need for cooking fuels such as propane.

Clean technologies

- Studies have been conducted on the introduction of Liquefied Natural Gas (LNG) to the Jamaican market for use primarily in the electricity and bauxite sectors. They have supported the move towards LNG as the diversification fuel of choice.
- Existing legislation is being revised to align to the new policy framework and fuel switch to LNG
- Use of cleaner technologies in a small percentage of the manufacturing sector

Situational Analysis – Jamaica’s Transport Sector

Background on the Transport Sector

The transport sector in Jamaica may be considered to include road and rail transportation, air and maritime transportation. Jamaica’s transport system includes: a total of 15,394 km of road network; an airport infrastructure of three international airports and three domestic aerodromes; a railway network covering approximately 331 km of track as well as six privately owned mining railways lines; and a maritime transport infrastructure of fourteen major seaports.

During the period 2004-2008, Transport, Storage and Communication contributed on average 11.5% to Jamaica’s Gross Domestic Product (GDP). In 2008, transport (road, railway, water and air including services allied to transport) and storage contributed 5.6% to total GDP.

Vision 2030 Jamaica – National Development Plan has identified transportation as a key element in the national outcome “Strong Economic Infrastructure” in which five of the seven national strategies focus on transportation.

The Ministry of Transport and Works (MTW) has prepared a draft National Transport Policy⁴ to provide a framework for the future development of the sector and to achieve:

“Sustainable competitive safe accessible and environmentally friendly transport network providing world class Air Land Rail and Marine facilities contributing to a vibrant import, export and transshipment trade for Jamaica and the world”.

The Policy has identified the following nine principles which guided the approach to policy development:

- Competition
- Cost Recovery
- Economic Development
- Consultation
- Private Sector Participation
- Environmental Protection
- Equal Access to Transport
- Energy Efficiency
- Appropriate Land Use

⁴ On September 11, 2007, the Ministry of Housing, Transport, Water and Works (MHTWW) was re-organized into two (2) Ministries, the Ministry of Transport and Works and the Ministry of Water and Housing.

Transport and the Green Economy

One of the seven sectors of a green economy, as shown in Figure 1 above, is “green transport” – also referred to as “sustainable transport.”

Green transport refers to any means of transport with low impact on the environment, while at the same time making a positive contribution to the social and economic sustainability of communities. Green transport systems are fuel-efficient, space-saving and promote healthy lifestyles.

The European Union Council of Ministers of Transport defines a **sustainable transportation system** as one that:

- Allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations.
- Is Affordable, operates fairly and efficiently, offers a choice of transport mode, and supports a competitive economy, as well as balanced regional development.
- Limits emissions and waste within the planet’s ability to absorb them, uses renewable resources at or below their rates of generation, and uses non-renewable resources at or below the rates of development of renewable substitutes, while minimizing the impact on the use of land and the generation

Efforts to move toward green transport include measures such as: efficient traffic management; carpooling; use of clean fuels to minimize pollution; flexi-work hours; using information and communications technologies to reduce or replace physical travel; providing increased choices; an efficient public/urban mass transit transport system; encouraging non-motorized transport; and promoting vehicle and road maintenance programmes. Air travel results in significant levels of air pollution. However, within the air and maritime transportation sector, greening efforts would include environmentally friendly airports and ports.

Profile of Jamaica’s Transport Sector

Land Transport

Land transportation in Jamaica encompasses two components: road and railway transportation. The bulk of commuting public in Jamaica travels via land transportation. The

land transport sub-sector is the second largest consumer of petroleum, accounting for 21% of total consumption in 2006. Land transportation is also the most affected by natural disasters such as hurricanes and tropical storms, which have caused extensive damage to infrastructure in recent years and in effect result in a significant reduction in activities of Jamaica's transportation system.

Road transport includes the road infrastructure, private motor vehicle movement, and the public transport system including buses and licensed public passenger system. Jamaica has one of the densest road networks in the world, with a total of 15,394 km of road. Traffic volume has been steadily increasing over recent years. This has led to congestion problems in major towns and capitals across the island. Traffic management initiatives have been implemented in the Kingston Metropolitan Transport Region and proposals have been made to address congestion issues in other parishes.

Air Transport

Jamaica's air transport system comprises an international system and a domestic system. The Airports Authority of Jamaica (AAJ) is responsible for the ownership, management and commercial functions of the three international airports – Norman Manley International Airport (NMIA), Sangster International Airport (SIA), and the recently designated Ian Flemming International Airport (formerly Boscobel Aerodrome). In 1997, AAJ's responsibility was expanded to incorporate the three active domestic aerodromes – Ken Jones, Negril and Tinson Pen. One of the primary responsibilities of the AAJ is to oversee the expansion and modernization of facilities. Passenger movement at the NMIA in 2004 was 1,454,668 and this increased to 1,710,155 in 2008, an increase of 17.6%. SIA recorded a smaller increase of 1.9% for the same period, as passenger movement increased from 3,323,680 in 2004 to 3,385,207 in 2008.

Significant enhancements were made to the two major international airports through the Norman Manley International Airport Capital Development Programme and the Sangster International Airport Expansion Project, some of which incorporated green building concepts. Construction on Phase 2 of the NMIA project is scheduled for 2013 – 2023.

Maritime Transport

Jamaica's water-based transport sub-sector is almost entirely represented by deep-sea maritime transport, as inland waterways and short-sea coastal shipping play insignificant roles in the island's transport sector.

The role of maritime transport is enhanced by Jamaica's location astride strategic sea trade routes and by the projected increase in transshipment traffic through the Caribbean over the long term based on the planned expansion of the Panama Canal that will double its capacity by

the year 2015. The preeminent issue for the maritime transport sub sector is the major commitment made to establishing Jamaica as a global transshipment and logistics hub as a part of its economic future involving significant investment in infrastructure in the Port of Kingston.

Jamaica possesses well developed maritime infrastructure with a total of 14 seaports including four cruise ship facilities. Jamaica accommodated 3,586 vessels in 2008, handling 30.3 million tons of cargo and 1.09 million passengers. The port of Kingston (Kingston Container Terminal, Kingston Wharves and the Kingston sufferance wharves) accounted for 68% of the vessels calls and 54% of tonnage handled. Major commodities handled at Jamaican ports include containerized general cargo, bauxite/ alumina, gypsum, limestone, bananas, sugar, crude oil, petroleum products and motor vehicles. There are 45 Jamaican flagged vessels totaling 200,000 gross tons trading worldwide.

Jamaica's Progress in the Transport Sector towards a Green Economy

Recent efforts implemented in the transport sector which contribute toward green transport are described below.

Promoting Road Maintenance Programmes

- Funding of US\$400 million for the implementation of the Road Master Plan was secured from China under the Jamaica Development Infrastructure Programme (JDIP).
- Interventions for flood control and mitigation of flood damage to roads were undertaken, including improvements to water ways, and drain and gully cleaning.

Development/Enhancement of the Public Transportation System

- The Government undertook the development of a Public Transportation Rationalisation Project, aimed at developing a comprehensive and inter-modal transportation system for the island, including major towns such as Montego Bay and May Pen; a Multi-Modal Public Transportation Policy; studies for a multi-modal transport plan for the extended Kingston Metropolitan Transport Region; and development of Rural-Urban Plans for a number of rural towns including Ocho Rios, May Pen, Santa Cruz, Montego Bay and Spanish Town. Progress was made toward expanding the public bus system, with the Jamaica Urban Transit Company (JUTC) adding 300 new buses to its fleet in 2009-2011.
- Montego Bay Metro (MBM) Limited received two new buses from the Government during the period. MBM plans to expand its routes to operate a school bus service to Irwin High School, a full circle bus to the Airport, and full bus service to Lucea.

Development of Alternatives to Road Travel

- An Economic Impact Assessment study was conducted by Halcrow in 2009, which supported the rehabilitation of the railway with emphasis on cargo between Kingston and Montego Bay and between Spanish Town and Ewarton, and tourism between Montego Bay and Appleton. During the period the Jamaica Railway Corporation refined its limited service proposal to offer railway service from Spanish Town to Linstead. However, fiscal constraints require that the project be configured for private investors, with re-scoping for possible implementation over the 2010-2013 period.
- The development of strategic maritime infrastructure for cargo and passengers during the period 2009-2011 included the completion of Phase 5-1A of the Kingston Container Terminal.

Development of Fuel Efficiency and Conservation Initiatives

- The Ministry of Transport and Works and the Ministry of Energy have been holding discussions towards promoting vehicle fuel efficiency.

Protection of the Marine Environment

- The Government recognizes that the maritime transport sub-sector will require addressing the environmental impacts of marine transport, including ship-borne waste, dumping, oil and exhaust pollution, potential introduction of aquatic invasive species through ship ballast water, and impact on coastal eco-systems from port facilities and shipping activities. While the maritime transport sub-sector has had a good track record with respect to oil spills with very few incidents recorded over the past decade, there is less data available on the performance in other areas such as ship-borne waste and introduction of aquatic invasive species. Jamaica is currently signatory to a number of relevant international agreements, including the International Convention for the Prevention of Pollution from Ships (MARPOL), Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention), and the Convention on Wetlands of International Importance (RAMSAR).

Sectoral Consultation – Energy and Transport

The sectoral consultation for energy and transport within the context of the green economy was held on May 14, 2012. The consultation was held with members of the Thematic Working Groups for Environment, Energy and Transport. These thematic working groups are part of the monitoring and evaluation mechanism under Jamaica's long-term national development plan – Vision 2030 Jamaica. Vision 2030 Jamaica is designed to put Jamaica in a position to achieve developed country status by 2030. Participants at the meeting are presented below:

- Peter Knight – Chairman and CEO of the National Environment and Planning Agency
- Elsa Sommerville – Western Regional Health Authority, Ministry of Health
- Le-Ann Roper – Planning Institute of Jamaica
- Anthony McKenzie – National Environment and Planning Agency
- Johnil Morgan – National Environment and Planning Agency
- Michael Myles – National Environment and Planning Agency
- Doreen Prendergast – Ministry of Transport, Works and Housing
- Janet Geohagen-Martin – Statistical Institute of Jamaica
- Seveline Clarke King – Planning Institute of Jamaica
- Harry Jackson – National Solid Waste Management Authority
- Calvert McLeod – National Solid Waste Management Authority
- Winston Watson – Petroleum Corporation of Jamaica
- Martin Addington – Jamaica Institute of Planners
- Janice Miller – Ministry of Foreign Affairs and Foreign Trade
- Anthony Chen – Climate Studies Group, University of the West Indies
- Jeffery Spooner – Meteorological Service
- Marilyn Headley – Forestry Department
- FJ McDonald – CANARI
- Indi McClymont Lafayette – Panos Caribbean
- Karen McDonald Gayle – Environmental Foundation of Jamaica
- Margaret Jones Williams – United Nations Development Programme
- Leonie Barnaby – Ministry of Water, Land, Environment and Climate Change
- Elizabeth Emanuel – Vision 2030 Jamaica
- Sherica Hawthorne – Vision 2030 Jamaica

The objectives and purpose of the meeting was to focus on the Rio+20 Conference occurring between 20th – 22nd June 2012 in Rio de Janeiro, and to review the progress made since the last UN Conference on Environment and Development. A presentation was made on Energy and transport within the Context of the Green Economy with specific emphasis on progress made in Jamaica over the years. (see Appendix for presentation and note that most of the information from this presentation is included in the previous sections of this paper).

This presentation was followed by a discussion on the energy and transport sectors within the context of the green economy and strategies that Jamaica could pursue. To facilitate the discussion a series of questions was posed to the participants at the meeting. These questions are listed below:

1. Do you believe that the concept of the green economy is well understood across all sectors of society?
2. Is Jamaica progressing towards a green economy (energy and transport sectors) and to what extent?
3. Are the strategies articulated in Vision 2030 Jamaica for these two sectors sufficient and appropriate to move us into the realm of the green economy?
4. What key strategies for sustainable energy and transport can we propose for the short, medium and long term?
5. What would be the key benefits of embracing the green economy?
6. What are some of the institutional, and policy arrangements that need to be considered?
7. What role would you prescribe for Vision 2030 Jamaica to aid in moving Jamaica into the realm of the green economy?
8. How can green economy concepts be institutionalized in GOJ?
9. Are there any emerging challenges and/or opportunities that Jamaica must consider?
10. What roles do you see the private sector and civil society playing as Jamaica moves towards the green economy?

General Comments of the Group

1. The green economy helps to engage those who are involved in economic planning, while sustainable development focuses on the physical environment.
2. Sustainable development focuses more on the environment (contribution and protection), whereas the green economy is moving towards social equity, decreasing unemployment in terms of job creation, hence Rio+20 is a development agenda and not an environment agenda.
3. One aspect of the green economy that must be considered is natural capital and ecosystems services, putting a valuation on it and incorporating these into the country's systems of national accounts and GDP.
4. Each country should be encouraged to develop its own definition of the green economy.

5. There needs to be a greater emphasis on urban design in terms of research and development in designing strategies to deal with the energy and transport sectors.
6. Current strategies articulated in Vision 2030 Jamaica as well as those being pursued are insufficient as it relates to the energy and transport sectors
7. Some key strategies proposed for moving to more sustainable energy and transport sectors included:
 - Better Urban planning
 - Linking Plans to Implementation
 - Publicizing ideas from these discussions and making them available to the public whereby the private sectors could contribute in ensuring that these areas are implemented.
 - Evaluate global warming potential
 - Consider decision made at Durban, that by 2015, all countries will come to an agreement on the reduction and mitigation of greenhouse gases.
8. The team could look at how Civil Society is incorporating the green economy
9. Decision making and enforcement of policies need to be increased.
10. One member noted that at a recently held conference, small developing states were being encouraged to reject the concept of a green economy and accept the concept of a blue economy. Therefore, he encouraged the meeting to think carefully about whether or not we want to be associated with the conditionalities of a green economy.
11. Smart Growth concepts should be considered to assist with the development of the green economy.
12. The issue of the Green Economy is to be considered for inclusion into the new Medium Term Socio –Economic Policy Framework currently being developed for Jamaica as part of the implementation framework for Vision 2030 Jamaica.

International Best Practice – The Energy and Transport Sectors within the Context of the Green Economy

There are numerous examples of efforts within the energy and transport sectors that support the green economy. A select few are presented here.

Curitiba, Brazil – a Sustainable City

Curitiba – a city in southern Brazil – is known internationally for its progressive transportation system, social services and environmental practices. Development in the city is guided by the Curitiba Master Plan which seeks to minimize urban sprawl, reduce downtown traffic, preserve Curitiba's historic district and provide easily accessible and affordable public transit.

The keystone of the plan is the city's mass transit system. Despite the small size of the city, Curitiba has a well-planned, easily-navigable, efficient, and environmentally-responsible transportation system which is used by 85% of the city's population. The system is extremely user-friendly and includes: purchasing tickets beforehand to avoid frustrating boarding processes, colour-coding, ranges of systems that service different distance transit, and great navigation graphics. Based entirely on buses and proper land development, the system in Curitiba was designed to provide simple transportation to and from the city center via an (at the time) unique system known as the Tertiary Road System: a system in which two roads exclusively for public transport are surrounded by the standard one-way streets for private transport.



Curitiba faces the usual urban problems including overcrowding, poverty, pollution and limited public funding. What is different about Curitiba is that its planners have come up with some creative and inexpensive ways to go about solving universal problems for cities. They have invested in an extensive bus system; developed recycling programmes that clean up the environment and also address poverty; attracted new industry while expanding green spaces; and used preserved historical areas to revitalize neighborhoods and grow tourism.

City residents now recycle two-thirds of their garbage, in a program that costs no more than the old landfill. The city is cleaner, its people have more jobs, farmers have more dependable income, and the poor receive food and transportation benefits.

The “Garbage that is not Garbage” and “Garbage Purchase” programs involve curbside pick-up and disposal of recyclables sorted by households and in less accessible areas, exchange of collected garbage for food or transit tickets by low-income residents. The “All Clean” program temporarily hires retired or unemployed persons who concentrate on areas where litter has accumulated.

Trash is separated into only two categories, organic and inorganic, picked up in two different types of trucks. Poor residents in areas unreachable by truck bring their waste to neighborhood centers, where they exchange it for bus tickets or eggs, and milk bought from outlying farms. Trash is separated at a plant built of recycled materials, sorted by workers who are handicapped, recent immigrants and alcoholics. Recovered materials are sold to local industries. Styrofoam is shredded and used for stuffing for quilts.

Trinidad and Tobago – Solar Lamps and Garbage Bins

In the past decade solar energy has been making inroads in Trinidad and Tobago. Several companies have started cutting electrical costs by installing solar powered energy.

The Piarco International Airport has upgraded its airfield lighting with solar-powered LED airfield lights. These lights are self-contained waterproof units which drastically reduce maintenance costs and eliminate the need for wiring and external storage batteries. Also they can be remotely controlled from the control tower where variations may be made to intensity or “flash” patterns as required. As an alternative to wired runways lights,



these solar-LED lights install quickly and operate reliably, with no scheduled maintenance, in even the most challenging environmental conditions. With no bulbs to burn out, and each light powered independently of the grid, a solar-powered lighting system offers a dependable year-round solution. In windstorms, flooding, local power outages or regional blackouts, solar-powered lights can stay lit even when other lights go out. Solar lights also have been installed at the Crown Point Airport in Tobago.

A two-mile self-contained light is on trial at Telecommunications Services for Trinidad and Tobago for its towers. Lighting of a similar nature for marine applications has also been supplied to Maritime Services where there have been preliminary discussions regarding at least one lighthouse application. Solar lights have been installed on several Petrotrin offshore oil platforms. Several shopping malls and military facilities have also been using solar powered lights.

One company recently installed solar powered bins in San Fernando and Port-of-Spain. The bins compact garbage before it overflows onto the sidewalks. These bins store energy from the sun to compact the garbage inside, holding up to five times the normal amount of waste. The promoter has said if the bins were installed throughout the city there would be a need for fewer garbage trucks.