Study on the Identification of Potential Project Portfolios Associated to Programmatic CDM and NAMAs in Jamaica

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LIST OF ACRONYMS

CDM	Clean Development Mechanism
CER	Certificate of Emission Reduction
CHENACT-AP	Caribbean Hotel Energy Efficiency and Renewable Energy Action Advanced Programme
CME	Coordinating Managing Entity of a CDM PoA
CO2	Carbon Dioxide
COP	Conference of the Parties
CPA	Project Activity of a PoA
DNA	Designated National Authority to the CDM
DOE	Designated Operational Entity in the CDM
ECPA	Energy and Climate Partnership of the Americas
EE	Energy Efficiency
ESCO	Energy Service Company
EU	European Union
EUETS	European Union Emission Trading Scheme
GEF	Global Environmental Facility
GoJ	Government of Jamaica
IDB	Inter American Development Bank
KP	Kyoto Protocol
LDC	Least Developed Country
LEDS	Low Emission Development Strategy
MACC	Marginal Abatement Cost of Carbon
MSTEM	Ministry of Science Technology Energy and Mines
MWLECC	Ministry of Land Water Environment and Climate Change
NINO	NAMA Information Note
NAMA	Nationally Appropriate Mitigation Action
NHT	National Housing Trust
OLADE	Latin American Energy Organization
PDD	Project Design Document in the CDM
PoA	Programme of Activity
PoA CPA DD	Design Document for a Project Activity in a PoA
PoA DD	Design Document for a PoA
RE	Renewable Energy
SME	Small and Medium Enterprises
tCO2e	Tons of CO2 equivalent
UNFCCC	United Nations Framework Convention on Climate Change
USG	United States Government
WB	World Bank

EXECUTIVE SUMMARY

This report is prepared under the implementation of the "Study on the Identification of Potential Project Portfolios Associated to Programmatic CDM and NAMAs in Jamaica".

OLADE is providing support to the Government of Jamaica (GoJ) through the provision of technical assistance in order to contribute in the identification of opportunities for the development of CDM Programs of Activities (CDM PoA) as well as Nationally Appropriate Mitigation Actions (NAMAS).

The study begins by presenting in a summarized way the state of the art on the current situation of the CDM, both from the regulatory side of things at the UNFCCC level and into the recently observed dynamics at the market perspective. Presentation is done on current trends to move from strict carbon financing to a broader concept of climate financing, which includes the NAMAS as an opportunity under development to assist countries in enabling mitigation activities both at the policy as well as the project/program level.

The report continues by tacking stock on the situation of the CDM in the country and the level of participation achieved during the First Commitment Period of the Kyoto Protocol. Jamaica being a small economy with small Greenhouse Gas Emissions, as many other countries, shares a very small participation into the CDM as a market mechanism. Only a couple of wind farm projects were registered under the CDM and some issuance of CERs took place. Nevertheless in consistency with the regulations of the CDM, the country implemented institutional development of a DNA as well as procedures for national approval of CDM projects. Several PoAs of the multi-country level at validation stage include Jamaica as potential target country for CPA development. One small scale PoA for hydro electricity development in the country advance through design stages but did not continue into the CDM project cycle.

Assessing potential for different types of interventions requires the review of the on-going activities in the country from policy to institutional development and into program executions in the climate change area as well as the energy sector. It is clear that the country has enacted a series of visions, policies and action plans that can contribute significantly to prepare the ground for climate financing opportunities. An issue to bear in mind is that transforming the vision of the country is involves profound transformation of the political economy of government institutions as well as conducting stakeholder engagement dialogues at different level in order to create the momentum of the transformation desired.

An initial gap analysis is performed on the actions that may be required in order to mobilize climate financing in order to contribute from the mitigation side of climate change to the proposed types of scaling up of activities the country is embarking in the energy sector. Important issues addressed relate to the policy environment, legal aspects of institutional and contracting for private sector participation and broad cooperation and collaborations amongst the myriad of institutions involved, emphasizing the need to have a strengthen Climate Change Unit under the MWLECC, with a capacity of devise paths for international pitching on resources as well as in to

contribute in the MRV of programs with an explicit climate change mitigation component.

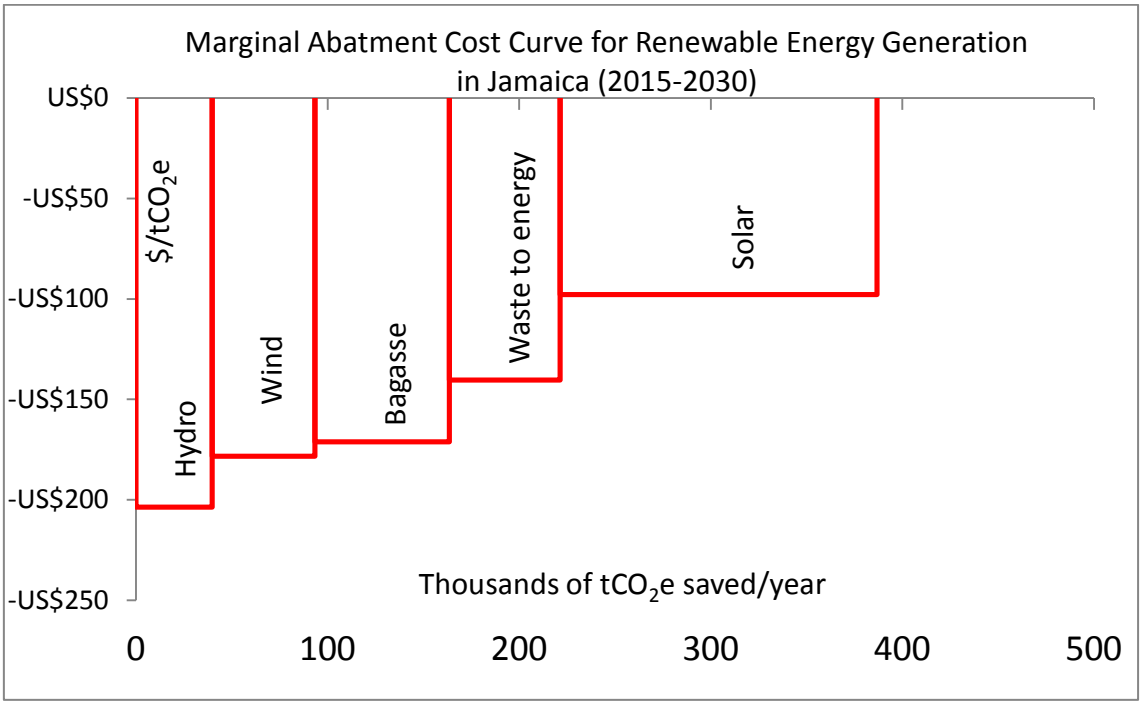
Identification is performed of several potential actions that can be developed as NAMAs using PoA arrangements both in the RE technology for grid interconnections as well as on energy efficiency in the hotel sector and public buildings; based on the existence of on-going programs that can be scaled up.

It is the opinion of the author, that unless the country is very proactive in negotiating participation in bilateral agreements with target Annex I countries, it may well be that the path is somewhat defined already (by the international negotiations as well as market issues):

- In the short term, large scale emission reduction projects may be able to reach carbon markets through bilateral agreements, and it is likely that in the medium term (from 2015 onwards) they will have to wait and see how the negotiations on the New Market Mechanism will shape up or not.
- Small scale CDM type projects will likely be able to make it into the CDM market via adscription as CPAs to already registered multi-country PoAs (i.e. stoves, biogas, small RE technologies for rural households, etc.) that may tackle support from Annex I countries like those in the EU.

It is becoming clearer that the paths for most of the identified and discussed potentials for emissions reductions in Jamaica lies within the boundaries of the NAMA mechanisms under discussion in the UNFCCC as a vehicle for climate financing.

An initial MACC approach is used for assessing the cost of mitigation action on renewable energies and a cost curve has been developed, by using the author´s estimations based on information available from recent studies conducted in the country on levelized cost of energy for different sources of electric generation.



From the climate mitigation perspective, renewable energy interventions seem to be very cost effective in Jamaica, and associated climate financing may be able to be attracted in order to assist in removing some of the perceived gaps or barriers associated to the regulatory challenges as well as in mobilizing financing and investment guarantees for private sector participation.

Although it has not been possible to apply the same approach in order to assess Energy Efficiency programs, presentation is given on their perceived merits. Altogether, the identified potentialities indicate that Jamaica can expect important mitigative results from the identified opportunities.

Type of mitigation measure	Estimated Emissions Reductions for the period 2012-2030	Comment
Renewable Energy Electricity Generation for Grid Interconnection	6.96 million ton CO2	Measure shows negative marginal cost abatement of carbon (MACC), and will be strongly related to the baseline adopted. Important sustainable development benefits associated. Estimation based on target renewable energy penetration in the grid according to the energy policy and country vision.
Energy Efficiency and	1.94 million ton CO2	No calculation performed on

Type of mitigation measure	Estimated Emissions Reductions for the period 2012-2030	Comment
Conservation in the Tourism Sector		the MACC, but anticipated to be attractive from experience in other countries. Important sustainable development benefits associated. Estimation based on a program directed at the spectrum of hotels in the country.
Energy Efficiency and Conservation for Public Buildings and Infrastructures	0.25-0.6 million ton CO2	No calculation performed on the MACC, likely to be attractive with important benefits to the GoJ. Estimated as a range in scaling up existing programs but depending of degree of available resources from the GoJ.

The study assesses the identified opportunities from the perspective of early-on lessons learned that are emerging elsewhere on NAMA development. The identified potential is observed from perspectives such as: inscription into long term visions and clear objectives, availability of partners and resources, level of political commitment and collaboration, designation of responsibilities, experience in participatory processes and existence of on-going programs with scaling up potential.

Although it may be too early to assess fully, information is presented on each of the potential initiatives for the different success criteria.

- In general, it can be said that the identified NAMA type activities are consistent and solidly based within long term visions and clear objectives, although the latter may be better linked in case of renewable energy than to energy efficiency.
- There is a myriad of identified partners and resources that need to be mobilized in order for a NAMA to take off from the ground. In all opportunities identified, at least there are identified partners with access to early on resources that can be important; possibly needing a discussion on types of instruments most likely needed in order to attain the scaling up of the proposed intervention.
- There seems to be adequate political collaboration, but the complex political economy of institutions in the country will need to be addressed in mobilizing towards creating a pitch to obtain incremental climate finance for the different interventions.
- There is plenty of experience on participatory processes in the country and the effort created by the Jamaica Vision 2030 is of major impact. Efforts

nevertheless will be needed in assembling discussion tables and bottom-up approach participatory processes for successful NAMA development.

A major plus encountered is that in all three identified potentials, there are on-going projects and programs currently under implementation in the country. Scaling up will be possible if appropriate lessons learned are obtained and adequate discussion from the climate financing perspective is achieved in the country.

The country needs to engaged into strengthening its capabilities to understand the depth of new climate financing opportunities and risks, assess if the emerging mechanisms of climate financing may be attractive to supplement and scale up on-going activities, and from there pursue opportunities that are cost effective and with ample sustainable development benefits for the country.

A NAMA concept denominated **"Jamaica Renewable Energy Scaling Up NAMA"** is presented in order to facilitate decision maker discussion on the issues to be taken into account when deciding or not to embark in readiness activities towards NAMA development.

1. Introduction

This report is prepared under the implementation of the "Study on the Identification of Potential Project Portfolios Associated to Programmatic CDM and NAMAs in Jamaica".

OLADE is providing support to the Government of Jamaica (GoJ) through the provision of technical assistance in order to contribute in the identification of opportunities for the development of CDM Programs of Activities (CDM PoA) as well as Nationally Appropriate Mitigation Actions (NAMAS), as part of implementing climate change mitigation actions within the energy sector, with special interest in the areas of contributions from renewable energy and energy efficiency project/program development.

This activity is a continuation of other on-going capacity building activities sponsored by OLADE, like the Sub Regional Workshop on CDM PoA and NAMA Development that took place in Jamaica in 2012.

2. A Framework of the Current Situation in the CDM and NAMA Development Internationally

Currently, and based on most recent developments associated to international climate change negotiations, the carbon markets are experiencing tremendous transformations reflected in a lack of demand, floor level prices, potential over demand on the second commitment period of the Kyoto Protocol and lack of overall ambition by developed countries to further deeper commitments. A transformation is also beginning to take shape as the world is preparing to shift from just carbon market mechanisms to broader climate finance schemes (where markets can still continue to play important roles). As presented very recently by Perspectives Climate Change in Austria (2013) there is relevant action worldwide on different types of carbon markets, providing confirmation that the CDM will not likely be the only type of market program and therefore it is expected a continuous flow of changes since different markets will also be reacting to specific country/region political decisions. It is clear that at least from the EU perspective, only CDM CERs coming from projects in LDC countries will be acceptable under their scheme.

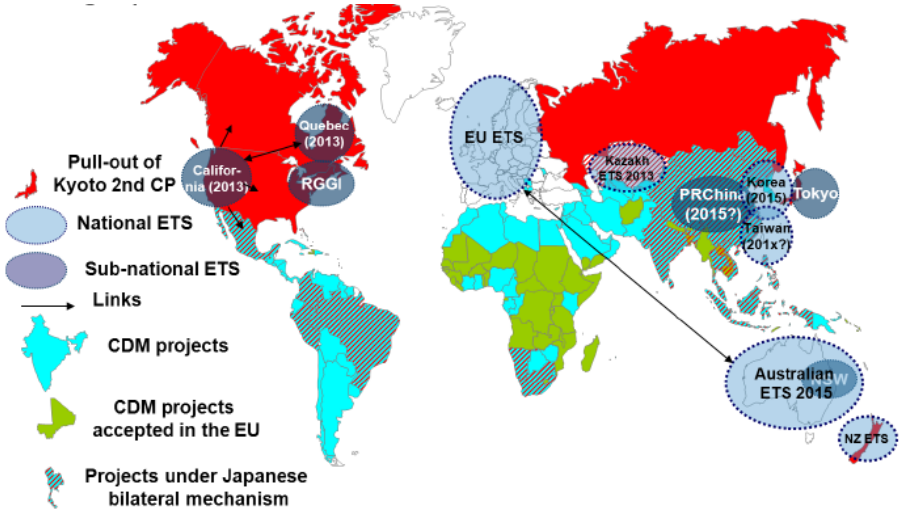


Figure 1. International carbon market activities worldwide (Michaelowa, 2013)

Statistics do not lie also, and the current carbon markets have gone from heaven to hell in less than 18 months when the price reached down to the floor.

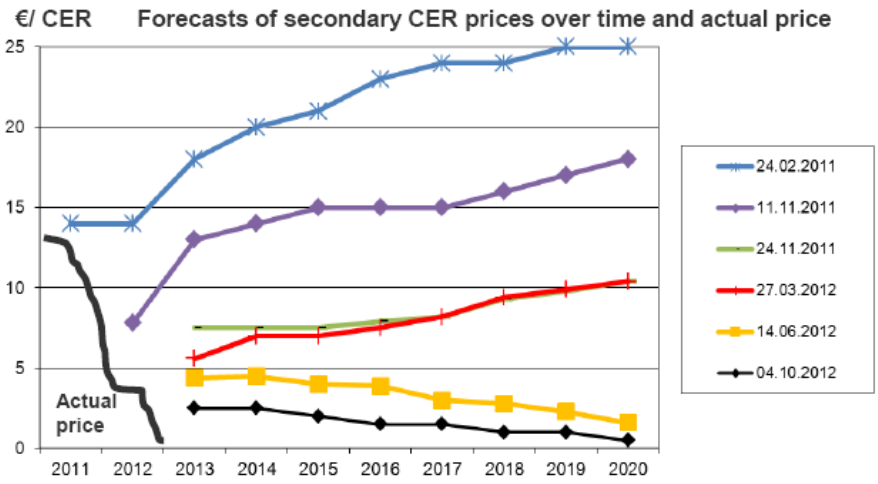


Figure 2. Current and projected trends for CDM CERs (Michaelowa, 2013)

It can be noticed that the drop on the actual value on the price of the CER is very high and that projections on the future value of it are indicative of the existence of negative perceptions accelerated by the lack of political decisions at the level of the UNFCCC.

Moreover the countries in the world have embarked in the discussion of a new market mechanism that can serve to structure broader participations from countries taking on mitigation actions (contentious issue at the climate change international negotiations).

Over the last couple of years, Nationally Appropriate Mitigation Actions or NAMAS have been at the forefront discussion of new trends to support innovative fast forward mitigation activity development in developing countries. Nationally Appropriate Mitigation Action (NAMA) refers to a set of policies and actions that countries undertake as part of a commitment to reduce greenhouse gas emissions. The term recognizes that different countries may take different nationally appropriate action on the basis of equity and in accordance with common but differentiated responsibilities and respective capabilities. It also emphasizes financial assistance from developed countries to developing countries to reduce emissions.

NAMA was first used in the Bali Action Plan as part of the Bali Road Map agreed at the United Nations Climate Change Conference in Bali in December 2007, and also formed part of the Copenhagen Accord issued following the United Nations Climate Change Conference in Copenhagen (COP 15) in December 2009.

One major distinction needs to be understood when talking about CDM and talking about NAMAS. The CDM was a project performance based market mechanism in which the project owner took most of the responsibility in assuring the delivery of the emissions reductions and therefore played a major role. NAMAS need to be registered by countries and therefore normally are discussed at a very different level within a given society.

The inherent potential flexibility of NAMA mechanisms is widely regarded as an opportunity to deliver benefits that go far beyond greenhouse emissions reductions, and a few countries are a step ahead in gaining experience in this new emerging climate finance mechanisms.

A can be seen in the next few figure, NAMAs are beginning to take shape, with few already submitted to UNFCCC and or at implementation, but many more under conceptualization.

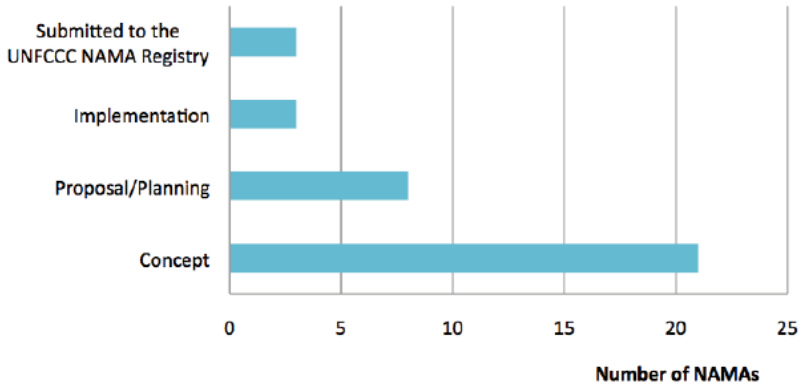


Figure 3. International level of activity in NAMAS (Mitigation Momentum, 2013)

Recent examples of new entries of NAMAS worldwide include the following around the world.

Country	Sector	Objective of NAMA	Stage of NAMA development
Georgia	Energy supply	Construction of 10 hydro power plants in the Kakheti region of Eastern Georgia to reduce fossil fuel based electricity generation and related GHG emissions	Concept
Mali	Energy supply	Reduction of GHG emissions through renewable energy production (e.g. with hydro, wind, biomass and solar PV technologies)	Concept
Ethiopia	Transport	Increase in tonne/km of freight transported by electric rail, powered by renewable electricity, as opposed to road transport	Concept
Colombia	Transport	Build the planning and implementation capacity of the Ministry of Transport and the National Planning Department in Colombia, to structure NAMAs in the transportation sector and more specifically in the field of freight transportation.	Proposal/Planning
Chile	Energy supply	Revolving fund to insure renewable energy projects against spot market price fluctuation	Proposal/Planning

Figure 4. Examples of recently submitted NAMAS (Mitigation Momentum, 2013)

In terms of worldwide distribution, Latin America represents 57% of the current portfolio, with the Middle East and Africa representing 34%, Asia 6% and Europe 3%. In terms of sectors of coverage, energy supply represent 37%, transport 23%, waste 14%, buildings 11%, agriculture 6% and forestry 6%.

There are still issues to be defined within the concept of NAMAS, as there is criticism related to the pending definitions as to whether supported concepts will eventually be market driven or subsidized ones from the developed world into the developing world.

Although the scope of this intervention is not of concentrating in the design of NAMAS, the approach suggested by GIZ on how to assess opportunities for NAMA development is followed, at least conceptually over the first 3 steps depicted in the following figure.

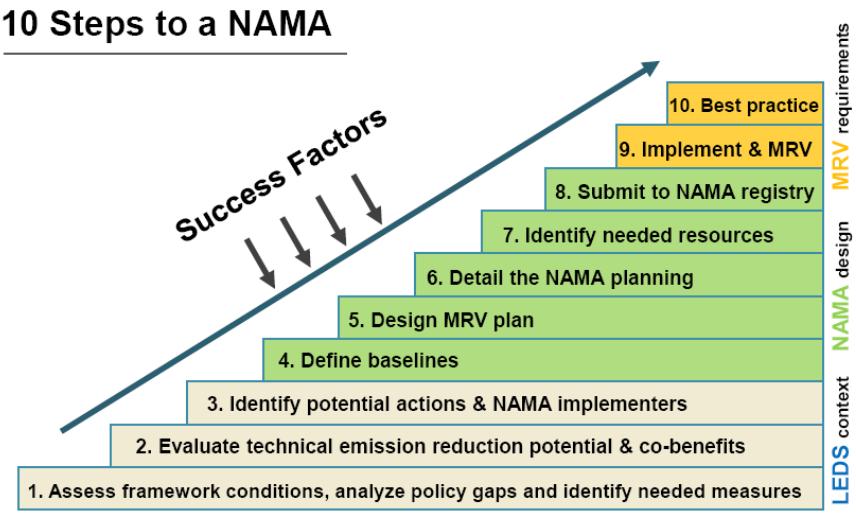


Figure 5. Recommended steps for a NAMA development (GIZ, 2013)

Any country considering going into the NAMA path must start by developing appropriate low carbon emission strategies in order to determine and prioritize the climate mitigation action with the best complementary sustainable development benefits as a NAMA is basically a country supported action.

In order to provide assistance to the GoJ, this intervention supported by OLADE looks at:

1. Leveling the floor of information to what was accomplished in the country with the CDM,
2. Presenting and assessing from a gap analysis perspective, where are the spaces for potential development of POAs and NAMAS in the energy sector,
3. Identification of some of the technical potentials and associated sustainable development co-benefits; and
4. Provide early recommendations to the GoJ for the promotion and early development of the identified potential.

The author recognizes the impressive body of on-going activities there is currently in the country, within the energy sector and therefore is very thankful of the support provided by the local authorities as this work is being implemented.

3. The CDM in Jamaica and Status of Results over the First Commitment Period of the Kyoto Protocol

Jamaica is a signatory country of the Kyoto Protocol, which it ratified since 1999. As a signatory country, Jamaica has dully reported to the UNFCCC a National Designated Authority to the CDM, entity that is charged with the implementation from the Host Country perspective of the appropriate and applicable modalities and procedures for the national approval of CDM project activities.

The Caribbean region has seen relatively little participation in the CDM (compared to the rest of Latin America). As per of March 2013, the region has 18 projects registered in the CDM, showing a concentration of 12 projects in the Dominican Republic, 2 in Jamaica, 2 in Cuba, and one respectively for Guyana and Bahamas.

As per the sectoral distribution of the projects from the region, renewable energy followed by landfill gas and fuel switch projects occupies the upper tier with respect to observed developments.

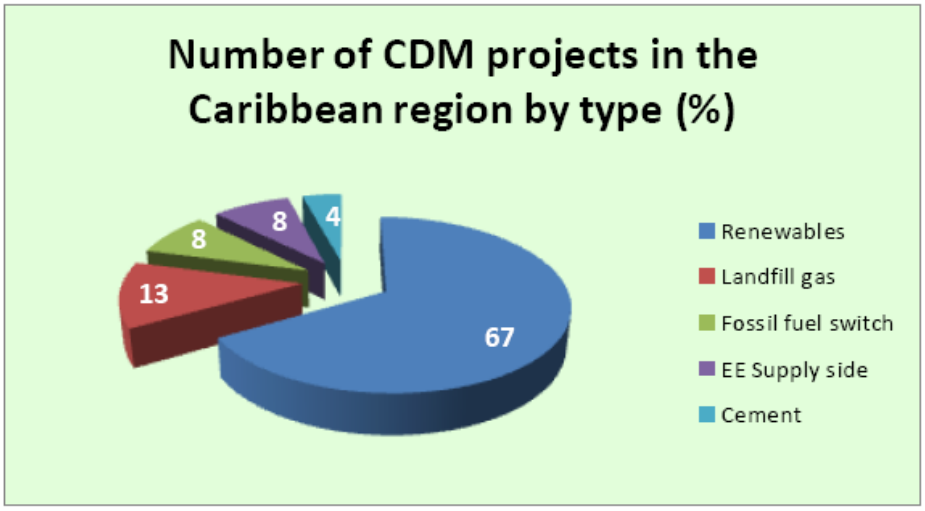


Figure 6. Number of CDM projects by project type in the Caribbean region (UNEP Risoe, 2013)

As a first approximation to assess the current situation of the CDM in Jamaica, detailed information is provided on the projects that have entered formally into the CDM project cycle coming/or associated to Jamaica. Information is presented on both CDM normal project activities as well as to identify PoA activities. No inclusion is done here of any other projects that may have at some point in time interested in the CDM but who do not reached to enter into the official CDM project cycle.

Table 1 presents an overview of the status of CDM project activities in the country.

Table 1. CDM Project Status in Jamaica (including both normal projects and PoAs)

Project / PoA	# CDM	Type	Capacity	Estimated CERs (ton CO2e/year)	Scale[1]	Validation	Registration	CER Issuance	Comments
Projects									
Wigton Wind	0239	RE Wind.	20.7 MW.	52,540 ton	L	Completed 26/08/2005	19/03/ 2006	Project has	

[1] L: Large Scale, S: Small Scale.

Project / PoA	# CDM	Type	Capacity	Estimated CERs (ton CO2e/year)	Scale[1]	Validation	Registration	CER Issuance	Comments
Farm Project (WWF)				CO2e/year.		by DNV.	Crediting period: 29/04/2004 – 28/04/2014 (fixed).	issued CERs, 8 MR from 29 April 2004 – 31 Dec 2012.	
Wigton Wind Farm II	5522	RE Wind.	18 MW.	40,348 ton CO2e/year.	L	Completed 24/02/2011 by SGS.	21/12 2011 Crediting period: 01/03/2012 to 28/02/2019 (renewable).	None yet No MR produced.	The CDM record file includes 3 declarations of prior consideration forms for this project.
Blend Increasing in the cement production of Caribbean Cement Company	n.a.	Cement Industry clinker substitution.	n.a.	231,509 ton CO2e/year.	L	Started on 10/01/2008 by DNV, remains in a validation status under the CDM. PDD was developed for this project.	Not obtained.	None.	Project did not continue on the CDM project cycle apparently due to methodology issues, although not within the CDM the project proponent implemented the pozzolan incorporation in the cement product line of the company.
Fuel Switch from heavy fuel oil & diesel to natural gas	n.a.	Fuel substitution, perhaps energy generation CDM sector.	n.a.	n.a.	L	n.a.	n.a.	n.a.	CDM files a submission of a prior consideration form for this project dating to 27/11/2009 by the Petroleum Corporation of Jamaica expressing their interest in pursuing the development of a project under such a name.
Programme of Activities (PoAs)									
Internatio	POA	Different	n.a.	The PoA	S	Completed	16/11/201	n.a.	Although

Project / PoA	# CDM	Type	Capacity	Estimated CERs (ton CO2e/year)	Scale[1]	Validation	Registration	CER Issuance	Comments
nal Water Purification Program (multi country PoA)	5962.	types of water purification technologies.		reduces the use and demand for fossil fuels and non-renewable biomass that would have been used to boil water as a mean of water purification. First CPA with 6,254 ton CO2e/year located in Uganda.		on 16/11/2012 by Germanischer Lloyd Certification GmbH (GLC).	2 Crediting period: 16/11/2013-30/10/20 POA lifetime: 19/11/2012-18/11/2040.		this PoA included Jamaica at the level of documentation submitted at time of starting validation, Jamaica does not appear as a participating country at the time of PoA registration in the CDM No information available from CME on activities in Jamaica or from Jamaica DNA on possible status of CDM national approval.
Carbon Soft Open Source POA, LED Lighting Distribution (multi country PoA)	n.a.	Development of purpose-designed, RE charged, LED/CFL lamp projects.	n.a.	First CPA with 44,183 ton CO2e/year in Oceania.	S	Currently under validation, started on 23/12/2011 by Carbon Check Pty.	n.a.	n.a.	No information available from CME on activities in Jamaica or from Jamaica DNA on possible status of CDM national approval.
For Stoves Programme of Activities (multi country PoA)	n.a.	Efficient cooking stoves in communities.	n.a.	First CPA with 62,624 ton CO2e/year in Tanzania.	S	Currently under validation started on 28/09/12 by TÜV Rheinland (China) Ltd.	n.a.	n.a.	No information available from CME on activities in Jamaica or from Jamaica DNA on possible status of CDM national approval.
Small Scale	n.a.	The Small	Several small	First CPA is the	S	This PoA did not	n.a.	n.a.	This PoA concept

Project / PoA	# CDM	Type	Capacity	Estimated CERs (ton CO2e/year)	Scale[1]	Validation	Registration	CER Issuance	Comments
Hydro Program for Jamaica		Scale Hydro Program for Jamaica aims to develop Small Scale, Run of the River, Hydropower Projects in Jamaica in line with The National Energy Policy 2009-2030 and its sub-policy for Renewable Energy (RE).	scale run of river type project to a total installed capacity of up to 23 MW.	Maggoty New Hydropower Station with a capacity of 6.3 MW for an estimated 15,533 ton CO2e/year in emissions reductions.		start a formal CDM project cycle.			produced relevant CDM documents as POA-DD, POA CPA DD and Specific CPA DD. As per the existing information, MEM was to play a role as PoA CME and the first CPA was to be implemented by Jamaica Public sector Company Limited. No information available on current status of the PoA although it is believed development was stop on it.

Under the normal CDM, Jamaica registered 2 projects, both related to wind technology electricity generation. Another project, related to the cement industry entered into validation but it never achieved the full project cycle. Another project, related to fuel switch, communicated with the UNFCCC through a prior consideration form as an expression of interest from a potential project developer in developing a project as a CDM project activity.

It has not been possible to assess whether or not any other projects started CDM project cycle activities, within the country; but it may be that at least other types of project developers may have considered an interest in the CDM at some point in time, although never materializing their interest through formal channels associated to the roles of the DNA or within the available international sources providing information on the CDM.

A couple of the Jamaican projects to the CDM (Wigton Phase I and the Carib Cement) were projects that occurred early on the life of the CDM. Unfortunately, the cement project did not follow through in the CDM, but the investment took place; and as per the wind project at least several issuances of CERs took place in time, generating a value

added to the project developer. The most recent wind project has not issued any CERs since it got registered late in the first commitment period of the Protocol, its registration was unilateral and it has also being hit by the most recent trends pertaining to low CER prices internationally.

The fuel switch project related to the switch to natural gas, did what it was logic at the time, that is completing the prior consideration forms to the CDM, and see whether or not its normal investment decision cycle develops in order to provide further consideration to enter a formal CDM cycle of approvals.

Jamaica has published an official grid emission factor for the electricity grid available from the Ministry of Science, Technology, Energy and Mines (MSTEM) as ex ante calculation based on CDM baseline methodologies. The results of such calculation for the country indicate that the combined margin for 50:50 (operating to build margin ratio) type technologies like hydro, biomass, geothermal is 0.6927 ton CO2/MWh and for 75:25 type technologies like wind and solar is 0.7324 ton CO2/MWh; values which indicate an emission factor associated to a largely fossil fuel dependent electricity sector. It is not clear from the available information if the estimated factor was validated through the means of a CDM Designated Operational Entity; neither whether was it nor not reported officially to the CDM.

Although with limited experience, associated to larger type project development organizations in Jamaica, the country has been exposed to the modalities and procedures of the CDM. The DNA has an existing approval procedure for this type of projects, has issued letters of national approval, there has been some capacity building achieved and project developers with an interest in the CDM have been able to follow through with the complexities of the mechanism.

The only in-country developer of the Wigton Power Plants is currently assessing the strategies in order to deal with the uncertainties as well as market price realities of carbon.

As with many other countries, Jamaica has not being able to develop normal CDM projects of the denominated small scale, in the case of electricity below 15 MW of installed capacity.

Although late into bloom, the CDM Programme of Activities (PoA) has shown remarkable development in the CDM, allowing smaller size activities to be assembled as programmes of interventions with the objective of delivering emissions reductions and aiming at attracting a carbon value that can generated an incentive for development.

4 PoA type interventions have been detected in this work related to Jamaica. One seems to originate in the country, and the rest may be driven from outside by managing entities with an interest in developing interventions at the project level in the country.

The Small Scale Hydro Program for Jamaica aims, at least conceptually in the documentation, to develop Small Scale, Run of the River, Hydropower Projects in Jamaica in line with The National Energy Policy 2009-2030 and its sub-policy for

Renewable Energy (RE). This PoA advanced in terms of drafting important documentation components related to PDD PoA Design as well as relevant specific project activity documents. The developments of related CDM documents, and efforts for PoA registration have apparently stopped, although the development of the initial CPA has continued in country.

The situation with the other PoAs describe above is less clear at this time, it seems most of those have originated from international driven Coordinating Managing Entities (PoA CME). The International Water Purification PoA has been recently registered, and although Jamaica appeared as one of the countries of potential geographic coverage, within the initial set of countries which granted national approval, Jamaica is not there. With respect to the other PoAs (related to efficient lighting, improved cooking stoves), there is no public information available since both the intended CME entities (which were contacted by the author) as well as the Jamaica DNA declined to mention the current status of situation of intended CPAs in country or national CDM approval.

4. On-Going Activities in Climate Change Mitigation and also Renewable Energy in Jamaica

In order to produce an appropriate approach to a gap analysis that can yield both lessons learned, as well as identification of spaces for further work, a methodology needs to be selected. In this case, the author has selected the approach presented in recent documents prepared by GIZ, as the NAMA TOOL.

Conducting a gap analysis should include both: data collection and data analysis. Data collection was done during a field trip undertaken by the author in January 2013 and included suitable elements from two different perspectives and sets of local stakeholders related to climate change and the electricity sector.

The information used as an input for the gap analysis is identified in the following table, and is related to international commitments and positions, national policies/strategies and targets, Emissions Profiles (GHG Inventories and National Reporting) and Reductions Potentials, On-Going Programs on Energy Sector as well as Climate Change. Table 2 includes the basic information gathered during the field trip in the country.

Table 2. Information on relevant on-going activities in Climate Change and the Energy Sector

International Commitments and Positions
Jamaica is a signatory country of the UNFCCC having ratified it on 06/01/1995. The focal point reported to the UNFCCC[2] is as reported in the UNFCCC web site: Mr. Jeffery Elleson Spooner

[2] http://cdm.unfccc.int Consultation on 23 February 2013.

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Historically, the Meteorological Service has hosted the Focal Point to the UNFCCC. More recently, Jamaica has enacted the Ministry of Land, Water, Environment and Climate Change. Currently there is an internal organizational development related to the creation of a Climate Change office/unit in the newly renamed ministry.

As a signatory country to the UNFCCC Jamaica conducts periodic and on-going studies related to National GHG Communications, etc. Jamaica is an active member of the UNFCCC negotiations process as a member of AOSIS.

Jamaica ratified the Kyoto Protocol as a Non-Annex I country on 28/06/1999. Jamaica has a Designated National Authority to the CDM, dully reported[3] to the Secretariat as the focal point:

Ms. Nicole O´Reggio
Office of the Prime Minister
16A Halfway Tree Road
Kingston 5. Jamaica. West Indies.
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Although the focal point reported to the UNFCCC web site is as above, the current contact point information is:

Ms. Nicole O´Reggio
Director Pollution Control (Act)
Environmental management Division
Ministry of land, Water, Environment and Climate Change
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Organizationally, the DNA function lies within the newly renamed Ministry of Land, Water, Environment and Climate Change.

The most recent letter of CDM national approval given to the Wigton Wind Farm II (October 24th, 2011) is indicative of the terms and conditions under which such national approval is granted to CDM projects in Jamaica.

Sample copy of the CDM National Approval Letter to the Wigton Wind Farm Project

[3] http://cdm.unfccc.int Consultation on 23 February 2013.

October 14, 2011

WIGTON WINDFARM LIMITED
36 TRAFALGAR ROAD
KINGSTON 10

LETTER OF APPROVAL FOR WIGTON WINDFARM LIMITED'S WIGTON WINDFARM II PROJECT

1. The Ministry of Housing, Environment and Water, in its capacity as the Ministry responsible for the Environment and therefore Jamaica's Designated National Authority to the Clean Development Mechanism (the "DNA"), refers to Wigton Windfarm Limited's request for the DNA's Letter of Approval for the Company's "Wigton Windfarm II" Project (the Project),

2. Jamaica is a party to the United Nations Framework Convention on Climate Change (the "Convention") and the Kyoto Protocol to the Convention and is in compliance with its obligations under these international instruments

3. Jamaica participates voluntarily in the Clean Development Mechanism.

4. The DNA confirms that:

   a. The Project is owned by Wigton Windfarm Limited, a subsidiary of the Petroleum Corporation of Jamaica, and is located at Wigton, Rose Hill District in the Parish of Manchester, Jamaica,

   b. The Project's objective is to add 18 megawatts of generating capacity to the Mandeville area through the installation of nine (9) new Vestas V80 -2 MW wind turbines. The new facility will generate 55.1 GWhr of electricity per year that will be sold to the national grid,

   c. The Project will contribute towards the realization of Jamaica's sustainable development goals,

   d. The DNA will cooperate with Wigton Windfarm Limited and the CDM Executive Board to facilitate the possible registration of the new facility, to the extent possible and give assistance, where necessary, for the issuance and transfer of Certified Emission Reductions to Wigton Windfarm Limited,

5. The DNA authorises:

   a. The voluntary participation of Wigton Windfarm Limited in the Project;

   b. Wigton Windfarm Limited to generate certified emission reduction units (CERs), by the realisation and operation of the Project, in accordance with Article 12 of the Kyoto Protocol;

   c. By virtue of Jamaica's national ownership of any and all greenhouse gas emissions reductions generated in Jamaica within the framework of the abovementioned international instruments, in the event that, upon generation of such greenhouse gas emissions under this project, Wigton Windfarm Limited acquires an interest in the greenhouse gas emissions reductions, the sale of such interest, subject to approval of the Government of Jamaica;

6. The duration of validity of this Letter of Approval shall be 24 months from the date hereof,

7. The authorisation granted in terms of this Letter of Approval is conditional upon:

   a. Project development being in accordance with the Project Design Document as received by the DNA,

   b. Any transfer of interest by Wigton Windfarm Limited being subject to approval by the Government of Jamaica

8. The DNA retains the right to withdraw authorisation granted in terms of the Letter of Approval in the event of non-compliance with the conditions mentioned in paragraph 7 above,

9. The granting of this Letter of Approval does not guarantee the registration of the Project as a CDM project by the CDM Executive Board,

10. By its acceptance of this Letter of Approval, Wigton Windfarm Limited indemnifies the DNA against any loss that Wigton Windfarm Limited may suffer as a result of Wigton Windfarm Limited's implementation of the Project.

Nicole O'Reggio

Ministry official
for Permanent Secretary

There is an existing national approval process in the country, and the letter of approval sequentially expresses:

- The charter of the DNA,
- Status of the country´s participation in the UNFCCC as well as the Kyoto Protocol,
- Voluntary nature of Jamaica´s participation in the CDM,
- Confirmation on the project owner,
- Confirmation on the project´s characteristics,
- Confirmation of contribution to the country´s sustainable development goals,
- Confirmation on the willingness of the DNA to provide cooperation to the project

participant as well as the CDM EB through the different stages of CDM project implementation,

- Authorization to the project participant,
- Authorization to the project participant to generate CERs,
- Authorization that upon generation of CERs and by virtue of interests, the sale of any interests on CERs by the project participant must have the approval of the Government of Jamaica,
- There is duration of validity to a CDM national approval letter,
- Authorization given in the letter is conditional to project development being in accordance to the PDD as received by the DNA,
- Authorization given in the letter is subject to approval by the government in case there is any transfer of interests,
- The DNA retains the right to withdraw authorization in case there non compliance of expressed conditions,
- Expresses that the granting of the letter of approval is not a guarantee of CDM registration, and that
- By accepting a letter of approval, a project participant indemnifies the DNA for any loss suffered in the implementation of the project.

National Policies, Strategies and Targets

Jamaica Vision 2030

Jamaica Vision 2030 is the strategic guide or roadmap to achieve a secure and prosperous future encapsulated in the vision statement: “Jamaica the place of choice to live, work, raise families and do business”.

The Vision 2030 contains meaning, outcomes, strategies and target indicators:

It can be noticed that two national outcomes of the vision pertain to the objectives of this study (as presented in the Vision Document):

National Outcome 10: Energy Security and Efficiency

Energy represents an essential input for modern economies and social life. Jamaica is almost entirely dependent on imported petroleum as its primary source of energy. The long-term planning for the energy sector must focus on the heaviest users of energy – transport, the bauxite and alumina industry and electricity generation – to achieve meaningful improvements.

Vision 2030 Jamaica will provide a secure and sustainable energy supply for our country. We will diversify our energy supply, and increase use of renewable energy. We will coordinate decision-making between the bauxite and alumina industry and the public electricity supply to resolve the fundamental medium-term fuel choice between coal and natural gas to replace dependence on petroleum, based on economic and environmental considerations. At the same time, we will become more efficient in our use of energy throughout our economy and society. Over the long term, we will take advantage of emerging technologies that will reduce our dependence on fossil fuels permanently.

The main strategies and responsible agencies under this outcome are:

NATIONAL STRATEGIES	RESPONSIBLE AGENCIES
10-1 Diversify the energy supply	Ministry of Energy Ministry of Mining and Telecommunications Petroleum Corporation of Jamaica (PCJ) Jamaica Public Service Company Limited (JPSCo) Bauxite companies Ministry of Transport and Works Private Companies and Associations
10-2 Promote energy efficiency and conservation	Ministry of Energy Ministry of Mining and Telecommunications Petroleum Corporation of Jamaica (PCJ) Jamaica Public Service Company Limited (JPSCo) Bauxite companies Ministry of Transport and Works National Water Commission (NWC) Private Companies and Associations

The proposed set of indicators for National Outcome 10 are:

National Outcome #10 – Energy Security and Efficiency					
PROPOSED OUTCOME INDICATORS	BASELINE	PROPOSED TARGETS			COMMENTS
	2007 or Most current	2012	2015	2030	
Percentage of renewables in energy mix	4.8%	11%	12.5%	20%	Local targets based on the Draft Energy Policy for 10% by 2010 and 15% by 2020. The 2030 target is set using the same annual average incremental increase.
Energy intensity index (EII) BTU/US$1 Unit of output (Constant Year 2000 $US)	15392	14000	12700	6000	Target set to approach average EII for the top 5 non-oil producing nations by 2030.
Fuel reserve Barrels/1000 population	592 21 days	846 30 days	2537 3 months	5074 6 months	Jamaica presently has approximately 21 days reserve. The targets are set to allow for 1 month supply by 2012, and 6 months supply by 2030, estimated at current (2008) use.

National Outcome 14: Hazard Risk Reduction and Adaptation to Climate Change

Natural and man-made hazards which lead to disasters have dire consequences for economic activities, infrastructure, human welfare and natural resources management. To a large extent, disasters result from the failures of development policy to mitigate vulnerability to hazard events. Climate change is likely to increase the incidence of natural disasters by causing extreme weather events to occur more frequently. Under Vision 2030 Jamaica we will place greater emphasis on hazard risk management activities and programmes for reducing our existing and future vulnerability. We will incorporate climate change scenarios in future economic and land use planning and provide a framework to ensure that we reduce the risks associated with natural hazards by integrating hazard considerations into our country's development planning.

The main strategies and responsible agencies under this outcome are:

NATIONAL STRATEGIES	RESPONSIBLE AGENCIES
14-1 Improve resilience to all forms of hazards	Office of Disaster Preparedness and Emergency Management Office of the Prime Minister Ministry of Agriculture Ministry of Health and Environment National Environment and Planning Agency (NEPA) Ministry of Education Ministry of Finance and the Public Service Jamaica Information Service Public Broadcasting Commission Local Authorities (Parish Councils) Meteorological Office
14-2 Improve emergency response capability	Ministry of Health and Environment Fire Services Red Cross Jamaica Defence Force, Coast Guard Jamaica Constabulary Force Office of Disaster Preparedness and Emergency Management NEPA
14-3 Develop measures to adapt to climate change	NEPA Local Authorities (Parish Councils) Forestry Department Ministry of Agriculture Ministry of Health and Environment University of the West Indies University of Technology, Jamaica Office of the Prime Minister Meteorological Office
14-4 Contribute to the effort to reduce the global rate of climate change	Petroleum Corporation of Jamaica Ministry of Energy Ministry of Transport and Works Ministry of Health and Environment Ministry of Industry, Investment and Commerce Meteorological Office Ministry of Foreign Affairs and Foreign Trade NEPA

The proposed set of indicators for National Outcome 14 are:

National Outcome #14 – Hazard Risk Reduction and Adaptation to Climate Change					
PROPOSED OUTCOME INDICATORS	BASELINE	PROPOSED TARGETS			COMMENTS
	2007 or Most current	2012	2015	2030	
Cost of damage caused by disasters as % of GDP	3.3%	2.5%	1.5%	≤1%	Reduction in the cost of disasters indicates the preparedness and resilience of the country. The target is to minimize these damages.
Loss of lives due to disasters		≤10	≤10	≤10	A disaster in terms of loss of lives occurs when 10 or more lives are lost. The target is not to have disasters as defined by loss of lives.
Greenhouse Gas Emission (Mt per annum)	5	4.75	4.50	3.5	Target from the EPI is for 2.24 Mt by 2050.

It is to be recognized that actions related to energy and climate change may have positive impacts and contributions in other outcomes related to economic performance, sustainability of natural resources and also waste management for example.

Jamaica National Energy Policy 2009-2030

The Jamaica National Energy Policy 2009-2030 presents the vision, goals and areas of focus as:

"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"

(Vision of Jamaica's Energy Sector)

Goal 1:	Goal 2:	Goal 3:	Goal 4:	Goal 5:	Goal 6:	Goal 7:
Jamaicans use energy wisely and aggressively pursue opportunities for conservation and efficiency	Jamaica has a modernized and expanded energy infrastructure that enhances energy generation capacity and ensures that energy supplies are safely, reliably, and affordably transported to homes, communities and the productive sectors on a sustainable basis	Jamaica realizes its energy resource potential through the development of renewable energy sources and enhances its international competitiveness, energy security whilst reducing its carbon footprint	Jamaica's energy supply is secure and sufficient to support long-term economic and social development and environmental sustainability	Jamaica has a well-defined and established governance, institutional, legal and regulatory framework for the energy sector, that facilitates stakeholder involvement and engagement	Government ministries and agencies are a model/leader in energy conservation and environmental stewardship in Jamaica	Jamaica's industry structures embrace eco-efficiency for advancing international competitiveness and moves towards building a green economy

For each of the seven goals, the national policy incorporates issues to be addressed (that can be associated to perceived gaps), key strategies and actions as well as key implementing agencies and partners.

There are 6 specific sub-policies under the National Energy Policy:

1. Renewable Energy Policy,
2. Energy from Waste Policy,
3. Biofuels Policy,
4. Carbon Emission and Trading Policy,
5. Energy Conservation and Efficiency Policy,
6. Electricity Policy.

National Renewable Energy Policy 2009-2030

Policy Vision: A well developed, vibrant and diversified renewable energy sector that contributes to Jamaica´s energy security and a sustainable future.

The policy framework is underpinned by a strategic framework which sets the goals, strategies and specific actions required to achieve the vision.

There are 5 goals articulated as:

Goal 1:	The economic, infrastructural and planning conditions conducive to the sustainable development of all of Jamaica's renewable energy resources
Goal 2:	An enabling environment that facilitates the introduction of key policy instruments (financial and fiscal) for the promotion of renewable energy (by redirecting national resources and investments to RETs)
Goal 3:	A dynamic legislative and regulatory environment, responsive to growth and development in the renewable energy sector
Goal 4:	Enhanced technical capacity and Public awareness of renewable energy through effective support of training programmes, information dissemination strategies and ongoing government communication
Goal 5:	Sustained R & D and innovation in existing and emerging RETs

The most important drivers for RE development and use in Jamaica are identified as:

Economic Drivers	Social Drivers	Environmental Drivers
• Security of energy supply • Economic optimization • Reduced costs of energy • Development of new industry • Provides opportunities for innovation	• Employment opportunities (and with energy feedstock producton particularly in rural areas) • Social-economic cohesion - improving economic prospects in rural areas • Improved access to energy services by providing reliable and affordable energy supply • Public support	• Environmental Conservation • Reducing the impacts of climate change • Reducing Emissions

National Energy from Waste Policy 2010-2030

Policy Vision: Jamaica is the regional leader in providing affordable and clean energy from waste contributing to a sustainable future. The 4 goals are:

Goal 1:	**Jamaica creates economic infrastructure and planning conductions conducing to the development of the energy-from-waste sector**
Goal 2:	**Jamaica builds its energy-from-waste sector on the most appropriate technologies that are environmentally-friendly, producing a clean reliable renewable source of energy**
Goal 3:	**Jamaica creates partnerships between the energy sector and the waste management and agriculture sectors to facilitate the continuous streams of waste into the energy from waste**
Goal 4:	**Jamaica has a well-defined governance, institutional, legal and regulatory framework for the generation of energy from waste**

The drivers for the waste to energy policy are:

Social	Economic	Environmental
• Generation of clean electric power • Reduced land space used for landfills • Sustainable economic growth and development • Job creation	• Reduced costs for users of electricity and bio-diesel • Increased supply of bio-diesel • Increased independence and less reliance on imported petroleum • Improved balance of payments • Sustainable economic growth and development • Job creation • Stimulated industrial development • Reduced costs for solid waste management	• Environmentally safe waste management and disposal • Reduction in disease vectors such as vermin and insects • Reduced greenhouse gas (GHG) emissions • Reduction in the overall waste quantities requiring final disposal

National Biofuels Policy 2010-2030

Policy Vision: A modern, efficient, diversified and environmentally sustainable biofuels sector that contribute to Jamaica´s long term energy security and socio economic development. The stated goals of the policy are:

Goal 1:	The economic, infrastructural and planning conditions conducive to the sustainable development of the biofuels sector, supported by intersectoral collaboration
Goal 2:	Innovative and clean technologies facilitating a secure supply of biofuels into local and national distribution systems
Goal 3:	A well-defined governance, institutional, legal and regulatory framework for the development of the biofuels sector
Goal 4:	Jamaicans have the technical capacity and knowledge for the development, deployment, management and use of biofuels

National Energy Efficiency and Conservation Policy 2010-2030

Policy Vision: Jamaicans in all sectors conserve and use energy efficiently and continuously seek opportunities to use renewable energies … towards a sustainable energy future. The goals of the policy are:

Goal 1:	Households and businesses aggressively and continuously adopt energy conservation and efficiency practices towards reducing Jamaica's carbon footprint
Goal 2:	An enabling environment buttressed by dynamic legislation and regulations that facilitates the promotion of energy conservation and efficiency
Goal 3:	The Government of Jamaica is the leader in energy conservation and efficiency and sets the standard for all other sectors
Goal 4:	Jamaica has modern and efficient energy plants

The drivers for the policy are:

Economic Drivers	Social Drivers	Environmental Drivers
• Supports broad economic growth • Reduce dependence on oil • Maintain reliability of grid infrastructure • Make the best use of existing supply capacities to improve the access to energy • Reduce need for large-scale capital investments in power supply • Savings in foreign exchange	• lower utility bills to consumers • Attracts jobs	• Protects public health • Reduces carbon emissions

National Policy for the Trading Carbon Credits 2010-2030

Policy Vision: A competitive, diversified, efficient and investment-conducive carbon credits trading sector that fosters socio economic development and induces a less carbon-intensive economy. The goals of the policy are:

Goal 1:	A clear, flexible legal and regulatory framework for the carbon credits trading sector that is responsive to changes in the international arena
Goal 2:	A well-developed governance and institutional framework that leads to the maximization of opportunities for carbon credits trading
Goal 3:	Diverse initiatives implemented to reduce carbon emissions and generate carbon credits through the regulatory and voluntary markets as well as contributing to the social, economic and environmental development of the country
Goal 4:	A carbon credits trading sector that attracts investment through a financial and economic system in which benefits and risks are distributed equitably

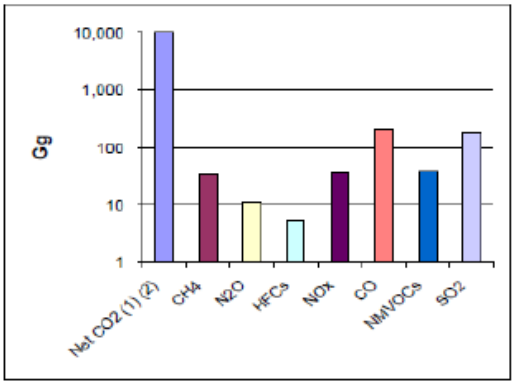
The drivers for the policy are:

Economic Drivers	Social Drivers	Environmental Drivers
• Accessing international financial and technical assistance • Enhances marketability of tourism sector • Security of energy supply • Development of new industry • Provides opportunities for innovation	• International commitments • Employment opportunities • Improved access to energy services by providing reliable and affordable energy supply • Public support	• Reducing greenhouse gas emissions • Sustainable use of natural resources • Reducing the impacts of climate change • Increased awareness of environmental issues

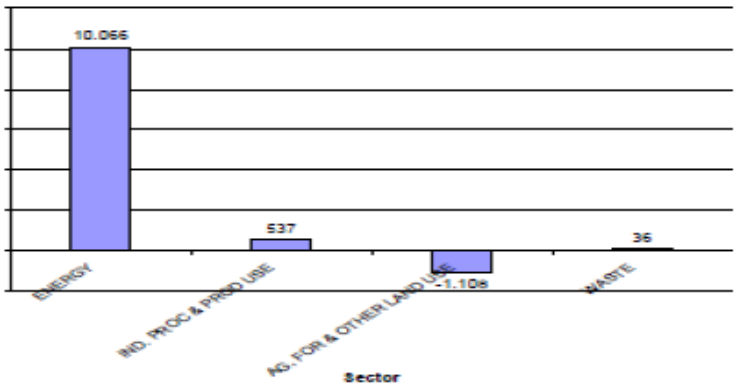
Emissions Profiles (GHG Inventories and National Reporting) and Reductions Potentials

As a signatory country to the UNFCCC, Jamaica has produced two National Communications on Greenhouse Inventories; the first one provides the HGH inventory for 1994 and the most recent one has been submitted in 2011 covers the year 2000 and also provides trends for the period 2000-2005.

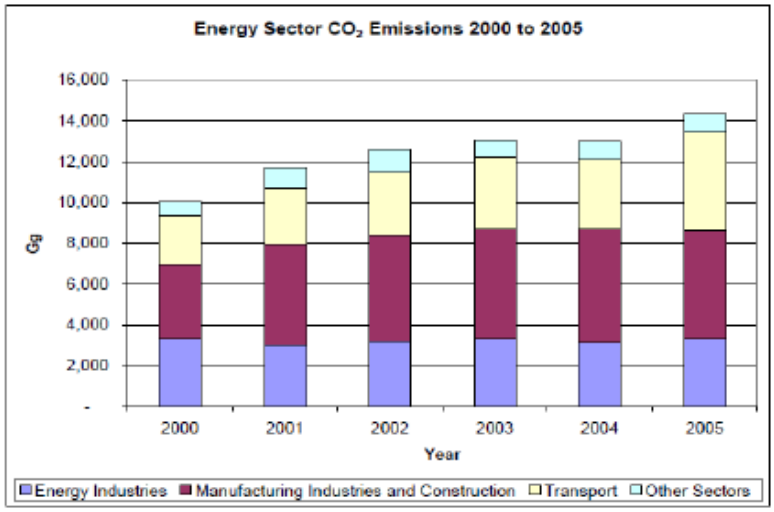
For the year 2000 the GHG inventory indicates that the predominant GHG gas is CO2 and that within CO2 emissions from fossil fuel combustion, the energy industries (33.05%), manufacturing and construction (35.71%) and transport (24.15%) are the principal sources of emissions.



In terms of sectors, energy is the principal source of GHG gases in country.



The national communication to UNFCCC includes an assessment of trends on emissions for the period 2000-2005 which for the energy sector are represented as:



This SNC includes an assessment of potential mitigation actions to reduce GHG over the period 2009-2030 by using the LEAP modeling approach.

On-Going Programs on Energy Sector as well as Climate Change

There are several on-going activities that have been identified during the field trip to Jamaica that share important relevance to the objectives of this work.

Related to Climate Change:

Partnership for Enhancing Capacity in Low Emission Development Strategies (EC-LEDS):

GOJ continues to strengthen, transform, and mainstream its climate change institutions. In April 2012, the GOJ established a climate change advisory committee and a climate change unit will be established within the Ministry of Water, Land, Environment, and Climate Change (MWLECC) in January 2013. Also the Meteorological (MET) Service of Jamaica, part of MWLECC, has embarked on a national Climate Change Awareness Campaign, in an effort to educate the public about how to effectively adapt to climate change. MWLECC is preparing a climate change policy, continuing awareness-building on climate change issues, and is seeking additional bilateral and multi-lateral support for climate change projects.

Most recently, GOJ and the United States Government (USG) are developing a strategic partnership for Enhancing Capacity in Low Emission Development Strategies (EC-LEDS). At the request of GOJ and USAID/Jamaica, technical assistance is being sought from the Analysis and Investment for Low-Emission Growth (AILEG) Project, which is a jointly-funded United States Agency for International Development (USAID) program from the Bureau of Economic Growth, Education and Environment's Economic Policy (E3/EP) and Global Climate Change (E3/GCC) Offices. AILEG focuses on providing methodological, analytical, data management and capacity building assistance on LEDS, climate economics and green investment.

Some of the key activities involved are: climate finance flow assessment, analysis of new climate mechanisms for Jamaica, leveraging finance for adaptation.

Related to Renewable Energy and Energy Efficiency:

Office for Utilities Regulation (OUR) request for proposals for supply of up to 115 MW of electricity generation capacity from renewable energy based power generation facilities on a Build, own, Operate (BOO) basis

This is an on-going active request for proposals in the country, where many project developers have shown an interest in bidding their projects. OUR has stated in this request the indicative avoided cost in Jamaica for capacity and energy at 10.05 US cents/KWh; and 9.33 US cents/KWh for energy only. Nevertheless the request indicates that maximum tariff rates for different types of RE technologies which is indicative of recognition of grid disparity for RE technologies as indicated by the following table:

Bagasse	-	15.16 US cents /kWh
Hydro-Power-		11.13 US cents /kWh
Waste –to- Energy		14.88 US Cents /kWh
Wind	-	13.36 US cents/kWh
Utility Scale PV -		26.73 US cents/kWh

Furthermore the terms of the request are also indicative of the balance of sources seek:

	Additional RE (MWh)	RE Capacity (MW)
RET	2015	2015
RE – Firm Capacity	212,084	37
RE - Energy Only	204,872	78
Total RE	416,956	115

Energy Security and Efficiency Enhancement Project

World Bank sponsored project involving a loan whose objective is to increase energy efficiency and security assisting the implementation of the country´s national energy policy. The project includes components related to strengthening regulatory and institutional frameworks (improve sector performance, increase private investment and transition to cleaner fuels); assistance in developing energy efficiency and RE potentials (expanding EE testing and labelling, investment promotion activities for small hydro sites, promotion of solar and wind energy, provision of line of credit/revolving

mechanism through the DBJ for retail finance for private sector in EE and RE.

Sustainable Energy Road Map for Jamaica

Worldwatch Institute Sustainable Energy Roadmaps for Small-Island States of the Caribbean aim to develop and communicate low-carbon energy strategies that empower these countries to reduce their consumption of, and dependence on, fossil fuel imports. By collaborating with local stakeholders in each country, Worldwatch helps determine effective ways for decision makers to increase energy security; reduce energy costs, local pollution, and greenhouse gas emissions; and create new business opportunities as well as high-quality jobs. The program began with a focus on the Dominican Republic, Haiti, and Jamaica, but has since expanded to include work covering the larger Caribbean Community (CARICOM).

The project is funded by the German Environment Ministry International Climate Initiative and has the following aims: assessing energy efficiency and renewable energy in the country as well as technical challenges for the electric grid to scale up contributions, study the underlying socio economic factor and reflect them through assessing levelized cost of energy for different sources of electricity, examine current policies and finance required for growth of EE and RE, and provision of recommendations to encourage sustainable energy development.

Energy Efficiency and Conservation Program

In 2011, the Jamaican government set a target of reducing public sector energy consumption 5 percent below the 2010 level by 2015, mainly through public sector efficiency improvements. The Energy Efficiency Loan Program ("EE Program") will provide substantial savings to the Government of Jamaica through the installation of highly-efficient and energy conservation equipment to public sector buildings.

The Government of Jamaica has received financing in the amount of a loan from the Inter-American Development Bank (IDB), the main objectives of this project are to:

1. Enhance Jamaica's Energy Efficiency (EE) and Energy Conservation (EC) potential through the design and implementation of cost saving Energy Efficiency (EE) and Energy Conservation (EC) measures in the public sector.
2. Strengthen the institutional capacities of the Ministry of Science, Technology, Energy and Mining (formerly Ministry of Energy and Mining) for implementing EE and EC measures
3. Invest in EE and EC measures in the public sector; and
4. Increase awareness among key public and private sector stakeholders together with demand-side management support.

The project will also establish a government program to install energy efficient lighting and cooling equipment and, potentially, to prepare an energy efficiency loan program. The government expects to export the lessons learned to all Jamaicans.

Among the project's other expected outcomes are the implementation of energy efficiency programs in hospitals, schools, and other public buildings, based on energy

audit recommendations; energy conservation and efficiency protocols for the operation of public sector facilities, with a coordinator for each facility; and an expanded role for the Energy Efficiency Unit (EEU) within the Petroleum Corporation of Jamaica (PCJ) to provide technical assistance for energy conservation and efficiency initiatives.

Caribbean Hotel Energy Action Project

The Caribbean Hotel Energy Efficiency and Renewable Energy Action Advanced Programme (CHENACT AP), which has already been piloted in Barbados, will be implemented in Jamaica.

CHENACT AP is being implemented by the Caribbean Tourism Organization and the Caribbean Hotel and Tourism Association, through funding from the Inter-American Development Bank.
Barbados piloted the project between December 2009 and October 2010.

The initiative, which launched in Kingston on Feb. 2012, will be targeting hotels with less than 400 rooms.

Wind Power Irrigation Feasibility

Wind Powered Irrigation Feasibility Assessment is to evaluate the technical and financial feasibility of implementing wind power at pumping stations in the St. Elizabeth Parish. This project has been implemented with support from the ECPA Caribbean partnership out of Organization of American States.

Capacity Development for Energy Efficiency and Security in Jamaica

The objectives of this project sponsored by UNDP are:

1. To increase the national capacity for energy efficiency and energy conservation within the public sector, by highlighting the importance of monitoring and maintenance to achieve sustainable savings and the teaching of new performance contract concepts which should result in a decrease in public sector energy usage and costs;
2. To provide technical assistance for small scale renewable sources of energy through the preparation and /or validation of a wind map and a feasibility study for small scale applications, as well as the construction of small scale wind turbines, and:

3. To establish a platform for dialogue between the public sector (particularly the Ministry of Energy and Mining) and the private sector to ensure information sharing from both sides and targeting resolutions for relevant significant issues faced by the private sector.

Jamaica Power Services (JPS) Net Billing Program

JPS runs the program to give credits for small scale renewable electricity. The framework for net billing has been solidified via the JPS Company Limited Standard

Offer Contract (SOC) for the 'Purchase of As-Available Intermittent Energy from Renewable Energy Facilities' up to 100 kilowatts. Initial rate set at 18-19 US cents/KWh. 11 licenses have been granted and the first connection was achieved at the end of 2012.

Development Bank of Jamaica (DBJ) Petrocaribe SME Energy Fund

DBJ has committed $1 BILLION Jamaica to the Small and Medium Sized Enterprises (SME) Energy Line of Credit. This will be on-lent through Approved Financial Institutions (AFIs), such as commercial banks, merchant banks, the National People's Co-operative Bank (NPCB), credit unions and micro-financing institutions. All AFIs must be in good standing to participate.

Eligible Enterprises

- Commercial institutions; small & medium-sized business users
- Large commercial and industrial users
- Commercial businesses requiring energy audits
- Energy Service Companies (ESCOs)
- Manufacturers of energy efficiency equipment and devices

Use of Funds

To provide retrofitting for small, medium-sized and large enterprises to accommodate energy efficiency, energy conservation and alternative energy sources, with specific emphasis on electricity conservation and solar energy via photovoltaic energy, etc.

DBJ has other financial instruments available for energy operations including: loan program for home owners to finance small RE systems, partial loan guarantees that have energy as a focus,

National Housing Trust (NHT) Solar Loans

This institution offers loans for solar water heating implementation as well as for solar panels.

The Solar Water Heater Loan provides financing to contributors and recognized institutions for the installation and retrofitting of solar heating systems. The Solar Water Heater Loan is available to any contributor (only one is allowed per applicant) who can provide a title for a residential property or who has at least enough funds in their Contribution Accounts here at the NHT equal to the cost of the system + J$20,000. Contributors may apply regardless of whether or not they have already received an NHT loan. Interest rate of 3% over a maximum period of 5 years (with a 5% service charge), to buy and install the system. The solar water heater system does not have to be installed on the house that is being used as security. A portion of the loan may be used to purchase and install water tanks and pumps.

The Solar Panel Loan provides financing to contributors and recognized institutions for buying and installing solar electricity panels that can be used to generate electricity.

The Solar Panel Loan is a Homeowners' Loan. It is available to any contributor who has not previously received an NHT Loan. Borrow´s at current interest rate for a maximum loan term of 15 years. The solar panel system doesn't have to be installed on the house that is being used as security.

5. Towards a Gap Analysis related to CDM PoA and NAMA Development in the Energy Sector in Jamaica

CDM PoA as well as NAMAS are indeed very different approaches for the development of climate change mitigation activities. CDM PoAs are well regulated, are an off-spring of the CDM regulatory process; and there is plenty experience in dealing with structural as well as transactional issues.

NAMAS on the other hand are ill defined, are at an infant stage and many aspects of their design are still within important decisions that need to be decided at the UNFCCC negotiation process.

Going from CDM into NAMAS, also involves different ways of thinking when moving from strict carbon market finance into a broader spectrum of climate change financing environment.

From the country perspective, it needs to be realized that NAMAS are to be country supported and implemented actions and therefore need to be reported at the country level, whereas the CDM is a project performance based mechanism where countries were exempted from further responsibilities apart from the national approval stating the project´s contribution to sustainable development.

In setting an assessment of gaps for further PoA development and for NAMA recognition needs to be given to the fundamental nature of the two, their different history but also to potential synergies that can be explored.

The CDM so far, has contributed to global climate change mitigation; mainly by having provided cost effectiveness for Annex I countries as well as creating value added to carbon emissions reductions; the CDM has also and somewhat provided a contribution to sustainable development on Non-Annex I countries. These sustainable development contributions have been normally geared to technology transfer, creation of employment and perhaps increased access to financing capital for project development; but each country should assess the merits of the participation on an individual basis.

It is also clear that the CDM has not been an effective mechanism to attract emission reductions projects in countries that are inherently small in terms of economic activity and which also have small national inventories of GHG, such as is the case of Jamaica.

Jamaica participated actively during the first commitment period of the Kyoto Protocol, through enacting capacity building activities, facilitating information to interested stakeholders interested in developing projects, creating a national institutional infrastructure and policy environment suitable to the development of CDM projects and by providing national letters of approval to projects that were deemed to contribute to the country´s sustainable development.

From that perspective, the country does not seem to have outstanding gaps with respect to the CDM; except perhaps to those that may arise when looking at the late blooming of the PoA development as an eligible type of project activity for the CDM, since the author have not been able to determine whether or not there is an specific approval procedure in the country for PoAs.

Another reflection that is important, especially for countries that have little project development activity in the CDM relates to whether or not the CDM has assisted in the development of institutional mitigative capacities. This obviously is related to the political economy of institutions associated to climate change as a transversal issue in our society. It is understood that Jamaica has chosen to elevate the topic of climate change to the level of incorporating the name directly in the Ministry of Land, Water, Environment and Climate Change. This decision involves a new set of internal conversations and designs of operational units in the ranks of the Ministry in order to strategically respond to the important considerations that Climate Change has within the Jamaica Vision 2030. Certainly many aspects of the country´s vision relate or have impact on the emission of GHG and therefore any climate finance mean available derived from the UNFCCC or other bilateral approaches will have to be looked in detailed in order to better assess the viability of attracting necessary financing in order to remove perceived barriers or needs.

Taking into account the current situation in the carbon markets, and although a second commitment period of the Kyoto Protocol has been approved in the last COP 18 in Doha, it seems that the lack of ambition on the part of the Annex I countries (since some have rejected their participation), as well as the imposed restrictions from the European Union stating that only CERs from registered projects to December 2012 and only new CDM projects from LDC countries will be allowed after 2012; render the CDM in a critical situation.

On top of that, the current and expected medium term price for CERs will likely continue at all times low values, certainly sending a strong disincentive signal to project developers to embark on CDM project development activities. Nevertheless it is expected that the CDM will continue to be available as an instrument for climate finance, but it is likely that activity will dwindle down in the short to medium term, or until agreements are reached on the new market mechanisms are finalized, hopefully before 2015.

Therefore it is the opinion of the author that the CDM will not likely be an attractive climate financing mechanism for renewable energy development in Jamaica in the short to medium term, not expecting to raise contributions required for the scaling up of renewable energy and energy efficiency that the country has expressed and is moving towards through many different types of policy and program developments.

Nevertheless, the CDM lessons learned and know-how achieved both internationally, and although at a smaller extend in the country; need to be considered in assessing which types of climate finance may be appropriate to consider in Jamaica, as well as for assisting the structuring of the monitoring, reporting and verification of climate change mitigation that the country is wishing to implement through, from the vision to the different policies in place in the energy sector.

The Energy Sector in Jamaica is composed by a complex set of institutions and agencies that go from the policy, into the planning, regulation, and operational levels. As in any other country, the associated political economy of institutions in the energy sector is very complex. Figure 7, presents a depiction of the institutional set up of the energy sector in Jamaica according to a World Bank Report

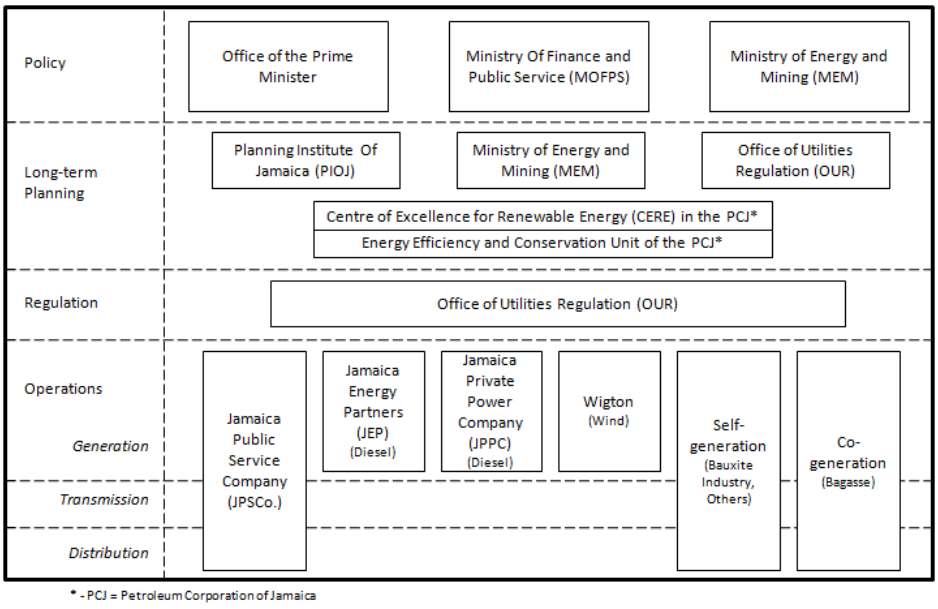


Figure 7. Institutional Structure of the Energy Sector in Jamaica (IDB, 2011)

The most important challenges facing Jamaica's energy sector are:

a. Reducing the cost of electricity and eventually lowering prices to improve the country's economic competitiveness and reduce the impact of energy consumption on households' budgets. This will require diversifying the sources of electricity generation away from expensive diesel oil to natural gas (through LNG) and heavy fuel oil,

accelerating the replacement of highly inefficient generating plants and reducing transmission and distribution losses.

b. Lowering the sector's vulnerability to oil price fluctuations, by reducing its reliance on imported petroleum products for electricity generation through: (i) the development of renewable energy sources; (ii) diversification toward fuels with more stable prices, such as gas and renewable energy; and (iii) energy efficiency measures.

c. Strengthening the sector regulatory framework by providing clear policy directions, regulations and incentives in order to mobilize private sector investment, promote renewable energies and increase energy efficiency at the level of utilities and end users.

d. Mobilizing private sector financing for energy infrastructure as public finances will not necessarily be able to provide substantial financial resources directly or even through guarantees.

e. Building institutional capacity to formulate, plan and implement energy policies and strategies and monitor and evaluate outcomes.

f. Reducing GHG emissions as an opportunity to bring collateral climate change co-benefits, by switching to less polluting fuels (such as gas), developing renewable energy, and curbing energy consumption (and the underlying related generation) through energy efficiency measures.

Several policies, programs and initiatives are currently taking place within the Jamaica Energy Sector. The topics range from the policy action to the governance and into the implementation of transformative actions like the net billing programs and the bidding for private sector participation in renewable energy generation.

Table 3 includes a systematized view on the level of on-going activities identified in the energy sector in Jamaica and some perceived gaps that may be important to consider when thinking about exploring synergies between climate financing and energy sector mitigation activities.

Table 3. Current Situation and Identified Gaps in the Energy Sector

Type of action	Current Situation/Identified Gaps
Establishment of renewable energy targets	Yes. Both at the level of the country vision as well as the national energy policy there are explicit targets for renewable energy participation expressed as percentage of the energy mix of the country. There may be gaps identified, especially at the level of

Type of action	Current Situation/Identified Gaps
	intended penetration of renewable energy in heat applications and also at the level of biofuels issues; which do not come as clear when assessing current targets.
Adopted national energy policy	Yes. There is a coherent and complete energy sector policy, stating policy goals, strategies and monitoring frameworks.
Specific adopted national renewable energy policy	Yes. There are several specific sub-policies dealing with renewable energy, waste to energy, biofuels, energy efficiency and carbon trading. A potential identified gap may be related to the depth of the existing carbon trading policy in the midst of the current situation in the carbon markets, and how this policy platform may facilitate or not the paths for accessing climate related financing at a time when carbon markets may not in the short term delivered the necessary signals for incorporating carbon as a revenue for many projects.
Detailed implementation plan for road map	Yes. The road map being implemented responds to the enactment of the specific goals under Vision 2030 and span over periods of 2-3 years. The implementation of the road map lies within several organizations in the public sector of the country, and information may not necessarily be as transparent; especially as an important player in the implementation of the road map is the private sector and its capacity to mobilize financing.
Dedicated government arm to oversee effectiveness of RE policy and achievement of target progress	Yes. Overseen the effectiveness of policy developments and achievement of targets happens at the level and under the responsibility of MSTEM and other agencies. Vision 2030 also includes its own mechanisms for monitoring the effectiveness of the path towards the attainment of the country vision. Possible identified gaps here may more related to the governance structures of sector institutions, how well communications take place and how feedback loops are occurring at the policy and planning/execution level.
Contractual frameworks	Under development.

Type of action	Current Situation/Identified Gaps
	There are important developments going-on in the country. Time will say how fast the necessary learning is to take place on important issues like the selection of winning bids under the OUR request for proposals, how effectively negotiations will take place in establishing PPAs and creating the necessary safeguards normally required in moving towards private sector participation. Normally the private sector interacts effectively, but creating pressure on government institutions that are not necessarily used in dealing with private sector firms. A potential gap may evolve in the area of contracting and also on the creation of risk mitigation structures necessary for the financing of projects. Other gaps may be related to the role of the net billing scheme under implementation and whether or not it is the best possible arrangement for providing strong signals for small scale intermittent sources entering the system. Lessons can be learned from observing the trends elsewhere and by having a solid discussion on the technical merits of distributed generation in the context of the physical limitations of the Jamaica grid.
Support schemes	Under development. There are several on-going schemes supportive of renewable energy and energy efficiency in Jamaica. Most of them are at the point of creating pilot or just beyond pilot interventions; most with support from MFI´s. Since most of the MFI´s are engaged in removing barriers for scaling up of interventions, the near term will be critical in assessing the perceived gaps for support and financing for scaling up. This is of the uttermost importance for any climate change financing that the country may want to pursue, since any pitch for support through the NAMA or other mechanism needs to have clearly identified and justified the need for international support at the financing level and what barriers and how effectively the country intends to use climate finance in support of national objectives.

6. Identification of Potential Emissions Reductions from Renewable Energy and Energy Efficiency Interventions in Jamaica

In order to dully assess potential opportunities for NAMA like interventions in Jamaica, separate consideration is given to actions on renewable energy generation, and energy efficiency and conservation.

6.1. Potential Emissions Reductions from Renewable Energy Technologies in Jamaica

For the sake of assessing potential emissions reductions from RE technologies in Jamaica, consideration is given in this section to the types of technologies available for grid connected electricity, based also on some of the identified in-country potentials and in accordance with the existing targets currently set in Jamaica for such contribution. The initial calculation performed and presented here is based on several sources of information on the energy sector, renewable energy potential in the country as well as initial results presented by Worldwatch Institute as per the levelized cost of energy (LCE) for renewable energy technologies under different scenarios of the energy sector development in the country.

The results presented here are a first approximation to a complex calculation process and therefore are intended to fuel up the discussion on how strategic climate finance may play a role in assisting on-going developments identified in the country by explicit ting the climate change mitigation component.

A marginal abatement cost curve or MAC curve is a set of options available to an economy to reduce pollution. They are valuable tools in understanding emissions trading, driving forecasts of carbon allowance prices, prioritizing investment opportunities, and shaping policy discussions. Typically, MAC curves cover emissions reduction opportunities across a number of sectors in an economy including power, industry, waste, buildings, transport, agriculture, and forestry.

In general the marginal carbon abatement cost (MAC) is determined through the following equation:

MACC= (annualized cost of intervention – annualized cost of reference case) / (CO2 emissions of reference case – CO2 emissions resulting from the intervention)

The procedure for initial estimation of the MACC for renewable energy in Jamaica is as follows:

- The rate of assumed penetration of Renewable Energy in Jamaica is based in accordance to recent studies conducted on the energy sector in Jamaica, and the level of identified potential and current policy goals, in a scenario where natural gas replaces oil based generation together and renewable energy and pet coke come in place.

Table 5. Scenario for Electricity Generation in Jamaica Towards 2030

Generation (GWh/y)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Oil	4.750	4.750	4.750	1.375	1.375	1.375	1.375	1.375	0	0	0	0	0	0	0	0	0	0
Natural Gas	0	0	0	3.500	3.500	3.500	3.500	3.500	5.250	5.250	5.250	5.250	5.250	6.125	6.125	6.125	6.125	6.125
Pet coke	0	0	0	0	0	0	0	0	750	750	750	750	750	750	750	750	750	750
Waste	0	0	0	0	177	177	177	177	177	177	177	177	177	177	177	177	177	177
Hydro	0	0	0	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
Wind	0	0	0	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
Biomass	0	0	0	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Solar PV	0	0	0	0	180	180	180	180	180	706	706	706	706	706	706	706	706	706
Total renewable energy	0	0	0	466	823	823	823	823	823	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349
Total energy	4.750	4.750	4.750	5.341	5.698	5.698	5.698	5.698	6.823	7.349	7.349	7.349	7.349	8.224	8.224	8.224	8.224	8.224

- It is supposed that most of the renewable energy generation enters the system around 2015-2016, which is compatible with existing plans like the OUR request for proposals for renewable energy generation projects. The rest of the RE incorporations to the grid will come after 2020 (mostly solar). Information on trends for the expected participation of the fossil fuel sources is important in order to assess the impact on the estimated emission factor of the grid in different segments of the period to 2030.
- The penetration potential of RE sources in Jamaica has been established in accordance with the estimated potentials for the different sources as presented in the following table.

Table 5. Identified Potential for RE Technologies in Jamaica

RE Source	Identified capacity (MW)	Expected annual generation (GWh)	Comments
Wind	70	153	It only considers current estimates base on above ground potential and not any off-shore.
Hydro	22	113	Based on existing project site potential.
Solar PV	650	1,139	Assumes international figures of up to 0.1% of country land and average interception on the order of 200-300 W/m2.
Biomass	20-40	105-200	Local sources.
Waste to energy	25	177	Assuming 540 tons of solid waste per day at an incineration type facility by using referenced value of 900 kWh/ton RDF, at a plant factor of 85%.

- Emissions reduction have been estimated on a 5 year basis for the period 2015-2030 and accumulated through the contribution of each source in the period. The emission factor for each period of 5 years is used as an approximation to the expected situation and it is used for the estimation.
- At the onset of the estimation, the current emission factor of around 0.69 ton CO2/MWh is used and for each subsequent period, an adjusted value based on an operating margin approach is used (taking into account the expected composition of the energy matrix according to the path of introduction of natural gas and pet coke: 0.44 ton CO2/MWh (2015-2020), 0.46 ton CO2/MWh (2020-2025) and 0.45 ton CO2/MWh for the period 2025-2030.
- The climatic benefits in terms of mitigation are estimated based on the arithmetic average difference of the LCO of the 4 selected sources as compared to the LCO of the business as usual scenario of oil based generating technologies. The above is correct since the decision point for developing and implementing a sustainable road for the sector looks at the case of oil dependency. Such LCE is then multiplied by the amount of generation expected by source for each segment of 5 years over the period under consideration. LCO information is as available from recent Worldwatch Institute results for the project on Sustainable Road Map for Jamaica (Table 7 and 8).

Table 6. Levelized Cost of Electricity Generation for Oil and Diesel Technologies in Jamaica

	Oil Combined Cycle	Diesel generator	Oil steam	Oil Combustion Turbine	Average
2010	0.16	0.15	0.17	0.32	0.20
2015	0.19	0.23	0.3	0.37	0.27
2020	0.20	0.24	0.32	0.39	0.29
2025	0.21	0.25	0.33	0.40	0.29
2030	0.22	0.255	0.35	0.42	0.31

Source: Worldwatch Institute & MSTEM. Designing a Sustainable Electricity Roadmap for Jamaica. November, 2012.

Table 7. Levelized Cost of Electricity Generation by Renewable Sources in Jamaica

RE Technology	US$/kWh Max. Levelized Cost of Energy
Bagasse cogeneration	0.105
Wind generation	0.095
Hydroelectricity	0.06
Waste to energy generation	0.149
PV generation	0.23

Source: Worldwatch Institute & MSTEM. Designing a Sustainable Electricity Roadmap for Jamaica. November, 2012.

- The LCO is the price at which electricity must be generated from a specific source to break even over the lifetime of the project. It is an economic assessment of the cost of the energy-generating system including all the costs over its lifetime: initial investment, operations and maintenance, cost of fuel, cost of capital, and is very useful in calculating the costs of generation from different sources.
- The MAC expressed in US$/ton CO2 for the different sources considered is plotted on the y-axis, and on the x axis or the width of each column, appears the amount of carbon mitigated by the intervention associated (in this case the electricity generated by each of the considered renewable technologies). Negative MAC values indicate that the proposed mitigation activity is cost effective in terms of its climate contributions, whereas positive MAC values require judgment against the cost of inaction - in this case the cost of the purchase of carbon credits – and/or ethical and marketing considerations.

Figure 8 presents the initial approximation to the MAC cost curve for renewable energy electricity generation in Jamaica. The results depicted are in-line with the expected results based on the scenario that incorporates both natural gas and pet coke in the generation. It is also interesting to note that from the climate change mitigation cost, these measures tend to be very cost effective as part of a low carbon development strategy for the country´s consideration and therefore it would be appropriate to give it further consideration as to how and timely any climate financing may contribute to scale up the implementation of such sources in the country.

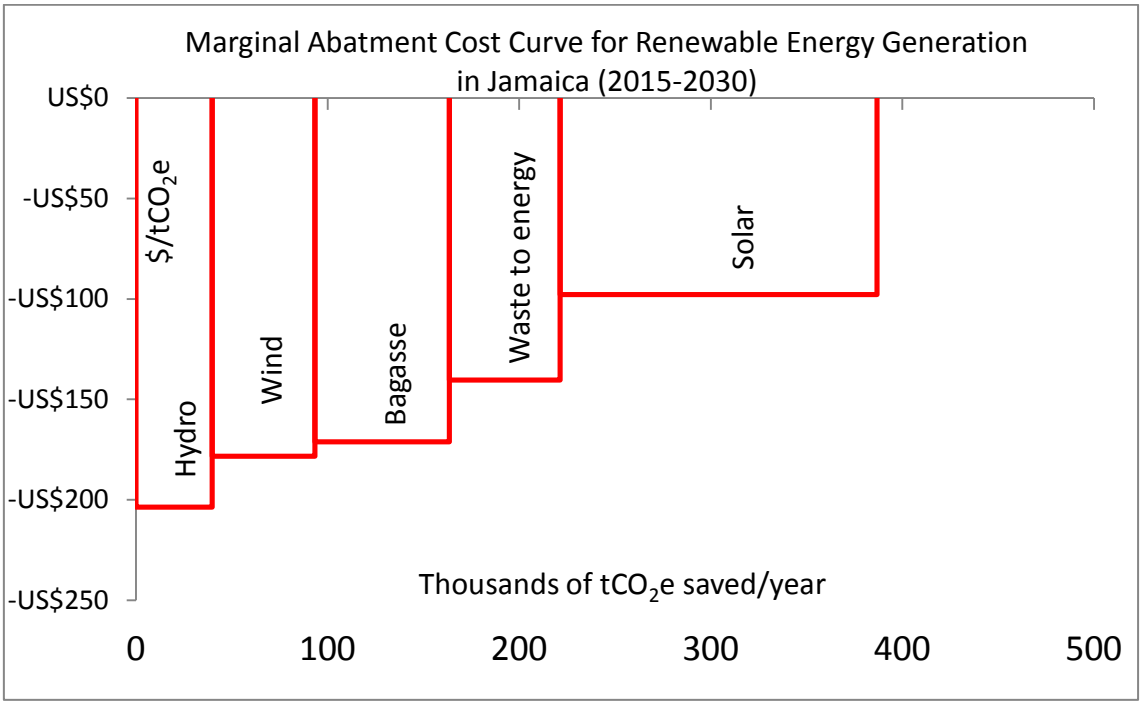


Figure 8. Marginal Cost Abatement Curve for RE Generating Technologies in Jamaica 2015-2030

The total emissions reductions associated to the introduction of the proposed renewable energy sources for grid generation over the period of 18 years towards 2030 amount to a total of around 6.96 million tons CO2 for the case of comparison with the proposed sustainable energy road map for Jamaica using both natural gas and pet coke. As an average yearly figure, renewable energy technology would deliver an estimated 386,913 tons CO2/year saved in this scenario.

Although not included as a figure, calculation was done on the emissions reductions impact from renewable energy technologies for grid generation, in case no action were to be taken with respect to the energy sector transformation and therefore current BAU based on oil and diesel technologies were to be maintained. Under such scenario, the contribution of renewable would be of reducing up to 11.95 million ton CO2 over the 18 years of the period under consideration, representing an average of around 664,744 ton CO2/year. Obviously under this consideration, the numbers are larger since the grid emission factors of the grid would end up being larger since the continuation of the types of existing generating technologies would be the norm.

At the specific project level, there may be different projects that can be identified in the country with a potential to be developed as part of the overall renewable energy contribution to grid connected electricity in Jamaica. In the very short term, a list of projects that will result benefitted from the OUR request for proposals will be announced and therefore it would be easier to target projects with a high likelihood of

occurrence, as to determine what kind of climate finance or carbon market participation may be interesting to assess in order to make explicit their emissions reduction components.

Nevertheless, a couple of indicative projects currently under initial development are presented in this work. The projects are currently under the consideration of the Private Financing Advisory Network Project in the Central American and Caribbean Region, sponsored by CTI.

The first identified project is a hydro run of river type project and the second one is a waste to energy facility in the country.

The Swift River Hydro Plant

The project is currently under early development by EmPCC, Empowered Caribbean Communities of the Caribbean, a not-for-profit organization intending to develop innovative models for energy provision through renewable energies in the Caribbean region. The project intends to develop a small 1.63 MW power plant and has a potential yearly annual average generation of around 8,567 MWh (assuming a 50% capacity factor). The project intends to serve around 859 rural households and also provide electricity to the National Water Commission. EmPCC intends to build the project under a new modality denominated CBOO which stands for "Community Build Own and Operate" in a scheme that can leverage private equity financing as well as more traditional project finance in order to reach a 6.79 Million USD financing pitch. EmPCC is currently looking at different spaces within the regulatory framework in Jamaica in order to achieve regulatory permits via connection to a low voltage distribution grid or through some kind of distributed generation arrangement. The project brings important sustainable development benefits at the local level through community development, job creation, capacity building and infrastructure enhancement. At current trends on the emission factor of the Jamaica grid, the project brings climate change benefits on the order of 6,000 ton CO2/year, which for the period of 18 years to 2030 adds-up to a total of 90,000 tons for the whole period considered in this study. This is clearly a project for which any sort of climate financing, especially at an early level, will be very beneficial in removing gaps for implementation. The project developer is beginning to explore considerations as to how best fit any carbon market activity especially from voluntary markets, but as it will be discussed later on, this kind of projects and support for its development may be the subject of both well designed PoAs and /or NAMAs.

The Duhaney WtE Facility

This project is under development by Dennergy and a consortium of international players with experience in the waste to energy business, and it is a likely potential participant in the OUR request for proposals for renewable energy generation. The project consists of a 21 MW (3x7MW arrangement) waste to energy facilitated utilizing an incineration type proprietary technology, that can process up to 540 tons of municipal solid waste. The project expects to generate up to 179,000 MWh of electricity per year. As a co-benefit the power plant intends to produce and sell potable water, and provide value added to different types of recycled materials in the country. The climate change benefits of the project are estimated by the project developer at around 229,000 tons of CO2e per year, coming from both the displacement of fossil fuel emissions in the grid and also by avoiding the methane emissions of waste that would otherwise have gone to a landfill site in the country. Under normal CDM market behavior over the last few years, this project would have been a clear traditional CDM project. In the absence of a clear short term market price signal for CERs, the developer aims at visualizing in the best possible way its climate change contribution.

The two sample projects identified present a different view of the scale of emissions reductions that is observed in different types of projects in the country. Both can contribute to the achievement of the energy sector vision as well as the climate mitigation targets that such vision incorporates. Nevertheless, very different meaning is associated to any carbon market or climate financing participation in assisting the financing of such different ventures. This issue needs to be highlighted since the current situation of the carbon market precludes from the direct conclusion that in the short term the market for CDM will likely be interesting to a project developer, and on the other hand any new climate financing arrangement will require involvement from the government.

6.2. Potential Emissions Reductions from Energy Efficiency Measures in Jamaica

As it was discussed in a preceding section, several important on-going activities in Jamaica are associated to energy efficiency and conservation. Although it has not been possible under this intervention to produce a MAC curve for EE measures, some of the potential emissions reductions associated to such measures may be estimated on a technical level.

The Caribbean Hotel Energy Efficiency and Renewable Energy Action Advanced Programme (CHENACT AP) is currently under implementation in Jamaica. Although specific information on hotel electricity consumption has not yet being obtained by the author of this report, some initial information is available from other CHENACT AP documents available as secondary sources of information. Energy consumption in the hotel sector is highly associated to air conditioning and lighting (representing between

30-60% of energy consumption). Energy consumption is also highly dependent on the hotel size, and in general energy conservation targets of up to 35% of the electricity consumed may be achieved by the introduction of energy efficiency and conservation measures like: retrofitting of mini split systems, installation of guest room controls, variable frequency drives for pool pumps, introduction of corporate energy management practices, retrofitting of lights at different levels. In the CHENACT experience in Barbados, for example, energy savings of around 39% can be achieved in different types of hotels.

In the case of Jamaica, CHENACT estimates consumptions of electricity by the hotel sector in the order of 475,000 MWh. Taking into account the grid emission factor in Jamaica currently of around 0.7 ton CO2/MWh; the overall emissions associated to the hotel sector are around 332,500 ton CO2/year. Taking into account the effects of energy efficiency best practices in the hotel sector elsewhere in the Caribbean through the CHENACT Barbados Program, the achievable potential emissions reductions in the hotel sector in Jamaica are in the order of 129,675 ton CO2/year; which for the period of consideration of up to 2030 totalled an estimated contribution of around 1.94 million tons CO2 during the whole period.

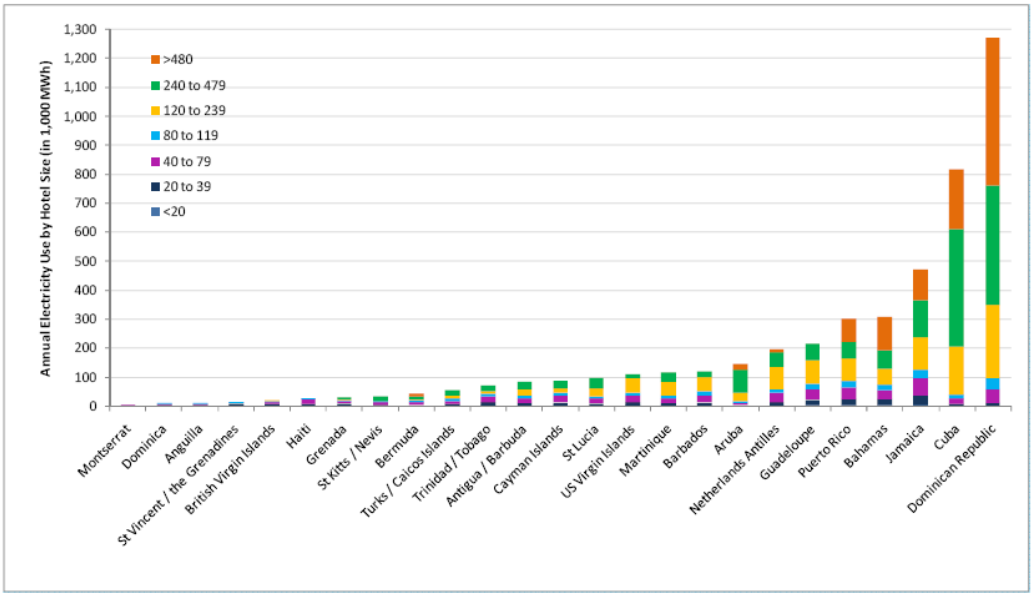


Figure 9. Electricity consumption in the Hotel Sector in Jamaica (CHENACT, 2012)

Emissions reductions associated to the hotel sector will be very dependent on the size of property as well as occupation rates in the industry. For example for a hotel reported under the CHENACT Project with a total of 67 rooms and 36,705 guest nights, and with an energy usage of 1,188,366 KWh/year; estimated average energy savings of 350,000 KWh could be achieved. The climate benefit of such measures will be around 245 ton CO2/year. Again the big questions to bear in mind are what kind of climate

financing might best suit the development of such a type of a program, what kinds of gaps can be filled by attracting such finance? Experience elsewhere may surely bring the attention to the use of PoA like grouping for assembling an MRV associated to a potential tourism sector NAMA in the country rather than looking at straight carbon market transactions for a program like this one.

The **Energy Efficiency and Conservation Program** is an on-going program that the GoJ is implementing with the assistance from the Inter-American Development Bank (IDB) to design and implement EE and EC measures within the public sector.

The main problems identified during the walk-through and detailed energy audits performed in hospitals, pumping stations and various government buildings are: (i) low efficiency of water pump operations, old motors, lack of management of peak demand and low level of preventive maintenance (the National Water Commission (NWC) accounts for over 50% of energy expenditures in the public sector); (ii) inefficient street lighting and obsolete lighting equipment in public buildings (lighting is primarily provided by T-12 fluorescent lamps of 40-watt (W) and incandescent bulbs), mini-split Air Conditioning (AC) units and reach-in refrigerators in the hospitals; (iii) lack of insulation of public sector building envelopes (i.e. windows, doors and roofs are prone to energy leakage); (iv) Heating, Ventilation and AC (HVAC) systems manually operated, and (v) single pane glass windows allowing heat from the outside.

The program has identified the equivalent of US$90 million of capital expenditures for EE and EC, however, given the current fiscal constraint faced by the GoJ as per the SBA multilateral debt requirements, an investment operation for an amount of up to US$20 million was agreed with the GoJ to develop such measures.

Preliminary calculations for the Program confirm the potential for energy savings in the public sector of up to US$7 million per year. This would result in a 6.7% reduction of government energy consumption, which would translate into savings of 44,000 barrels of oil per year and reduction of Green House Gas (GHG) emissions of 16,600 tons CO2 per year. Estimated payback period vary according to the investments on EE and EC measures implemented and range from less than a year (for water pumps) to 4 years or more for more costly EE and EC investments, such as lighting and HVAC retrofitting.

The climate contribution over the period of time to 2030, resulting from the introduction of such measures is on the order of 0.25 million tons CO2 for the targeted investment under the Program. Taking into account that the current program targets up to 22% of the identified required investment, there is plenty of space for consideration of other climate financing in order to assist in the scaling up of the existing programs, obviously taking into account potential public sector investment limitations. Therefore potential scaling up of the emissions reductions can be expected in ranges totaling 0.25-0.6 million tons CO2 during the period to 2030.

The interesting issue here is how can the country build from the on-going program and be able to make a pitch for innovative climate financing via NAMAs in order to assist the required scaling up or to provide targeted financing for critical activities that may still required very targeted financing. Certainly in this kind of program, the features of a PoA type architecture may result beneficial in order to create an MRV framework.

At the project activity specific level, the author has performed a quick assessment of potential emissions reductions from an energy efficiency intervention in the hospital sector of the country. Information for this is available from a recently commissioned study by ECLAC on Energy Efficiency Potential in Jamaica and is based on results from the Petroleum Corporation of Jamaica (PCJ) energy audit program in the hospital sector.

The estimation performed is based on the use of the reported annual cost savings for different types of EE interventions, the assumption of an average cost of electricity at around USD 0.35/KWh for the price of electricity and the use of the current grid emission factor of Jamaica.

For example, energy savings in the order of 2,059 MWh can be achieved in the sector, distributed as 25% in electric power measures (power correction, motor replacements, variable speed drives), 40% in refrigeration and AC, 18% on improvement of building envelopes, and 17% in retrofitting of lighting fixtures. Therefore the climate benefit associated to such an intervention is in the order of 1,441 tons CO2/year, and for the total of the period represents around 25,943 tons CO2/period 2013-2030. It is clear that such an intervention even in the case of a healthy CDM market will not likely be able to make it into a CDM project due to transaction costs associated. Making visible the climate benefit is likely to be better through other type of climate financing interventions such as a NAMA for energy efficiency in the public sector of Jamaica.

Many other potential opportunities may be identified in Jamaica that can be used for assessing the potential of renewable energy and energy efficiency interventions that clearly have climate benefits associated to reduction of emissions with respect to the BAU conditions in the sector, but the ones described in this short evaluation can serve the purpose of further illustrating the trade-off, and issues that need to be discussed in order to define a road map for future climate financing and mitigative efforts in the country.

7. Further development of CDM PoAs and NAMAs in Jamaica

The previous situation up to December 2012, during the First Commitment Period of the Kyoto Protocol and the CDM, offered the path for many emission reductions project to achieve a path to accrue monetary value associated to their emissions reductions. Even though there have been asymmetries of participation for regions, scales of projects and perhaps types of developers; many project received value added from the registration in the CDM.

Although late in blooming, The PoA alternative has served the purpose of integrating benefits to small project activities with small climate change benefits, especially those for which the monetized benefit is potentially a large fraction of the investment required (such as stoves, household and farm biogas, efficient lights, etc).

The short to medium term situation of the CDM is clear although not necessarily the best prospect for any project developer.

It is clear that unless CERs may be coming from an existing registered project or PoA, the European Union may not be allowing new registered CDM projects to enter its emission trading mechanism (EUETS). Only new CDM projects coming from LDC countries are allowed into the European Union. There are some emerging bilateral mechanisms such as the one under implementation of the Japanese government that can use CDM type CER emissions reductions; and there are some other market developments under design and implementation in different countries that may or may not be fungible to CDM CER accrued under the new commitment period.

Jamaica should be doing its own country assessment of the potential paths for CDM participation. The country´s experience shows only 2 registered projects and a potential participation in on-going multi-country type PoAs that are still under validation in the CDM.

It is the opinion of the author, that unless the country is proactive in negotiating participation in bilateral agreements with target Annex I countries, it may well be that the path is somewhat defined already (by the international negotiations as well as market issues):

- In the short term, large scale emission reduction projects may be able to reach carbon markets through bilateral agreements, and it is likely that in the medium term (from 2015 onwards) they will have to wait and see how the negotiations on the New Market Mechanism will shape up or not.
- Small scale CDM type projects will likely be able to make it into the CDM market via adscription as CPAs to already registered multi-country PoAs (i.e. stoves, biogas, small RE technologies for rural households, etc.) that may tackle support from Annex I countries like those in the EU.

It is becoming clear that the paths for most of the identified and discussed potentials for emissions reductions in Jamaica lies within the boundaries of the NAMA mechanisms under discussion in the UNFCCC as a vehicle for climate financing.

Identifying potential opportunities for NAMA interventions normally requires a series of steps in order to be able to build successful interventions. As it was discussed before, there are several important and on-going programs in the energy sector in Jamaica. A gap analysis was done in a previous section of this work and it was determined that most needed interventions necessary for scaling up of the RE and EE in the country

need, possibly, the implementation of activities related to sector governance, and financing support structures needed for stakeholder engagement.

Early NAMA success is based upon:

- ✓ Inscription into long term visions and clear objectives,
- ✓ Availability of Partners and Resources,
- ✓ Adequate political commitment and collaboration,
- ✓ Clear designated responsibility associated to issues like MRV and grouping of activities,
- ✓ Existing experience with participatory processes (bottom-up), and
- ✓ Existence of on-going programs since NAMAS may be easier to jump start when such programs are in place.

It is against such a pragmatic context, that the search for NAMA opportunities in the energy sector in Jamaica should be started (Table 8).

Table 8. Assessing NAMA Opportunities Related to renewable Energy and Energy Efficiency in Jamaica

Criteria /Type of NAMA Opportunity	Related to Renewable Energy Electricity Generation Technologies	Related to Energy Efficiency in the Tourism Sector	Related to Energy Efficiency in Public Buildings and Infrastructures
Inscription into long term visions and clear objectives	RE generation technologies are at the core of the country´s vision in towards 2030. There are clear objectives for their incorporation as part of articulating a Sustainable Road Map for the Energy Sector. Clearly specified objectives and targets are defined in existing policy documents and the development of programs is under way in order to achieve the targets.	The tourism sector is aware of the need to undertake energy efficiency and conservation as part of a sustainable path. Currently there is development of the updated Tourism Master Plan, having a clear opportunity in order to make energy efficiency a key component of such a sector vision. Energy sector policies and vision documents clearly recognize the importance of tackling the tourism sector for energy efficiency interventions. A strong NAMA intervention related to tourism is likely to be	Energy sector policies are clear on the importance of public buildings and infrastructures as part of energy consumption patterns in the country. Although the vision is clear, at the level of objectives the situation may not be as clear, since any program to tackle such energy usage involves the allocation of public finance in the country; therefore decisions may be taken on a budgetary basis.

Criteria /Type of NAMA Opportunity	Related to Renewable Energy Electricity Generation Technologies	Related to Energy Efficiency in the Tourism Sector	Related to Energy Efficiency in Public Buildings and Infrastructures
		successful is clear coordination amongst stakeholders is achieved, and it is also likely not only to consider energy efficiency interventions but also sustainable transportation associated to tourism.	
Availability of partners and resources	Most of the public sector partners for the implementation of programs are in place, although the sector shows a complex institutional political economy, which is characteristic of a country with a long term history of public ownership and predominance in the energy sector. Important stakeholders related to the private sector may still be underrepresented as well as the associated resources related to equity financing and debt financing sources through the participation of the local banking institutions. Special attention needs to be placed in learning important lessons learned from the on-going OUR bidding process, in order to properly assess the level of gap and types of interventions most needed.	There seems to be a well represented spectrum of stakeholders in the sector as to start developing activities towards the consideration of NAMA opportunities. It will be required to assembled such stakeholders and discuss from the direct benefits into co-benefits, the importance or not of visualizing a climate component to an intervention that can scale-up the on-going CHENACT AP program. Proper and due consideration needs to be given to the issue of identifying resources both in terms of human capital as well as financing, since most of the actors at the front of hotels are facing important restrictions related to the observed trend of tourist visitations as well as managing the day to day of their operations.	A NAMA of this type requires clear articulation of stakeholders, likely at the level of the energy sector but also at the level of different ministries. Resources may be an issue due to the current fiscal situation and budgetary allocations, although taking into account the severity of impact of electricity bills in government, there may be available resources. Mobilizing partners is likely to require the enactment of sector/ministry level plans that need to be design and enacted.
Political	There is clear	Taking into account the	Political commitment

Criteria /Type of NAMA Opportunity	Related to Renewable Energy Electricity Generation Technologies	Related to Energy Efficiency in the Tourism Sector	Related to Energy Efficiency in Public Buildings and Infrastructures
commitment and collaboration	commitment on the issue of supporting RE generation in country. Attention needs to be given to the fact that in the short to medium term the country faces major vulnerability and energy security issues. Very short term decisions related to the incorporation of coal as a generating source may affect the establishment a baseline for the sector. Proper consideration needs to be given to the issue of collaboration amongst institutions; targeting innovative climate financing such as NAMAS calls for a renovated approach on how to design and especially on how to define the best and most suited type of instrument that will have to be used in order to support the objective of a potential NAMA in this area.	importance of the tourism sector in the country´s economy, there seems it would be a high level of political commitment for the discussion of a potential NAMA in the sector. Collaboration amongst stakeholders may be an issue due to the level of engagement already identified by stakeholders in the sector, who normally have a very up loaded agenda in terms of international promotion, and day to day operation of institutions. A potential NAMA needs to be rooted deeply on the perception of contribution to competitiveness and other local co benefits associated to the scaling up of EE interventions in the sector (possibly labels and strategies for differentiation of the country as a sustainable tourism destination)	for this type of efficiency measures comes from the Office of Prime Minister directly, assuring a high level political support.
Clear responsibilities for MRV and grouping	Although is too early to say, it is expected that clear MRV responsibility designation needs to be discussed. Of all stakeholders involved, the Ministry of Land, Water, Environment and Climate Change needs to strengthen its ranks in	This issue cannot yet be assessed as a success factor or not at the concept stage.	This issue cannot yet be assessed as a success factor or not at the concept stage.

Criteria /Type of NAMA Opportunity	Related to Renewable Energy Electricity Generation Technologies	Related to Energy Efficiency in the Tourism Sector	Related to Energy Efficiency in Public Buildings and Infrastructures
	order to be a solid proactive player as per reporting purposes. MSTEM has institutional capabilities to undertake monitoring of NAMA activities. It may well be necessary to align MRV objectives from the "top-down" coming from reviewing the monitoring performed as part of Jamaica Vision 2030 and the "bottom-up" approach coming from the field as activities get implemented.		
Existence of participatory processes	From the top-down there seem to be appropriate participatory processes, but on the other direction "bottom-up", a participatory process especially involving private sector project developers and financing institutions needs to be articulated.	From the top-down there seem to be appropriate participatory processes, but on the other direction "bottom-up", a participatory process especially involving different size hotel owners, providers of energy efficiency services and goods, etc. needs to be articulated. On the latter, the advantage is that there are a series of ongoing activities in this direction. Early showing from the implementation of CHENACT will be important in assessing the depth of participatory processes in the sector for a NAMA of this type.	Possibly there are adequate existing processes for participation of stakeholders, but structural issues need to be addressed.
Existence of on-going programs	There are on-going programs for incorporation of RE technologies. The OUR driven process	A NAMA on this sector may well be linked to the lessons learned and success of the on-going CHENACT Project; as well as on	The current Energy Efficiency and Conservation Programme is a must-have building block to assess the

Criteria /Type of NAMA Opportunity	Related to Renewable Energy Electricity Generation Technologies	Related to Energy Efficiency in the Tourism Sector	Related to Energy Efficiency in Public Buildings and Infrastructures
	for bidding of generation capacity constitutes a major learning and step building in the process. A successful NAMA needs to assess and design complementarities. There may be asymmetries with respect to the issue of smaller intermittent renewable sources in the grid, coming from technical limitations in the grid as well as on the type of policy instrument currently envisaged for their deployment. It is likely that a discussions needs to be conducted on the purpose of the net billing approach as compared to other policy vehicles like distributed generation schemes.	how effectively other programs in the country can integrate know-how and a road map for scaling-up interventions (capacity building in labeling, provision of technical and business services for energy efficiency, etc.)	viability of NAMA in this area.

A draft template for a sectoral NAMA on scaling-up renewable energy in Jamaica is presented in Annex 1, document that includes the information developed in the study under a well recognized international format useful for decision makers in assessing the issues confronted in thinking about NAMAS.

8. Conclusions

The CDM has not necessarily being a positive mechanisms to attract climate related investment in countries that have small levels of economic activity as well as relatively small national GHG emissions. The world is finding that it has to live with this result of the experience so far in using market mechanisms to correct such a complex issue a s that of climate change.

Jamaica is a signatory country of the Kyoto Protocol, has enacted a relevant institutional set up as per regarding the establishment of a Designated National Authority (DNA); having in place procedures for the national approval of CDP project activities. Only 2 projects from Jamaica have been fully registered in the CDM and one

of those has issued Certificates of Emissions Reductions (CERs). Some other activities of the Programme of Activity (PoA) type may be advancing under the validation stage of the CDM project cycle.

Such small rate of participation makes harder the attainment of lessons learned from the CDM at the national level from the perspectives of technology transfer, contribution to sustainable development and also on assisting the country on shifting paths as for example emissions in the energy level.

At the project level, surely for one of the projects was able to bring value added trhough monetization of carbon assets, although the project and the developer are currently facing the restrictions and realities of today´s carbon markets.

Moving from the analysis of the current status of the CDM in the country, this study moved as to assessed the types of on-going activities; from policy to program/project level that can be observed in the energy sector in the country; with the aim of identifying potential further PoA type activities as well as potential Nationally Appropriate Mitigation Actions (NAMAS).

The world is moving from a traditional approach based on carbon markets as the way to assist in tackling climate change mitigation to a much broader approach to climate financing (where markets can and surely will play a role). Climate finance is broader in the sense that it does not only rely on performance of specific projects, but it can recognize policy action and programs that can make viable emissions reductions.

At the project level, the path for Jamaica may well be identified as:

- In the short term, large scale emission reduction projects may be able to reach carbon markets through bilateral agreements, and it is likely that in the medium term (from 2015 onwards) they will have to wait and see how the negotiations on the New Market Mechanism will shape up or not.
- Small scale CDM type projects will likely be able to make it into the CDM market via adscription as CPAs to already registered multi-country PoAs (i.e. stoves, biogas, small RE technologies for rural households, efficient lighting, etc.) that may tackle support from Annex I countries like those in the EU.

The study focuses on the identified programs for which, and during the site visit information was gathered. As such further consideration has been given to renewable energy generation for grid connection, energy efficiency in the tourism sector and energy efficiency in public buildings and infrastructures.

Although the best approach for identification of NAMAS calls in for top-down approaches based on the consideration of Low Carbon Development Strategies (LEDs), in order to clearly assess the important co-benefits associated when mobilizing at the national level the effort on mitigation to climate change (process that Jamaica is

starting), this technical cooperation from OLADE looks at some elements that are coherent with the approach normally used internationally.

For that matter, an initial attempt is made to determine the Marginal Abatement Cost of Carbon (MACC) associated to measures directed at scaling up the participation of different sources of renewable energy generation. In all cases of renewable sources considered (hydro, biomass, wind above ground, waste to energy and solar photovoltaic) the MACC gives a negative value, meaning that from a climate mitigation perspective these types of measures are very cost effective for the country in contributing to the fight to climate change.

The level of information required for conducting a MACC is intense, and during the implementation of this study, it has not been possible to determine those values for identified opportunities in the area of energy efficiency and conservation measures. For those it is possible only to assess the overall level of climate mitigation potentially achievable.

The following table presents the overall results of calculations conducted:

Table 9. Targeted Emissions Reductions for Selected type RE and EE Activities in Jamaica for the Period 2012-2030

Type of mitigation measure	Estimated Emissions Reductions for the period 2012-2030	Comment
Renewable Energy Electricity Generation for Grid Interconnection	6.96 million ton CO2	Measure shows negative marginal cost abatement of carbon (MACC), and will be strongly related to the baseline adopted. Important sustainable development benefits associated. Estimation based on target renewable energy penetration in the grid according to the energy policy and country vision.
Energy Efficiency and Conservation in the Tourism Sector	1.94 million ton CO2	No calculation performed on the MACC, but anticipated to be attractive from experience in other countries. Important sustainable development benefits associated. Estimation based on a program directed at the spectrum of hotels in the

		country.
Energy Efficiency and Conservation for Public Buildings and Infrastructures	0.25-0.6 million ton CO2	No calculation performed on the MACC, likely to be attractive with important benefits to the GoJ. Estimated as a range in scaling up existing programs but depending of degree of available resources from the GoJ.

It is clear that the paths for most of the identified and discussed potentials for emissions reductions in Jamaica lies within the boundaries of the NAMA mechanisms under discussion in the UNFCCC as a vehicle for climate financing.

Initial conclusions can be observed with regard to the set of potential interventions in Renewable Energy and Energy Efficiency in Jamaica:

- The identified NAMA type activities are consistent and solidly based within long term visions and clear objectives, although the latter may be better linked in case of renewable energy than to energy efficiency.
- There is a myriad of identified partners and resources that need to be mobilized in order for a NAMA to take off from the ground. In all opportunities identified, at least there are identified partners with access to early on resources that can be important; possibly needing a discussion on types of instruments most likely needed in order to attain the scaling up of the proposed intervention.
- There seems to be adequate political collaboration, but the complex political economy of institutions in the country will need to be addressed in mobilizing towards creating a pitch to obtain incremental climate finance for the different interventions.
- There is plenty of experience on participatory processes in the country and the effort created by the Jamaica Vision 2030 is of major impact. Efforts nevertheless will be needed in assembling discussion tables and bottom-up approach participatory processes for successful NAMA development.
- A major plus encountered is that in all three identified potentials, there are on-going projects and programs currently under implementation in the country. Scaling up will be possible if appropriate lessons learned are obtained and adequate discussion from the climate financing perspective is achieved in the country.

There is an increasing level of activity worldwide on NAMA conceptualization and development; interesting synergistic potentials have been determined and assessed in Jamaica trhough the work of this study. Relevant institutions in Jamaica should respond in assessing if the NAMA vehicle provides the appropriate signals and

facilitation for removal of some of the perceived barriers for scaling up RE and EE in the country, while contributing to effective climate mitigation.

The path of institutional strengthening at the level of MWLECC especially on how the Climate Change office is establish will have important implications for further development of potential NAMA concepts in the country, since NAMAs as being public sector driven policy and project efforts need a fair amount of pushing-pulling of public sector actors in the country. NAMA readiness activities need to be discussed and eventually included in the climate change organizational set-up of the country.

Institutional capacities in discussing, assessing NAMA opportunities need to be developed in the short term; and for that matter the current efforts on LEDS strategy development are a fundamental step in involving both energy and environment institutions in the country.

The creation of a “NAMA Discussion Table” that could be used for further discussion of gap analysis, extracting lessons learned from on-going activities may be an important short term activity for further investigating the proposed concept of a sectoral NAMA on scaling-up Renewable energy participation in the country.

NAMAS presents Jamaica with opportunities but at the same time with challenges in how to effectively and timely respond to the assessment of new emerging mechanisms and trends in the already complex set up of the UNFCCC. Therefore proper assessment of the opportunities and implications is a fundamental part of the development of local institutions, when thinking about linking global efforts to mitigate climate change and in-country aspirations and a vision for a transformational approach to the energy sector development.

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Annex 1

Draft NAMA Information Note (NINO) for Jamaica

Jamaica Renewable Energy Scaling Up NAMA

DRAFT NAMAs Information Note – NINO[4]

NOT FOR DISTRIBUTION

Title of the NINO: Jamaica Renewable Energy Scaling Up NAMA

Country: Jamaica

NAMA Proposal			
Name of Activity	**Jamaica Renewable Energy Scaling Up NAMA**		
Proposing Entity/Organization	**MSTEM/MLWECC (to be discussed)**		
Activity information			
Scope of the activity	National Scope	Sectoral Scope[5]	Project/ Programme
		Renewable Energy	
Objective of the activity	**To assist in transformational efforts associated to Jamaica Vision 2030 scaling up of the renewable energy penetration in the projected mix of generation in the Jamaica grid.**		
Set of measures to obtain the objective	**The NAMA proposes different types of measures related to both the development of policy and regulatory mechanisms as well as financial instruments deemed required for alignment of necessary investments in renewable energy as a whole but also relevant to promotion of specific renewable energy generating technologies of intermittent power type (wind, hydro and solar).**		
Development status of the activity	(**X**) in planning (_) in process (_) nationally approved	(_) awaiting finance (_) under implementation (_) implemented	
Expected start of operation *(Month / Year)*	To be determined	Expected duration *(Months / Years)*	To be determined but likely to take effect in the period 2015-2030

[4] Based on UNEP RISOE template for NAMAS.

[5] Please indicate sector. E.g. Agriculture, Energy, Forestry, Industry, Renewable energy, Residential, Transport, Waste

Brief description of measures planned	
Sector background *(laws, regulations, policies and strategies of the Country that are of central relevance to the proposed activity, as well as any other major trends in the relevant sector)*	The Jamaica Vision 2030 calls for a swift penetration and scaling up of the renewable energy participation in the generation mix towards 2030. Most of this participation calls for a transformational approach to the use of different types of RE technologies of the intermittent power type like solar, wind and hydro type within the market context of the country in the years to come. The Jamaica National Energy Policy 2009-2030 calls for a recognition of the country´s potential of RE resources calling for a development of such resource base and it also calls for the development of the necessary legal and regulatory frameworks associated to the energy sector. The Jamaica National Renewable Energy Policy 2009-2030 establishes the foundation of specific goals for RE in the country:  Potential RE participation in key timeframe scenarios projected towards 2030 indicates that near to 600 MW of RE generation need to be implemented in-country in such a period of time. The country has a complex and changing energy institution environment represented by the following maps of players that need to be mobilized towards alignment of interests in key areas of policy and regulations, enabling financial environments and also required technical developments for the up-take of RE intermittent power. Jamaica is currently involved in developing several activities in strengthening the climate change institutional landscape, being one of few countries that is recognizing a specific Ministry with direct ordinances on climate change aspects, as is the Ministry of Land, water, Environment and Climate Change. Important institutional

	framing decisions are expected in the short term in articulating this transformation of institutions. The country is, with support from international donors, embarking in developing a Low Carbon Development Strategy, which could set up the basis for appropriate NAMA development as part of climate finance opportunities for mitigation finance.
The current situation, including barriers to improvement *(without the intervention)*	Participation of RE resources in Jamaica´s electricity generation is currently very low, although there are adequate resources that show promise for a sizeable contribution. There is some degree of participation of small scale hydro and wind farm type operations in the country. An important effort represented by the Office of Utilities Regulation (OUR) is currently underway in accepting proposals for up to 115 MW of grid connected RE power, process that sustains the basis for the scaling up of RE in the country. As per the country´s vision and on-going attempts to reform and scale up the participation of RE sources several prominent gaps have been identified through different interventions in the country (OLADE, WWI, etc). These gaps are related to the following main areas of barriers encountered by RE project development specially of the private type: 1. Grid dispatch flexibility issues, both physical as well as operational/market arrangements. 2. Policy/regulatory and contractual issues. 3. Suitability of financial instrument and facility availability for Re project development. Many remaining questions are still open in order to more precisely define the barriers (specially at the specific RE technology type) but a general accord exists in-country on the main and most important ones to be addressed in planning a potential NAMA (generated trhough stakeholder involvement in the Sustainable Energy Road Map for Jamaica by WWI):

	Grid integration of renewable energy • How is Jamaica's grid designed and operated? (grid codes, solar and wind forecasting, frequency of market operation) • How successful are efforts to improve the grid? (JPS automated metering program, other measures?) • Are we correct in our understanding that the major hurdle at this point is to obtain LNG at a feasible price? Now that GOJ has withdrawn, is JPS responsible for sourcing LNG and financing the terminal and pipelines? Is private financing still looking likely? Finance • How is the PetroCaribe Energy Line of Credit for SMEs functioning right now? What could be done to improve uptake and make this a viable financing option? Where is this money actually coming from? • How are other financing programs such as the DBJ loan program for small-scale residential renewable energy and the NHT solar mortgage program working? How can these be improved and other programs be implemented? Are there any other programs that we have missed? • What do investors perceive to be the major barriers to investing in energy efficiency and renewable energy projects? • How does Jamaica's existing debt burden impact its future choices for international (climate or otherwise) finance for sustainable energy projects? Policy • What impact will OUR's RFP have for the use of avoided cost in pricing renewable energy from IPPs? • Is renewable energy permitting currently a major barrier for renewable energy IPPs to enter the market? How can this be streamlined? Is there a particular agency that can serve as the single administrative window for renewable energy project developers? • What is the status of the Modernize Electricity Act? • What is the significance of the Supreme Court ruling on the JPS monopoly and the appeal process in place now? • How effective will the RFP be for procuring new renewable capacity? It is anticipated that the process of conceptualization and development of a NAMA in country should address in a participatory process the discussion of the aforementioned relevant questions and issues in order to properly define the identified gaps and instruments and specific activities the NAMA could include.
The specific measures and/or activities	To be determined.
The measures and/or activities' relation to other NAMAs, proposed or under implementation/ implemented	No other NAMA is currently proposed or under implementation/implemented in the country.
The boundaries of the proposed measures and/or activities	The boundaries are limited to the interconnection of different types of intermittent RE power technologies to the Jamaican electricity grid encompassing physical locations in Jamaica.

Impact of the NAMA

The activity's contribution to the country's sustainable development	
How do the measures and/or activities contribute to sustainable development priorities of the host country? *Social, environmental, economic and any other benefits*	a. Reducing the cost of electricity and eventually lowering prices to improve the country's economic competitiveness and reduce the impact of energy consumption on households' budgets. b. Lowering the sector's vulnerability to oil price fluctuations, by reducing its reliance on imported petroleum products for electricity generation through. c. Contribution to the generation of a new set of business practices resulting in the local creation of value added and development of the human capital of the country through creation of new spaces in the energy sector resulting in job creation to the Jamaican population. d. Mobilizing private sector financing for energy infrastructure creating investment opportunities for different target sectors in the country (from private to equity, social pension funds, etc). e. Environmental benefits by reduction of point source pollution effects from the trend of fossil fuel based generation, including effects on effluents and discharges. f. Improved benefits resulting from better zoning ordinances, as well as synergistic recognition of environmental services provided by watersheds in the country. g. Reducing GHG emissions as an opportunity to bring collateral climate change co-benefits.
GHG emission reduction	
Types of greenhouse gases reduced by implementation *(CO_2, CH_4, N_2O, HFC,PFC, SF_6,NF_3)*	**CO2**
Estimate of potential emissions reduction and the time frame	**6.96 million tCO2 in the period 2015-2030. On a yearly average basis it rounds up at around 386 ktCO2eq/year**

of estimates (2020, 2030, etc) *(ktCO$_2$eq/year)*	
Brief description of estimation methodology	a. Creation of electricity generation scenarios in Jamaica. b. Determination of levelized cost of energy (LCOE) for different sources of energy including Re and also environmental externalities. c. Application of marginal abatement cost of carbon curve for the proposed contribution of RE technologies in Jamaica. d. Consideration and simulation of grid emission factor suitable to the scenarios proposed. e. Initial estimation of a marginal abatement cost of carbon for RE technologies in Jamaica The procedure for initial estimation of the MACC for renewable energy in Jamaica is as follows: • The rate of assumed penetration of Renewable Energy in Jamaica is based in accordance to recent studies conducted on the energy sector in Jamaica, and the level of identified potential and current policy goals, in a scenario where natural gas replaces oil based generation together and renewable energy and pet coke come in place. **Scenario for Electricity Generation in Jamaica Towards 2030**

Generation (GWh/y)	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
Oil	4.750	4.750	4.750	1.375	1.375	1.375	1.375	1.375	0	0	0	0	0	0	0	0	0	0
Natural Gas	0	0	0	3.500	3.500	3.500	3.500	3.500	5.250	5.250	5.250	5.250	5.250	6.125	6.125	6.125	6.125	6.125
Pet coke	0	0	0	0	0	0	0	0	750	750	750	750	750	750	750	750	750	750
Waste	0	0	0	0	177	177	177	177	177	177	177	177	177	177	177	177	177	177

Hydro	0	0	0	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113	113
Wind	0	0	0	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
Biomass	0	0	0	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200
Solar PV	0	0	0	0	180	180	180	180	180	706	706	706	706	706	706	706	706	706	706
Total renewable energy	0	0	0	466	823	823	823	823	823	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349	1.349
Total energy	4.750	4.750	4.750	5.341	5.698	5.698	5.698	5.698	6.823	7.349	7.349	7.349	7.349	8.224	8.224	8.224	8.224	8.224	8.224

- It is supposed that most of the renewable energy generation enters the system around 2015-2016, which is compatible with existing plans like the OUR request for proposals for renewable energy generation projects. The rest of the RE incorporations to the grid will come after 2020 (mostly solar). Information on trends for the expected participation of the fossil fuel sources is important in order to assess the impact on the estimated emission factor of the grid in different segments of the period to 2030.
- The penetration potential of RE sources in Jamaica has been established in accordance with the estimated potentials for the different sources as presented in the following table.

Identified Potential for RE Technologies in Jamaica

RE Source	Identified capacity (MW)	Expected annual generation (GWh)	Comments
Wind	70	153	It only considers current estimates base on above ground potential and not any off-shore.
Hydro	22	113	Based on existing project site potential.
Solar PV	650	1,139	Assumes international figures of up to 0.1% of country land and average interception on the order of 200-300 W/m2.

- Emissions reduction have been estimated on a 5 year basis for the period 2015-2030 and accumulated through the contribution of each source in the period. The emission factor for each period of 5 years is used as an approximation to the expected situation

and it is used for the estimation.

- At the onset of the estimation, the current emission factor of around 0.69 ton CO2/MWh is used and for each subsequent period, an adjusted value based on an operating margin approach is used (taking into account the expected composition of the energy matrix according to the path of introduction of natural gas and pet coke: 0.44 ton CO2/MWh (2015-2020), 0.46 ton CO2/MWh (2020-2025) and 0.45 ton CO2/MWh for the period 2025-2030.
- The climatic benefits in terms of mitigation are estimated based on the arithmetic average difference of the LCO of the 4 selected sources as compared to the LCO of the business as usual scenario of oil based generating technologies. The above is correct since the decision point for developing and implementing a sustainable road for the sector looks at the case of oil dependency. Such LCE is then multiplied by the amount of generation expected by source for each segment of 5 years over the period under consideration. LCO information is as available from recent Worldwatch Institute results for the project on Sustainable Road Map for Jamaica.

Levelized Cost of Electricity Generation for Oil and Diesel Technologies in Jamaica

	Oil Combined Cycle	Diesel generator	Oil steam	Oil Combustion Turbine	Average
2010	0.16	0.15	0.17	0.32	0.20
2015	0.19	0.23	0.3	0.37	0.27
2020	0.20	0.24	0.32	0.39	0.29
2025	0.21	0.25	0.33	0.40	0.29
2030	0.22	0.255	0.35	0.42	0.31

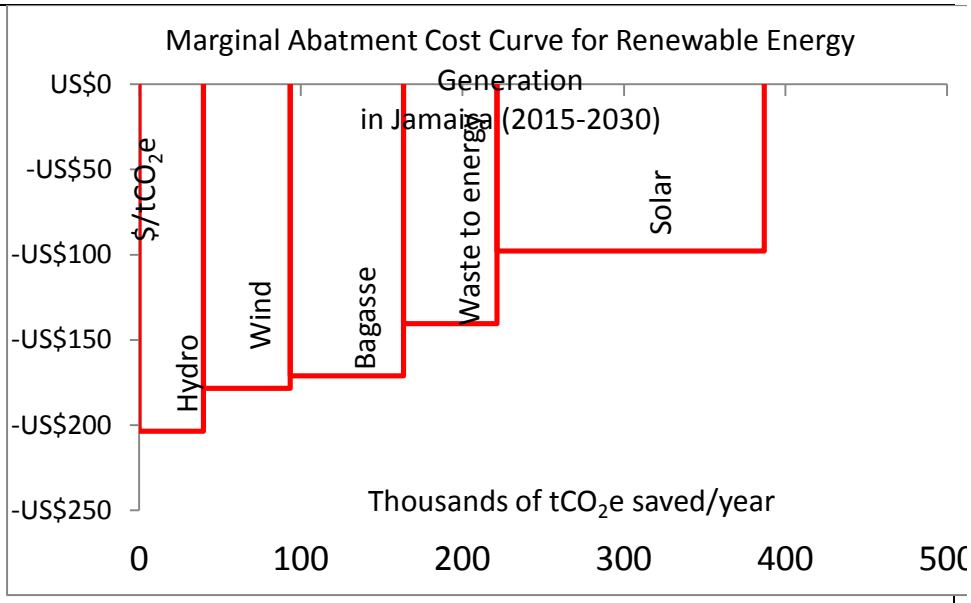
Source: Worldwatch Institute & MSTEM. Designing a Sustainable Electricity Roadmap for Jamaica. November, 2012.

Levelized Cost of Electricity Generation by Renewable Sources in Jamaica

RE Technology	US$/kWh Max. Levelized Cost of Energy
Bagasse cogeneration	0.105
Wind generation	0.095
Hydroelectricity	0.06
Waste to energy generation	0.149
PV generation	0.23

Source: Worldwatch Institute & MSTEM. Designing a Sustainable Electricity Roadmap for Jamaica. November, 2012.

- The LCOE is the price at which electricity must be generated from a specific source to break even over the lifetime of the project. It is an economic assessment of the cost of the energy-generating system including all the costs over its lifetime: initial investment, operations and maintenance, cost of fuel, cost of capital, and is very useful in calculating the costs of generation from different sources.
- The MACC expressed in US$/ton CO2 for the different sources considered is plotted on the y-axis, and on the x axis or the width of each column, appears the amount of carbon mitigated by the intervention associated (in this case the electricity generated by each of the considered renewable technologies). Negative MACC values indicate that the proposed mitigation activity is cost effective in terms of its climate contributions, whereas positive MAC values require judgment against the cost of inaction - in this case the cost of the purchase of carbon credits – and/or ethical and marketing considerations.
- Initial approximation to the MAC cost curve for renewable energy electricity generation in Jamaica. The results depicted are in-line with the expected results based on the scenario that incorporates both natural gas and pet coke in the generation. It is also interesting to note that from the climate change mitigation cost, these measures tend to be very cost effective as part of a low carbon development strategy for the country´s consideration and therefore it would be appropriate to give it further consideration as to how and timely any climate financing may contribute to scale up the implementation of such sources in the country.



Marginal Cost Abatement Curve for RE Generating Technologies in Jamaica 2015-2030

- The total emissions reductions associated to the introduction of the proposed renewable energy sources for grid generation over the period of 18 years towards 2030 amount to a total of around 6.96 million tons CO2 for the case of comparison with the proposed sustainable energy road map for Jamaica using both natural gas and pet coke. As an average yearly figure, renewable energy technology would deliver an estimated 386,913 tons CO2/year saved in this scenario.
- Although not included as a figure, calculation was done on the emissions reductions impact from renewable energy technologies for grid generation, in case no action were to be taken with respect to the energy sector transformation and therefore current BAU based on oil and diesel technologies were to be maintained. Under such scenario, the contribution of renewable would be of reducing up to 11.95 million ton CO2 over the 18 years of the period under consideration, representing an average of around 664,744 ton CO2/year.

Financing of measures, including technology		
Financing *(Sources of finance*	Domestic (to be determined)	GoJ through implementation of physical improvements to the grid for up-take of RE power/institutional involvement in policy /instrument development.

identified or sought for, amounts, and any supportive information available)		Private sector domestic equity investment.
	International support (to be determined)	Implementation of two targeted programs associated to: 1. Strengthening the RE Policy and Regulatory Frameworks 2. Grid connected RE Development involving the design and implementation of innovative financial approaches related to risk management in energy project development.
	Offset Credits (to be determined)	Through the use of the CDM PoA models, a strategy can be established that can assess, register and monitor the emissions reductions resulting that can be a source of carbon financing (to be investigated trhough the CDM, bilateral markets)
Technologies to be employed *(If available, specific technology identified and method of identification)*	Initially wind, hydro, solar PV, both at the grid level of interconnection to transmission lines but also at the distributed generation approach.	
Measurement, Reporting and Verification (MRV) (to be discussed at a later stage)		
Brief description of parameters to measure impacts	MRV directed at penetration compliance with targets and vision. Total power and energy contributions at the national level. Monitoring of co-benefit parameters to be established in accordance with general monitoring requirements of Jamaica Vision 2030.	
Brief description of national system for	To be completed. At the national level, the MRV will rely on the guidance of energy accounting in the country under the responsibility of MSTEM, although a specific sub sectoral system may need to be established; and at the level of GHG reductions, the contribution of National GHG Inventories under MLWECC is very important. A major issue emerging will be the estimation of baseline considerations and monitoring of the	

data collection	baseline scenario as other fossil fuel substitutions may or may not happen in Jamaica. At the project level, and depending on the composition of potential arrangement of project activities, especially if a potential credited component of the NAMA is envisaged, an arrangement based on the PoA like monitoring can be established for the larger scale projects as well as for any distributed generation component of the NAMA.
Brief description of national system for verification	A national system for verification will need to be developed for this NAMA.