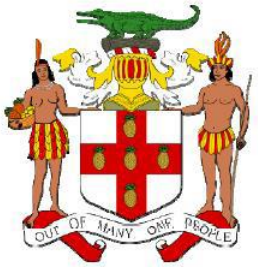


Ministry of Science, Technology, Energy and Mining

Ministry of Land, Water, Environment and Climate Change

Draft NAMA Proposal

Jamaica Renewable Energy NAMA

November 2014

Table of Contents

Draft NAMA Proposal 1

Jamaica Renewable Energy NAMA 1

SECTION 1: NAMA Overview 4

1. Basic information 4

2. Overview of the key aspects of the NAMA 5

2.1 Brief description of the objectives of the proposed NAMA and summary of measures to be included in the NAMA 5

2.2 Relevance to the national sustainable development plan(s) or national strategies and/or to the sectoral mitigation goals 5

2.3 Brief description of relevant existing mitigation initiatives and their synergies with the proposed NAMA 7

2.4 Brief description of the transformational impact, including its sustainability 7

SECTION 2: NAMA DETAILS 8

1. Introduction 8

1.1 Description of the general context of the country, including overview of national development and climate change policies 8

1.2 Detailed description of the current situation in the sector/sub-sector, including the relevant existing legal, regulatory and institutional framework, where NAMA would be implemented 16

2. Description of scope and objectives of NAMA to address the current situation 29

3. Identification of barriers and implementation options 31

3.1Analysis of barriers (financial, legal, regulatory, institutional, capacity, technology, etc.) that impede achievement of the NAMA objectives 31

3.2 Identification of possible options to address the barriers and selection of preferred options (=measures) to be implemented through the NAMA 32

4. Description of the NAMA Action Plan 34

4.1 Description of detailed activities to implement the mitigation measures included in the NAMA and work plan for the detailed activities (2 pages) 34

4.2 Implementation arrangements: roles and responsibilities of different entities and stakeholders involved in implementation of NAMA, including institutional arrangements (2 pages) 36

5. Estimate of National Sustainable Development Benefits and GHG Impacts 39

5.1 Baseline Scenario: narrative description of baseline situation in absence of planned NAMA measures 39

5.2 NAMA Scenario: narrative description of situation with the implementation of NAMA measures 40
5.3 Description of the benefits in terms of development (social, economic, and environmental) .. 41
5.4 Estimate of GHG emission reductions resulting from implementation of NAMA measures, including description of methodology to estimate GHG emissions impact 42
5.5 Description of the transformational impact of NAMA, including its sustainability 48
6. Measuring, Reporting and Verification 50
6.1 Description of key parameters to assess progress of implementation of the NAMA 50
6.2 Description of key parameters to assess the national sustainable development benefits and GHG emission impacts 51
6.3 Measuring and Reporting Plan 53
6.4 Description of verification process 55
7. Non-financial support required 56
7.1 Description of the technical and the capacity-building needs 56
8. Financial resources 57
8.1 Full cost of implementing the NAMA 57
Annex I. 60
Details of Proposed NAMA Coordinating Entity and NAMA Approving Entity 60
Annex II 61
Simulations of Baseline and NAMA Scenario GHG Emissions 61

SECTION 1: NAMA Overview

1. Basic information

Title of NAMA :Jamaica Renewable Energy NAMA

Country/ies: Jamaica

NAMA Implementation Coordinating entity:
Entity in charge of NAMA implementation (i.e. overall coordination for implementing the NAMA)
Ministry of Science, Technology, Energy and Mines
http://www.mstem.gov.jm/
Government of Jamaica (MSTEM)

National NAMA Approver[1]:
Mention name of national NAMA Approver if one has already been designated in your country (if not, leave blank)
As of 26th November 2013, Jamaica has not yet reported to UNFCCC and official entity responsible for NAMA approval
http://unfccc.int/files/cooperation_support/nama/application/pdf/nama-approver.pdf
Jamaica has a Ministry of Water, Land, Environment and Climate Change that has a Division of Climate Change
http://www.mwh.gov.jm/

Name of person(s)/organisation responsible for developing the NAMA proposal:
Name of the person(s)/organisation responsible for the analysis and identification of measures for the NAMA proposal. If a working group is responsible, please name the members of the working group.
NAMA development is supported through a Technical Assistance to Jamaica provided by the Latin American Energy Organization (OLADE) under the request from MWLECC and the concurrence of MSTEM. Currently the following persons are involved in the NAMA preparation:

Government of Jamaica:
Dr. Hillary Alexander, JP. Permanent Secretary. Ministry of Science, Technology, Energy and Mining (MSTEM).
Mr. Gerald Lindo. Senior Technical Officer Mitigation. Ministry of Water, Land, Environment and Climate Change (MWLECC).

OLADE:
Mr. Byron Chiliquinga. Gerente, Proyecto Energía Sostenible para América Latina y Caribe 2012-2017. OLADE.
Mr. Mentor Poveda. Consultor Desarrollo Sostenible y Eficiencia Energética. OLADE.
Mr. Oscar Coto. NAMA Consultant. EMA S.A.
Mr. Luis Roberto Chacón. NAMA Consultant. EMA S.A.

Sector/Subsector:
Sector/subsector in which NAMA takes place

Energy/Electricity/Renewable energy

Greenhouse Gas covered by the Action (marked x):

CO_2	x	**CH_4**	
N_2O		**HFCs**	
PFCs		**SF_6**	
NF_3			

Status of Endorsement by appropriate National Authority: Not yet submitted for National Approval

[1] NAMA Approval authority is the designated national focal point/entity for submitting NAMAs to the UNFCCC NAMA Registry.

2. Overview of the key aspects of the NAMA

2.1 Brief description of the objectives of the proposed NAMA and summary of measures to be included in the NAMA	*Describe the purpose of the NAMA by describing the current situation and the situation after NAMA implementation. Refer to technologies which would be implemented under the NAMA. Describe the objectives of the proposed NAMA in a clear manner.* *Briefly describe the measures that will be implemented as part of the NAMA.* *Explain what sources of emissions will be addressed by the proposed NAMA and how the proposed measures in the NAMA will impact GHG emissions. Refer to the GHG NAMA boundary.* The objective of the NAMA is to promote the incorporation of renewable energy based generation in Jamaica, assisting in the creation of a sustainable enabling environment that is adequate for early stage development of the renewable energy industry in the country, as well as contributing to the realization of the long term contributions associated to the use of renewable energy resources of the country. The Implementation of the NAMA will contribute in assisting the creation of a smooth transition into an energy system that is in tune with the proposed Jamaica Vision 2030 of being "Jamaica, the place of choice to live, work, raise families and do business". Jamaica has strong renewable energy potential and renewable energies could be used to meet an important percentage of the electricity demand. The NAMA aims at assisting in the creation of an enabling environment for the deployment of renewable energy generation technologies such as solar, wind, hydro and biomass in the country, contributing to the achievement and potentially scale up the contribution from renewable energy in the overall energy matrix. The main source of emissions addressed by the NAMA is the reduction of CO2 emissions due to renewable energy generation displacing fossil fuel generation at the grid level or in captive applications.
2.2 Relevance to the national sustainable development plan(s) or national strategies and/or to the sectoral mitigation goals	*Explain why the NAMA is relevant for national development plan/strategies and sectoral plans/strategies. In doing so, please provide information on the following:* • *Describe the national sustainable development context and objectives. Refer to relevant existing national sustainable development plan/strategies.* • *Describe the sectoral context (sector in which NAMA would be implemented) by referring to relevant existing sectoral plan/strategies.* • *Describe sectoral mitigation goals, if any.* • *Explain how the NAMA contributes to attaining the national sustainable development objectives and sectoral mitigation goals.* The Jamaica Energy Policy (NEP) 2009-2030 incorporates a vision for the participation of renewable energy in the energy mix of the country, stated to be: 12.5% by 2015 and 20% by 2030 (which is currently being revised to a 30% participation of renewable energy in the electricity generation of the country); in contrast to a 5.6% participation in 2008. It is stated also that GHG emissions of the energy sector should target 4.5 MtCO2/year in 2015 and 3.5 MtCO2/year by 2030, from an estimated 5 MtCO2/year in 2008. The

	NEP is also clear in stating that the targets are based on realistic strategies but are projections and therefore may be subject to change based on introduction of new and renewable energy sources. Jamaica´s energy sector is at a crossroads. Currently the country depends on petroleum imports for over 95% of its electricity generation, bringing enormous economic and environmental costs and necessitating a transition to a more sustainable energy system. Recently, as of 2011, Jamaica spent up to 15% of its GDP on petroleum imports and electricity prices for Jamaican residents are amongst the highest in the world at around 40 US cents per KWh, being a major barrier for the country´s sustainable development, issue that it shares with many small island states worldwide. Through a series of actions resulting in the implementation of measures, the NAMA will both contribute to the energy sector policies, the country´s vision; by contributing to the consolidation of an enabling environment that will responsive from the policy/regulatory frameworks, provision of support for strengthening of technical capabilities, and contribution to assure a vibrant investment climate in support of renewable energy electricity generating technologies.

2.3 Brief description of relevant existing mitigation initiatives and their synergies with the proposed NAMA	*Describe briefly any national and international (with international support) mitigation initiatives under implementation in the country that are relevant for the NAMA.* *For each of them, explain what are the link and synergies between the initiative and the NAMA. For each of them explain how coordination will be ensured with the NAMA.* There are different on-going activities on mitigation to climate change in Jamaica. The GoJ is implementing a policy of 10% ethanol on gasoline, a tender organized by the Office of Utilities Regulations allocated 78MW out of a 115 MW target to renewable energy projects (3/wind and solar), there is a net billing pilot project with over 200 licences issued. Through the National Housing Trust well over 2000 domestic solar water heaters have been installed. The Ministry of Land, Water , Environment and Climate Change has enacted a transportation fuels working group and with the collaboration of the USAID the country is embarking in the development of a Low Emission Development Strategy
2.4 Brief description of the transformational impact, including its sustainability	*Provide a summary of the information detailed in point 5.5* The main transformational impact of the NAMA centres in keeping the focus of the country in the important long terms multi-dimensional contribution of renewable energy. Taking into account the resource endowments of the country, over time the contribution of renewable energy can become strategically very important. From the point of view of the energy system itself, the scaling-up of the RE contribution, although posing important challenges to the system architecture and associated set of actors and stakeholders, offers a unique opportunity to contribute to increase the robustness and resilience at different levels. The NAMA has direct connection to the economic competitiveness of the country as it targets macro-economic factors associated to energy security, diversification, and improvement of balance of payments. In an emerging context of dynamic changes, the Jamaican society is striving to be more resilient and robust to adapt to change and impacts from the climate change phenomena. The NAMA contributes to achieve new sets of properties within the energy sector such as reflexive governance, agile institutions, responsive/flexible/adaptable infrastructure, responsive coordination, diversification of portfolios, flexible strategy development; all of which contribute inherently to overall efforts towards adaptation. It is transformational in pushing agenda development from perhaps current marginal actors with capacity to push for more flexible strategies than incumbent actors (for example consolidated renewable energy associations vs. traditional incumbent utilities).

SECTION 2: NAMA DETAILS

1. Introduction

1.1 Description of the general context of the country, including overview of national development and climate change policies

(2 pages)

a) *Describe the general social, economic and environmental context of the country as this is relevant for the NAMA.*

Describe the human development challenges that the country faces.

Describe the national development strategies and list the national priorities and objectives relevant for the NAMA.

Not more than 2 -3 paragraphs explaining the general context of sustainable development in the country, the priorities for development, key challenges to achieve development, etc. This sections helps clarify how the objective of the NAMA is aligned with national sustainable development priorities. The information should provide references to key national development planning or strategy documents.

As it is described within the Jamaica Vision 2030 (http://www.vision2030.gov.jm/), Jamaica is the largest English speaking island in the Caribbean and is known worldwide for its vibrant culture, sporting prowess and physical beauty; and boasts of its political stability, favourable climate, geographic location and abundant natural resources; with a population of talented, warm hearted and diverse people. The country has made considerable progress in many different social indicators including life expectancy, near universal enrolment in primary and junior secondary education, access to potable water and electricity services, being the country on course to meet several Millennium Development Goals by 2015.

In spite of these achievements, the country´s development has been characterized by paradoxes, where periods of expansion have alternated with periods of poor economic performance where growth has occurred alongside social issues of inequity in wealth and opportunity. Over the recent years, the country has experienced an economic turndown that compares unfavourably with regional and international counterparts; resulting in a deterioration of indicators related to different dimensions of life in the country.

INDICATORS	1970	1980	1990	2000	2005	2006	2007
Real GDP[1] (Growth) %	11.9	-5.7	6.3	0.9	1.0	2.7	1.4
Debt/GDP (%)		107.4	128.7	88.7	119.1	117.5	111.4
Average Annual Unemployment Rate (%)		27.4	15.3	15.5	11.2	10.3	9.9
Average Annual Exchange Rate (J$=US$1.00)	0.83	1.78	7.24	43.08	62.50	65.88	69.06
Inflation (%)		28.6	29.8	6.1	12.6	5.7	16.8
Population ('000)	1,861.3	2,183.8	2,414.9	2,597.1	2,656.7	2,669.5	2,682.1
Population Growth Rate (%)	1.5	1.1	1.0	0.6	0.5	0.5	0.5
Life Expectancy at Birth (years)				72.2	73.3	73.3	72.4
Adult Literacy (% of ages 15 and older)				79.9	79.9	85.5	86.0
Gross Primary Enrolment ("000)		427.3	339.0	325.3	326.4	318.7	310.0
% Population below Poverty Line				18.9	14.8	14.3	9.9
Access to Piped Water (%)				66.6	n/a	67.8	70.2

More recently, the country has being shocked by an economic crisis derived from the international crisis of 2007, that has limited the country´s access to capital markets, reduce the profitability of local business therefore reducing some key employment opportunities and delivering an overall worsening of the balance of payments. All of this having a negative impact in the social development agenda of the country. Recently the GoJ has signed an agreement with the International Monetary Fund[2], in order to regain formal borrowing arrangements pending the implementation of several types of measures over the next four years, which includes relevant energy targets related to diversification and promotion of renewable energies.

Jamaica's Human Development Index value for 2012 was 0.730—in the high human development category—positioning the country at 85 out of 187 countries and territories worldwide.

Jamaica´s energy sector is at a crossroads. Although almost having universal access to electricity services, currently the country depends on petroleum imports for almost 93% of its electricity generation[3], bringing enormous economic and environmental costs and necessitating a transition to a more sustainable energy system. Recently, as of 2011, Jamaica spent up to 15% of its GDP on petroleum imports and electricity prices for Jamaican residents were amongst the highest in the world at around 40 US cents per KWh, being a major barrier for the country´s sustainable development.

The Jamaica Vision 2030is 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 Jamaica Vision 2030 contains meaning, outcomes, strategies and target indicators that are designed to guide long term country action towards sustainable development of the country.

[2] https://www.imf.org/external/np/loi/2013/jam/041713.pdf
[3] http://global-climatescope.org/en/country/jamaica/#/details

The NAMA contributes to the Government of Jamaica (GoJ) efforts in scaling-up the contribution of renewable energy as stated in the Jamaica Vision 2030, by supporting a range of measures and programmes in alignment within National Objective #10 related to Energy Security and Efficiency; and also contribute to the effort of reducing the rate of Climate Change within the National Objective #14 related to Hazard Risk Reduction and Adaptation.

b) Describe the national context related to climate change, and in particular the mitigation aspects:

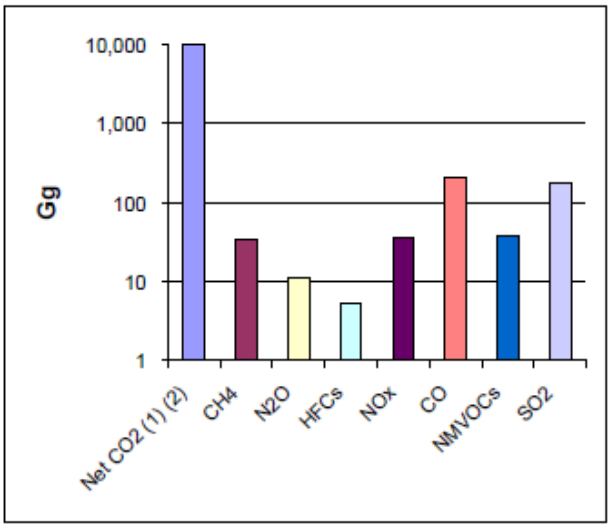
i. Describe briefly total national GHG emissions and key sources of emissions. Also describe available information on projections of national GHG emissions and key areas where growth is expected

Jamaica, as a small island developing state, is particularly vulnerable to the impacts of climate change not only in terms of its natural resources, but also its economic development, as sectors such as tourism, agriculture, fisheries, forestry and water are climate sensitive. Jamaica's susceptibility to natural disasters has proven to be a major threat to the social well being; as well as for the stability of human settlements and infrastructure.

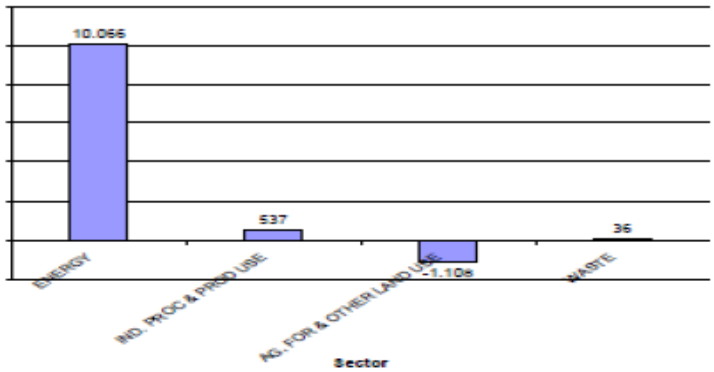
Between 2001 and 2012 Jamaica experienced 11 storm events (including 5 major hurricanes) and several flood events. These events combined resulted in loss and damage amounting to approximately $128.54 billion and in one case (Hurricane Ivan, 2004) the loss was equivalent to8.0 per cent of GDP. Hurricane Sandy (2012) accounted for $9.7 billion or 0.8% of 2011GDP in direct and indirect damage. The social sector (health, housing and education) had the largest impact accounting for 48% of the total costs. One death and 291 injuries resulted from Hurricane Sandy.

The Second National Communication of Jamaica to the United Nations Framework Convention on Climate Change (SNC)[4], provides the National Inventories for Greenhouse Gases in a report prepared as a requirement for Jamaica as a Party to the UNFCCC, also assessing climate change impacts for the key sectors of health, human settlements, and tourism, in addition to revisiting agriculture, water, and coastal zones, for the years 2015, 2030, and 2050. Jamaica's SNC also includes an assessment of potential mitigation options to reduce Green House Gas (GHG) emissions over the period 2009 to 2030. The SNC provides an outline of awareness raising requirements, a review of the national systematic observation systems, and a technology needs assessment for the country.

The most recently submitted SNC (2011) uses as a reference the year 2000. Net CO2 emissions increased from 8,418 Giga-grams (Gg) in 1994 to 9,532 Gg in 2000. The energy sector accounted for nearly 86 per cent of the 2000 CO2emissions, down from 97 per cent in 1994.

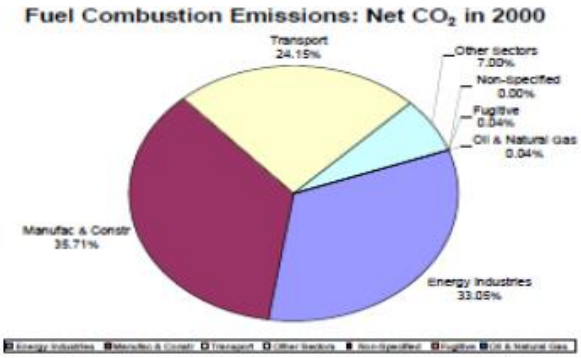


The energy sector is the dominant sector in terms of GHG emissions in the country.



The fuel combustion emissions for the year 2000 were:

[4] http://unfccc.int/resource/docs/natc/jamnc2.pdf



Manufacturing and construction accounted for 35.7 per cent of net CO2 fuel combustion emissions, followed by **energy industries (electricity generation and petroleum refining), 33.1 per cent**, and transport, 24.2 per cent.

As part of the SNC, within the Jamaica´s Greenhouse Gases Mitigation Assessment[5], estimations have been performed on projections of national GHG emissions for 2035 on key areas where growth is expected. The overall CO2 emissions in the overall energy demand for the different scenarios show increases that range from 29 percent, 52 percent and up to 98 percent respectively with respect to the 2000 GHG emissions inventory which was 10,046 Gg of CO2.

ii. Describe briefly the existing national climate change (mitigation) policies/strategies/plans and specify the national emissions reductions objectives.

The Ministry of Land, Water, Environment and Climate Change (MWLECC) is responsible for overseeing climate change issues in the country, through the Division of Climate Change; which is a new division created in 2012.

Climate Change is a relevant component of the Jamaica Vision 2030 and one specific output objective of the vision towards 2030 specifically addresses hazard risk reduction and adaptation to Climate Change, linking to specific strategies in:

1. Improving resilience to all forms of hazards,
2. Improve emergency response capabilities,
3. Developing measures to adapt to climate change,
4. Contribution to reduction of the global rate of climate change.

For each of the above, the Jamaica Vision 2030 includes national strategies that are identified as early drivers to guide action over the framework period of the implementation of the vision. Of particular interest to mitigation, it indicates the following key national strategies:

- Promote energy conservation and non-carbon-based forms of energy,
- Reduce deforestation rate through mechanisms such as reforestation programmes,
- Conduct research on Jamaica's levels and sources of greenhouse gas emissions with a view to further reducing the emissions,
- Promote the use of clean technologies in the manufacturing sector,
- Maximize the benefits of the Clean Development Mechanism (CDM) under the Kyoto Protocol,

[5]Claude Davies and Associates. Jamaica´s Greenhouse Gases Mitigation Assessment. Prepared for National Meteorological Service (2010).http://www.metservice.gov.jm/Climate%20Change/Final%20Report-Jamaica's%20Greenhouse%20GAs%20Mitigation.pdf

- Lobby at the international level for high greenhouse gas-producing countries to become more energy and resource efficient.

The Jamaica Vision 2030 also establishes key specific strategies and actions to be undertaken for the initial period of 3 years from 2009-2012, which for the output objective related to contribution to reduction of the global rate of climate change is directed to a strategy of lobbying at the international level for high greenhouse gas producing countries to become more energy and resource efficient and a related key action on preparation of the second National communication to the UNFCCC.

The GoJ is currently discussing the adoption of a Climate Change Policy Framework proposed by the MWLECC that was tabled to the Parliament in February 2014.The Vision Statement of the Draft Climate Change Policy Framework indicates that "Jamaica achieves its goals of growth and prosperity for its people while meeting the challenges of climate change as a country with enhanced resilience and capacity to adapt to the impacts and to mitigate the causes in a coordinated, effective and sustainable manner". This Policy Framework will create a sustainable institutional mechanism to facilitate the development, coordination and implementation of policies, sectoral plans, programmes, strategies, and legislation to address the impacts of climate change. These sectors may include, but are not limited to: water, energy, agriculture, fisheries, forestry, coastal and marine resources, health, mining, tourism, transportation, solid waste management, planning and disaster risk reduction and response management.

Possible mitigation and adaptation actions based on recommendations from stakeholder consultations are included for consideration within the policy framework proposed. The specific objectives are:

a. To mainstream climate change considerations into sectoral and financial planning and build the capacity of sectors to develop and implement their own climate change adaptation and mitigation plans.
b. To support the institutions responsible for research and data collection at the national level on climate change impacts to Jamaica to improve decision-making and prioritization of sectoral action planning.
c. To improve communication of climate change impacts so that decision makers and the general public will be better informed.

It is expected that, on the basis of this policy framework, the relevant sectors will develop or update, as appropriate, plans addressing climate change adaptation and/or mitigation. Actions related to the Ministry of Water, Land, Environment and Climate Change based on the Medium Term Socio-Economic Framework of the country are outlined and recommendations from stakeholder consultations are included for consideration in the development of plans.

The Ministry of Water, Land, Environment and Climate Change will oversee and support the implementation of this Climate Change Policy Framework. The Climate Change Division (CCD) will have administrative oversight and responsibility for climate change initiatives The CCD, in its coordinating role, will ensure the systematic dissemination of information among ministries, departments and agencies and the provision of technical support and guidance to facilitate the development of sectoral adaptation and mitigation plans.

Climate change focal points are being named within the ministries, departments and agencies related to the relevant sectors will be responsible for managing, monitoring, evaluating and reporting on the development of their sectoral strategies and actions with respect to climate change. The MDAs are requested to share with the CCD, relevant information and reports necessary for the proper collaboration, coordination, integration, monitoring and evaluation of climate change initiatives.

Legislation will be enacted to provide a framework for climate change mitigation and adaptation. This legislation will institutionalize the coordinating role of the CCD with regard to matters relating to climate change.

The MWLECC will present to Cabinet an annual report on measures that have been undertaken by the CCD to implement this policy. On the fifth anniversary of the date of this policy, the CCD shall conduct a public review of this policy to determine its effectiveness in achieving its goals and objectives.

The Government of Jamaica has identified an initial list of Special Initiatives covering both adaptation and mitigation measures. Out of those, one relates to low carbon development that have a clear relationships with renewable energy development in the country.

The **Special Initiative for Low Carbon Development**: Climate change threatens the efficient production of energy and given the high dependence on foreign energy sources across all sectors, this could increase Jamaica's overall economic vulnerability. MSTEM will play the lead role in this Special Initiative to develop programmes that include the scaling up of renewable energy and energy conservation programmes.

Some of the recommended actions within the energy sector that are included in the Draft Policy Framework on Climate Change, amongst others, include:

1. Identify and where possible provide incentives for private sector organizations to develop and implement renewable technologies including wind and solar supported by the development of an enabling legislative and regulatory framework.
2. Promote the development and implementation of energy regulatory standards and measures that focus on renewable energy development, energy conservation and the provision of sustainable energy supply (e.g. solar energy, biofuels, waste-to-energy and carbon emissions trading).
3. Explore opportunities for the implementation of projects that avoid or reduce the use of fossil fuels and the implementation of a carbon tax.
4. Improve institutional capacity to implement CDM projects and programmes by facilitating workshops and seminars led by technical experts.
5. Establish and enforce national emission standards for emitting sectors (e.g. transport, bauxite and manufacturing sectors).
6. Conduct energy audits annually across all public sector agencies to determine overall energy usage and identify measures to conserve on the use of electricity.
7. Promote energy efficiency in building construction and standards.
8. Develop an integrated energy plan across sectors to ensure that future energy demands are understood across the country

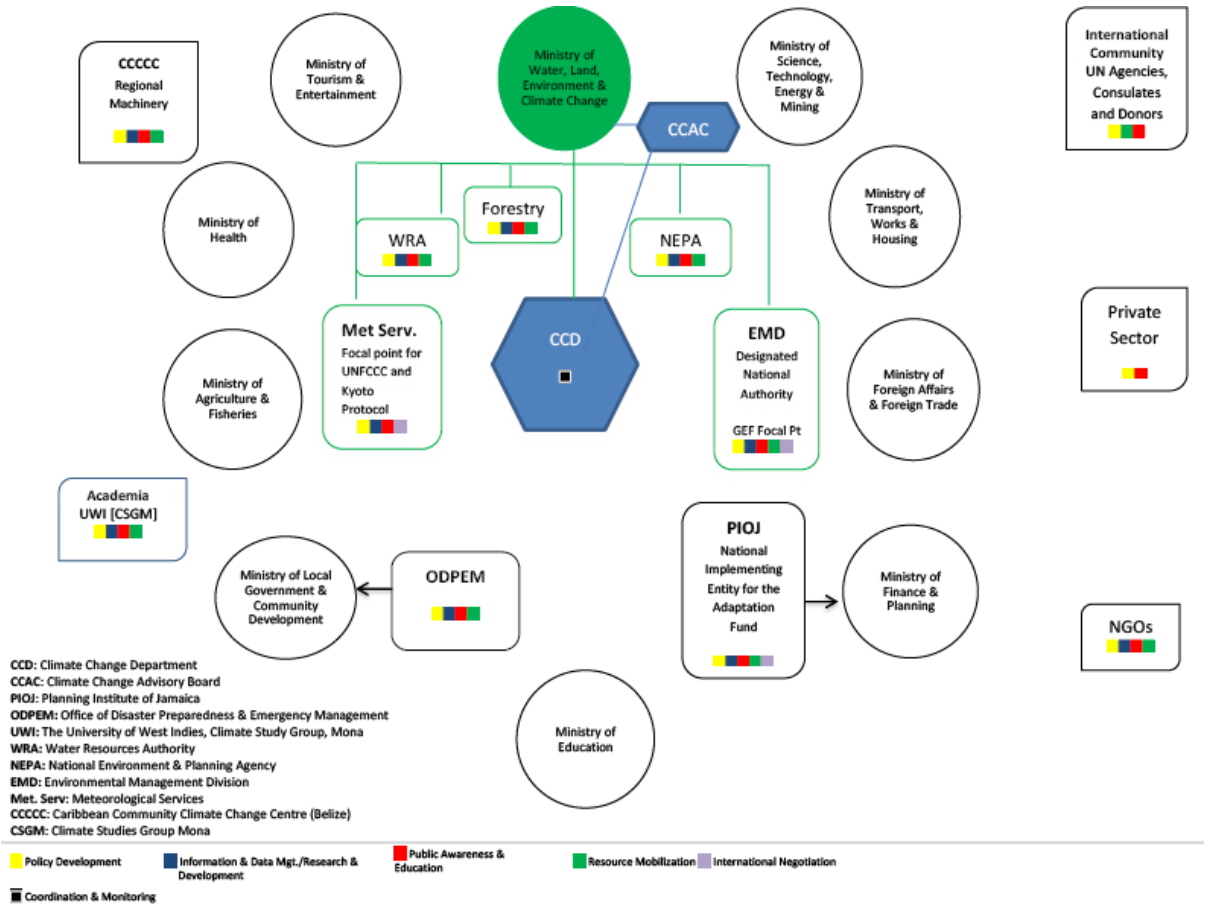
The Jamaica Vision 2030 incorporates targets for the percentage participation of renewable energy in the energy mix of the country, stated to be: 12.5% by 2015 and 20% by 2030; in contrast to a 5.6% participation in 2008. It is stated also that GHG emissions of the energy sector should target 4.5 MtCO2/year in 2015 and 3.5 MtCO2/year by 2030, from an estimated 5 MtCO2/year in 2008. The NEP is also clear in stating that the targets are based on realistic strategies but are projections and therefore may be subject to change based on introduction of new and renewable energy sources. Currently, the Ministry of Science, Technology Energy and Mines is revisiting the target to a contribution of 30% from renewable Energy electricity generation to 2030.

iii. Describe briefly the national institutional context existing in the country to manage the climate change issue, in particular for GHG mitigation.

As a UNDP[6] report indicated in July 2013, the national institutional context existing in the country to manage climate change issues includes the MWLECC, several of its divisions and other institutions/agencies within the GoJ. It is important to note the role to be provided by the Climate Change Division (CCD) which is in the process of being implemented.

The mission statement for the CCD is established as "to facilitate integrated and inclusive development in Jamaica to advance an equitable and climate resilient society with adaptive capacity in a low carbon economy and in line with Vision 2030 Jamaica".

Climate Change Mitigation aspects within CCD / MWLECC are dealt with through the Senior Technical Officer for Mitigation position with low carbon development competences in carbon mitigation including renewable energy sources and demand side management of energy as well as knowledge in international cooperation and negotiations. Currently, the Climate Change Focal Point Network within relevant ministries and agencies involved within the institutional map is now operational.



Jamaica is a signatory of the UNFCCC and has also signed and ratified the Kyoto Protocol, according to the following ratification status:

[6] http://www.jm.undp.org/content/dam/jamaica/docs/researchpublications/crisisprevention/EstablishingAClimateChangeDeptInJamaica2012.pdf

Climate Change Convention (UNFCCC)	
Date of signature:	12 June 1992
Date of ratification:	06 January 1995
Date of entry into force:	06 April 1995

Kyoto Protocol	
Date of signature:	
Date of ratification:	28 June 1999
Date of entry into force:	16 February 2005

MWLECC is the Designated National Authority for the CDM; and Jamaica has 2 projects dully registered under the Clean Development Mechanism.

Registered	Title	Reductions (t CO2eq/year)
19 Mar 06	Wigton Wind Farm Project (WWF)	52540
21 Dec 11	Wigton Wind Farm II	40348

The NAMA is aligned with the proposed Draft Climate Change Policy Framework and Action Plan proposed by the Ministry of Land, Water, Environment and Climate Change (MWLECC), which is currently being discussed in Jamaica. As part of the denominated flagship programmes within such policy framework, special mention is done on a proposed special Initiative for Low Carbon Development; in which is recognized that Climate Change threatens the efficient production of energy and given the high dependence on foreign energy sources across all sectors, this could increase Jamaica's overall economic vulnerability. MSTEM will play the lead role in this Special Initiative to develop programmes that include the scaling up of renewable energy and energy conservation programmes.

1.2 Detailed description of the current situation in the sector/sub-sector, including the relevant existing legal, regulatory and institutional framework, where NAMA would be implemented

(2-3 pages)

i. Briefly describe the contribution and importance of the sector (where the NAMA would be implemented) in the country to national economic growth, and also its contributions to social (human development) and the environment. This should be a brief explanation to highlight how this sector is related to the national human development challenges, as well as the national priorities and objectives mentioned in 3.1.

As indicated by IADB[7], Jamaica is the third largest island in the Caribbean, after Cuba and Hispaniola and is home to a population of 2.83 million people. The country's largest contributors to the national GDP are the bauxite industry, the tourism sector, agriculture and the manufacturing sector. The tourism sector is an important source for foreign exchange. Jamaica does not have notable hydrocarbon reserves and relies fully on imports to meet its petroleum and coal requirements. The country consumes about 60,000 barrels of oil per day (2010).

Like most island states in the Caribbean, Jamaica's energy imports as a share of overall imports has grown significantly over the past decade. In 2007 energy imports represented 34.5 percent of all imports, a doubling

[7] http://blogs.iadb.org/caribbean-dev-trends/2013/11/18/jamaicas-energy-market/

over the previous five years. The economic cost of energy imports can´t be overstated and the value of energy imports exceeds the value of total Jamaican exports. Oil consumption has grown at 3.75 percent per year since 2003, almost 8 times faster than population growth. With no domestic supply of hydrocarbon resources and the energy intensive bauxite and alumina industries, per capita oil consumption exceeds that of other Caribbean Island States.

Similar to the electricity sector in most Caribbean countries, Jamaica's electricity sector is highly dependent on fossil fuels, mainly fuel oil and diesel, for the generation of electricity. Steam and diesel account for 71 percent of overall generation, followed by combined cycle gas turbines at 17.2 percent, and gas turbines at 6.6 percent.

Regarding electricity charges, Jamaica's residential, commercial and industrial electricity prices are among the highest in the Latin American and Caribbean (LAC) Region. This is partly because 93% of electricity generation uses the more expensive petroleum fuel for generation. The cost of fuel and IPP charges which is approximately 2/3 of the electricity charge to the consumer is a pass through item and electricity delivered has been sold for approximately US$ 0.25/kWh in 2013. Service charges and tax are then added for a total charge amounting to US$ 0.40 – 0.42/kWh. This is further compounded by high total system losses of 23% (9.9 % technical losses and 13.0 % non-technical loses by electricity theft - 2009 data). The economic impact on the society from this fossil fuel generation is exacerbated by the necessary periodic increases in its tariff rates for central generation. The combination of global oil prices, pass through fuel charges, and generation and transmission inefficiencies makes electricity an expensive energy option for the average Jamaican household and especially for citizens in a low socio-economic grouping. The overall price of electricity is however expected to decrease by 20 – 30 % in the medium term (3 years) following the planned addition of 6.3 MW of hydro at the Maggoty Hydro Power site and nearly 360 MW of new liquefied natural gas (LNG) to the mix.

ii. Briefly explain the strategy and plans for development of the sector in which the NAMA would be implemented, as well as key objectives for the sector. Refer to the national strategy/development plans, as well as any sector-specific strategy or development plans.

The Government of Jamaica (GOJ) through the National Energy Policy (2009 – 2030) has promulgated several long term strategies; chief among them is energy diversification together with the achievement of price reductions in tariffs to end-users in the country. The policy defines that "Energy diversification will involve moving from an almost total dependence on petroleum to other sources, including natural gas, coal, petcock, nuclear, and renewable energy such as solar, wind, and bio-fuels. In the short to medium term, natural gas would be the fuel of choice for generation of electricity and the production of alumina". The fundamental objective of these interventions is to diversify the country's fuel mix so as to reduce the exposure and heavy dependence associated with any one fuel source for energy production while simultaneously improving the security of the country's energy supply.

Over the period towards 2030, and under different expansion plan evaluations; the Office of Utilities Regulation, OUR[8] estimates that around 1,400 MW of new installed power capacity is needed in the country in order to provide the required expected energy consumption, satisfy the system peak, maintain the necessary reserve capacity and manage loss of load probabilities in the Jamaican grid. Approximately 800 MW of this new capacity needs to be constructed in the coming decade, highlighting the urgency of the issue. The capital requirements for the new power plant fleet are in the range of US$ 6 to 8 billion depending on the mix of technologies that will be deployed, being the path based on natural gas deemed the lower cost available to the country in comparison to an expansion plan based on coal and the continuation of a fuel oil based expansion which comes to be the most expensive within the next 20 years.

There are many issues currently under discussion in country with respect to the diversification path, especially with regard to selection of fossil fuel of choice between natural gas, coal or continuation of current fuel oil trajectories. Those discussions will not only affect the price expected for the customers, but also overall investment; but also different elements that can make the penetration of renewable energy easier or difficult depending on response of the grid to accept intermittent energy, price to be paid to renewable suppliers into the system, etc. One other issue of importance of selection of fossil fuel diversification is related to the

[8] http://www.our.org.jm/ourweb/sites/default/files/documents/sector_documents/generation_expansion_plan_2010_0.pdf

capacity of any given system to up take renewable energy intermittent power and energy and should be accounted for in the process of realizing the goals expressed in the Jamaica Vision 2030 with respect to expected penetration of renewable energy.

The implementation strategy of MSTEM for the National Energy Policy is to manage its outputs through a targeted approach of seven three year National Energy Action Plans (NEAPs). These plans are aimed at bringing focus to government priorities taking into consideration the local social, economic and political climate through the development and implementation of flagship projects and sub-projects. A first NEAP was prepared for the period 2009-2012 and currently there is a Second NEAP Draft for the period 2013-2016.

Flagship projects within each NEAP are in alignment with the seven policy goals of the NEP, and anchored in:

- Priority strategies and actions identified in the NEP 2009-2030,
- Key strategies and actions for the energy sector enunciated in Jamaica Vision 2030, national Development Plans and Socio-Economic Policy MTF 2012-2015,
- Priorities as expressed in the Corporate Plan of MSTEM, and
- Development objectives of other Ministries and agencies impacting energy production and use.

The current Draft Second NEAP 2013-2016 includes 16 flagship projects which include several projects related to renewable energy.

Priority No	Project title	Supporting NEP Goal
1	Power Sector Development and Capacity Replacement	2
2	Improvement of Electricity Distribution and Transmission Efficiency	2
3	Facilitating Private Investment in Sustainable Energy	6
4	Jamaica´s Renewable Energy Programme: Increase in Wind Generation Capacity	3
5	National Energy Efficiency and Conservation Education Programme	1
6	The Renewable Energy and Efficiency Technology Training Programme	1
7	Jamaica´s Renewable Energy Programme: Increased Application of Solar (photovoltaic, solar cooling and thermal) Technologies	3
8	Strengthening of the Policy, Legislative and Regulatory framework	5
9	Promulgation of the Energy Sector Policies	5
10	Comprehensive Review of Energy Pricing-Fuels and Electricity	5
11	Generation Expansion Plan and Long Term Planning in the Energy Sector	2
12	Energy Efficiency and Conservation Programme for National Water Commission	1
13	Jamaica´s Renewable Energy Programme: Implementation of Hydro Power Capacity	3
14	The Development of Energy Service Companies (ESCOs)	1
15	Institutional Strengthening and improved Governance in Rural Electrification programme	5
16	Development of Smart Grid Road Map	2

According to the NEAP #2[9], several barriers affected the performance and implementation of the NEAP 2009-2012. The NEAP 2009-2012 was the first of seven three year NEAPs that will be implemented over the period to 2030. The first NEAP earmarked for implementation a total of 31 projects- 19 flagship projects and their sub-projects. While a number of projects were not implemented, there were activities to suggest that efforts were made towards their implementation.

[9]MSTEM. Draft National Energy Policy Action Plan #2. Jamaica 2014.

Furthermore the documentation aforementioned, indicates "that as a result of the First NEAP, commercial entities and residential customers have now an avenue where their RE and EE needs may be met, even though is not fully utilized. Entities such as the Development Bank of Jamaica (DBJ) and the National Housing Trust (NHT) provide support through loan and grant facilities for RE and EE projects. These investments have resulted in avoidance of imported petroleum products and also in carbon emission reductions. A low emission pathway was forged with two notable actions: the introduction of 10% ethanol blended gasoline and the expansion of the Wigton Wind Farm by 18 MW. From the policy perspective, the following can be regarded as small yet positive steps towards the low carbon emissions pathway: the amendment of the electricity license to allow for up to 25 MW production without competitive tender by Jamaica Public Services Co., the Standard Offer Contract to allow renewable energy solutions up to 2% peak demand to be grid connected and the amendment of the Petroleum Act to remove the exclusive rights of the Petroleum Corporation of Jamaica to execute renewable energy and energy efficiency programmes in the public sector."

In the most recent presentation to the "Sectoral Presentation: Building the Platform for Sustainable Development and Growth", in July 2014[10], the Hon. Phillip Paulwell MP, Minister of MSTEM indicated important updated status of actions and strategies in the energy sector, reinforcing plans through its National Energy Policy (NEP) 2009-2030, to continue to pursue fuel diversification, and renewable electrical energy and capacity from renewable sources and in keeping with Government's vision of having 12.5 per cent electrical energy from renewable energy sources by 2015.

Mr. Speaker, I am pleased to announce that the Government of Jamaica and the Jamaica Public Service have signed off on an amendment to the JPSCo. Licence. This will allow for the Cabinet to manage the procurement process through the Electricity Sector Enterprise Team (ESET). It will also grant the JPSCo. the right of first refusal in relation to the replacement of any of its existing generation facilities. The amendments and related matters are pertinent to the critical and urgent issue of the procurement of the new base load generation capacity. It removes constraints on the ability of ESET to proceed with its mandate.

Mr. Speaker, in 2011, the previous administration amended the JPS Licence to confer the management and administration of the procurement of new generation capacity on the OUR. We do not believe that this is a role for the regulator. The role of the OUR as the overall regulator of prescribed electricity services, as outlined in the OUR Act, will be maintained.

As has been announced, I have written to Energy World International (EWI) to indicate that I have formally revoked the licence to construct the 381-megawatt power plant. Consistent with the provision of the licence, the revocation takes effect on July 21, 2014. However, the Government regards the new base-load generation plant as a large-scale major project. As a result, all steps are being taken to give momentum to efforts to make this a reality, and allow for Jamaicans to benefit from cheaper electricity rates.

In this regard, the Cabinet has been advised by ESET that consultancy services are being engaged to complete, within two (2) months, the following:

- a least cost generation plan;
- power plant site options; and
- the business model and projected financial long term plan for JPS.

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Mr. Speaker, even as we move post-haste with the process of acquiring the mega-generation plant, we must not lose sight of developments and achievements with regard to conservation measures, and the efforts to tap into non-traditional sources of energy.

New projects for renewable energy supply are set to be implemented within 12 – 15 months, and I must dispel any notion that renewables will result in higher electricity rates to the consumer. Renewable energy enhances the energy security of Jamaica, and reduces the heavy reliance the country has had on fossil fuels.

In fact, by mid-2015, Jamaica will be among the top countries in the region in terms of its use of renewables when, in addition to the 40 megawatts of wind that we now generate, plus approximately 20 megawatts of existing hydropower, there will also be 78 additional megawatts of renewable energy to be linked to the national grid. Further, I have previously reported that I have signed 166 licences with a combined capacity of over 2.6 MW for Net Billing. Mr. Speaker, in total, these additional 80.6 MW generated from renewable sources will avoid the importation of 1,085,000 barrels of oil annually, and save approximately US$108.5 Million per.

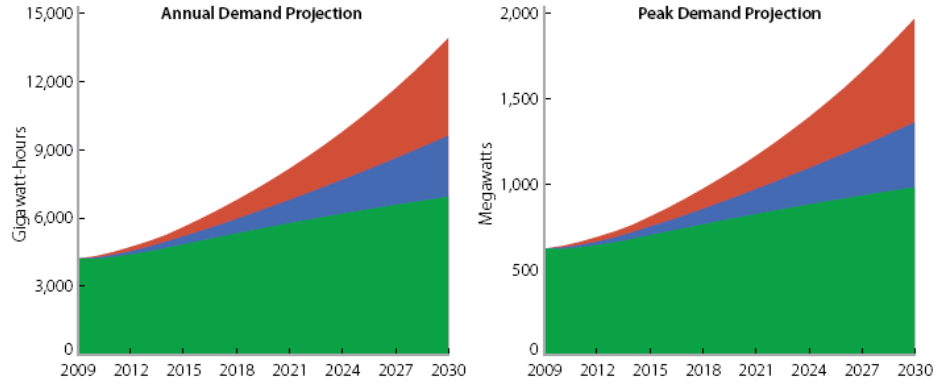
The additional 78MW will be generated from two wind projects that will offer 58MW, with the remaining 20MW to come from solar. Recommendations for licences for the projects are expected by my ministry from the Office of Utilities Regulation (OUR) shortly, while the Power Purchase Agreements (PPAs) with the JPS are being finalized. The three bidders have been selected for these projects. They are:

- Blue Mountain Renewables LLC, to supply 34MW of capacity from wind power at Munro, St. Elizabeth;
- Wigton Windfarm Limited, to supply 24MW of capacity from wind power at Rose Hill, Manchester; and
- WRB Enterprises Inc., to supply 20MW of capacity from Solar PV from facilities in Content Village, Clarendon.

The Government of Jamaica is committed to the development of a short term mega generation project involving a fossil fuel switch natural gas in order to diversify fossil fuels in the energy matrix as well as to deliver on a price reduction for electricity services in the country. Recent evaluations on current, as well as future, levelized cost of energy from different sources are indicative of the potential implications ahead, especially for some of the RE technologies (solar) that without proper addressing of market distortions may not get to participate in the power market delivering long term sustainable development benefits to the society. An important issue to bear in mind is that current evaluations of levelized cost done for the country do not include on one side for fossil fuel based options the costs associated to introduction of new diversified fuels such as coal or natural gas; and in the case of renewable energy intermittent sources, the cost associated to upgrading of transmission facilities or capacities to up take electricity at the distribution level under distributed generation technologies. Renewable energy technologies can have a significant impact in assisting the objectives of diversification of the energy mix in the country.

iii. Briefly describe the GHG emissions for the sector in which the NAMA would be implemented and key sources of GHG emissions. Further, provide an assessment of project growth in GHG emissions, and if possible the implications of achieving the growth strategy for the sector. Briefly present the national/sectoral strategy or approaches to addressing GHG emissions from the sector.

Studies by Worldwatch Institute[11], UNEP DTU Partnership[12] and OLADE[13] have been done on the issue of electric sector projected growth, potential participation of renewable energy in the generation matrix and estimated sector emissions as well as potential emissions reductions associated to the scaled up participation of renewable technologies in the country. Most of the assessments conducted utilize OUR's base-growth demand projections because these best reflect historical developments (the high-growth scenario has become very unlikely given Jamaica's faltering economic performance in the recent years since the projections were made). Electricity demand has the opportunity to be lower—approximating the levels in the low-growth scenario—if the country can make use of its energy efficiency potentials, but for normal consideration of this NAMA proposal a base case is to be used.



OUR Projections for Jamaican Energy Demand, 2009–2030
Source: OUR
© Worldwatch Institute

Worldwatch's scenarios assess how growing shares of renewable energy can be used to meet future energy demand. The scenarios are differentiated by the level of penetration of renewables by 2030 and the conventional fuel used in the transitioning phase. All renewable energy transition scenarios are compared to a business-as-usual (BAU) scenario that assumes that, despite growing demand, Jamaica's current electricity mix of 93% oil-based generation and 7% renewable sources remains unchanged to 2030, and that all new generation would come from efficient combined-cycle gas power plants. The scenarios are:

- Scenario 1: Building new natural gas power plants and repowering newer oil-based generation in addition to renewable energy expansion.
- Scenario 2: Building new coal power plants in addition to renewable energy expansion.
- Scenario 3: Extending the lifetime of existing oil-based generation in addition to renewable energy expansion.

For each of the scenarios a simulation was done for different rates of renewable energy penetration ranging from 20% up to very high potential penetration of nearly 90%.

The yearly projected results of the business as usual scenario indicate the continuous trend of contribution by sources in line with the current situation in the country.

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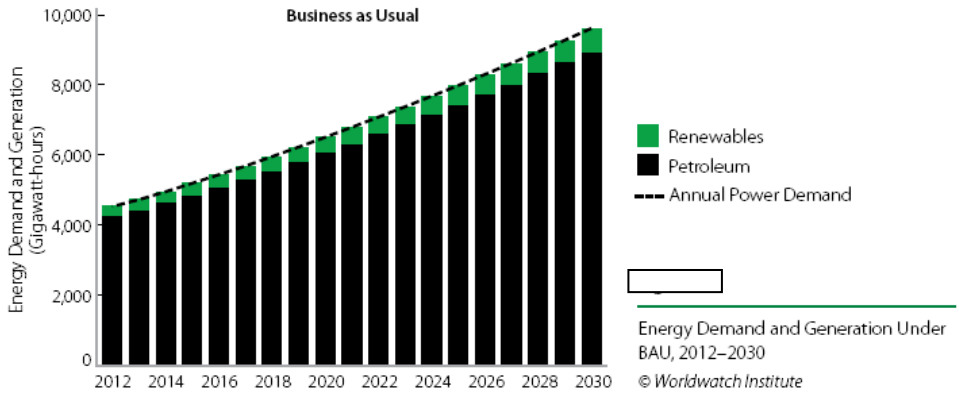
[11]ShakuntalaMakhijani, Alexander Ochs, et al., Jamaica Sustainable Energy Roadmap: Pathways to an Affordable, Reliable, Low-Emission Electricity System (Washington, DC: Worldwatch Institute, 2013). http://www.worldwatch.org/system/files/Jamaica-Sustainable-Energy-Roadmap-112013.pdf

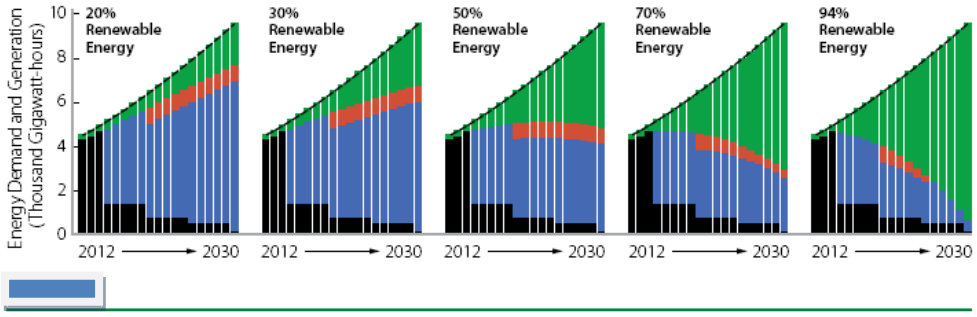
[12] Zaballa, Mauricio (editor). Climate change mitigation opportunities in the energy sector for the Caribbean region. UNEP-DTU Partnership (2014)file:///C:/Users/Toshiba/Downloads/CC%20Mitigation-Energy-Caribbean_URC_Web_Feb-2014.pdf

[13]Coto, Oscar (author); Chiliquinga, Byron; Parra, Cristian (collaborators).Study on the Identification of Potential Project Portfolios Associated to Programmatic CDM and NAMAs in Jamaica. (2013). http://www.olade.org/sites/default/files/CIDA/Final%20OLADE%20Consultancy%20Report%20Jamaica%20POA%20and%20NAMA%20Study.pdf

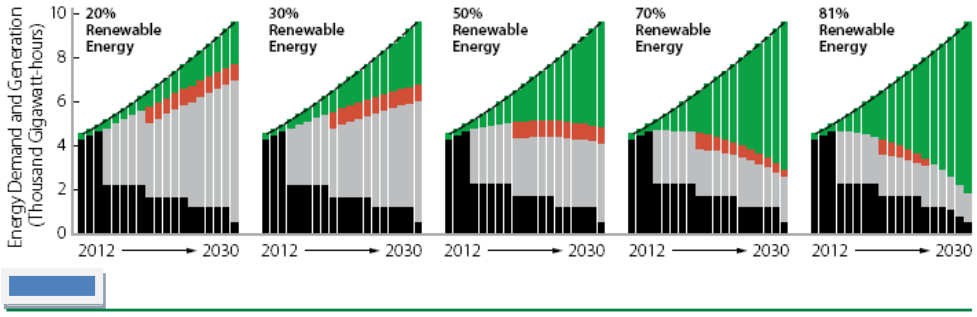


Energy Demand and Generation Under BAU, 2012–2030 © *Worldwatch Institute*

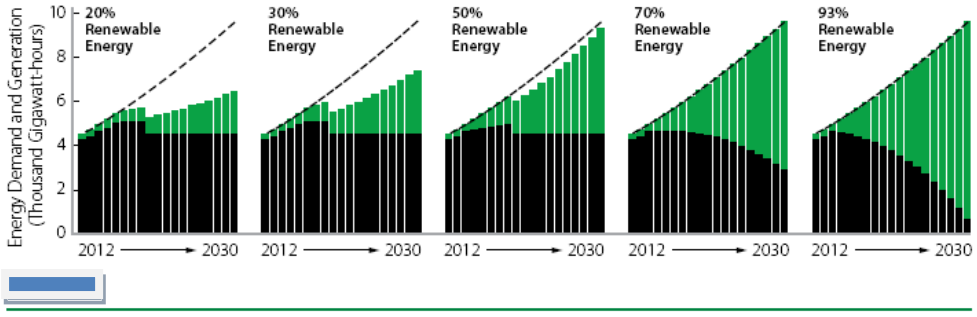
.The following figure presents all the scenarios developed by the World Watch Institute study on the participation of renewable energy for different target penetration rates.



Energy Demand and Generation Under Scenario 1 (RE/Gas), 2012–2030 © *Worldwatch Institute*



Energy Demand and Generation Under Scenario 2 (RE/Coal), 2012–2030 © *Worldwatch Institute*

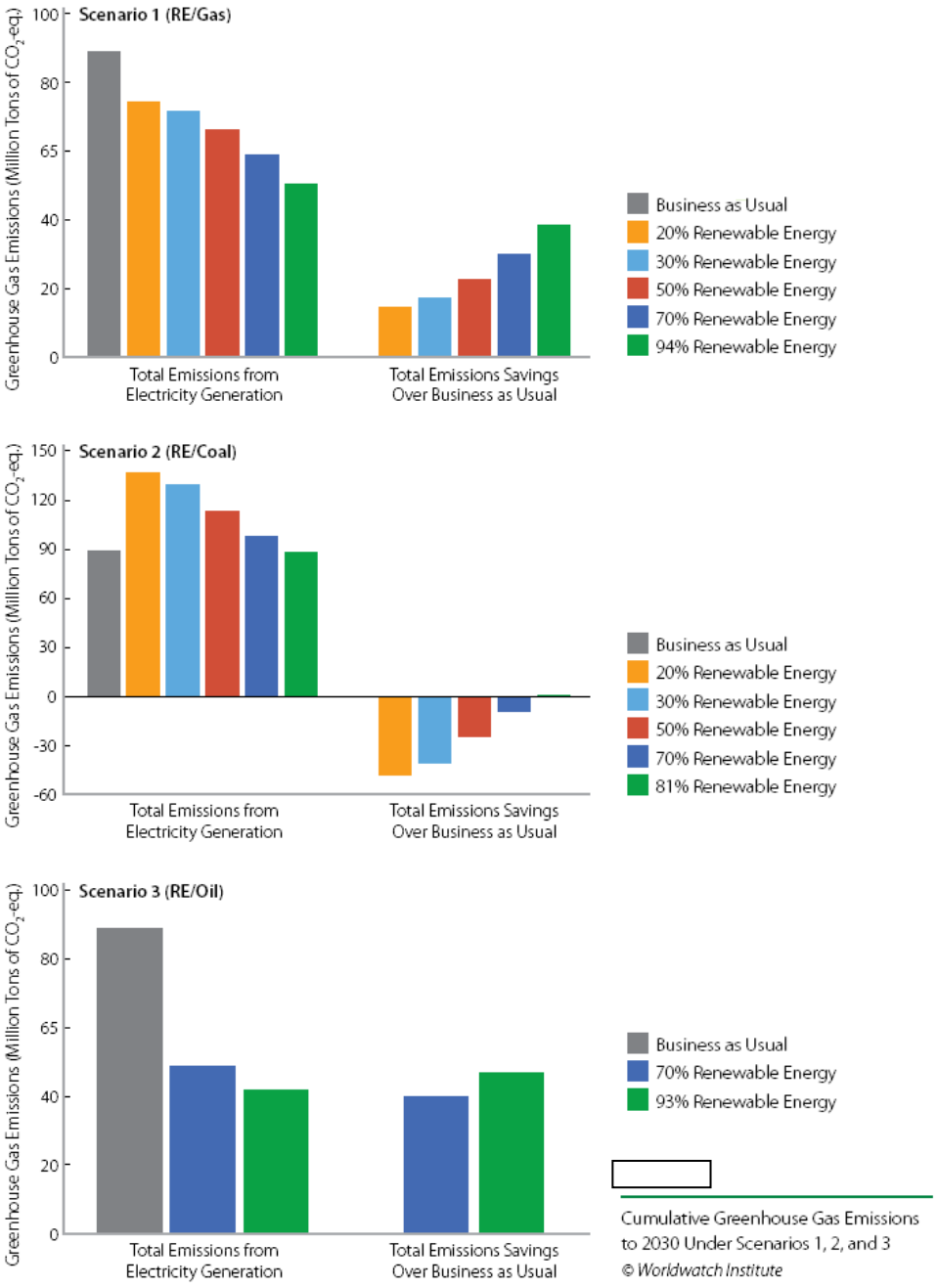


Energy Demand and Generation Under Scenario 3 (RE/Oil), 2012–2030 © *Worldwatch Institute*

Renewables Petcoke Natural Gas Coal Petroleum Annual Power Demand

It has to be restated that currently the GoJ has a vision target for a 20% contribution from RE and is assessing whether or not to adjust any goals based on consideration given to the results of the different studies conducted and also in alignment with targets established as part of the Regional Caribbean Sustainable Energy Roadmap[14] and Strategy (C-SERMS), through the Council for Trade and Economic Development (COTED) of CARICOM that has approved a 20%, 28% and 47% for years 2017, 2022 and 2027 respectively, for the contribution of renewable energy to total electricity generation. Taking into account recent studies[15] conducted by MSTEM the current target is indicative of a 30% RE penetration in grid connected electricity, and therefore this value will be used for the purpose of NAMA design considerations.

The results of the estimations performed by WorldWatch Institute are indicative and the levels of emissions projected into the future due to the participation of renewable energy are presented in the following figure.



[14] http://www.caricom.org/jsp/pressreleases/press_releases_2013/pres50_13.jsp

[15] MSTEM. Grid Impact Analysis and Assessment for Increased Penetration of Renewable Energy into the Jamaican Electricity Grid Final report `Prepared by EDF and HINICIO. November 2013

Results from other studies conducted on projections of emissions of GHG in the power sector are within a 20% of the results presented by the WorldWatch study depicted above.

iv. Describe briefly the current legal/policy framework, the existing institutional framework and the existing regulatory framework, as well any policies directly relevant to addressing energy efficiency use of renewable energy and addressing GHG emissions.

The key Institutions / Stakeholders in the energy sector are the following:

The Office of the Prime Minister. In late 2006, a Technical Inter-Ministerial Committee on Energy Policy and Analysis was empanelled. It is comprised of representatives from the Cabinet Office, the Office of the Prime Minister, the Ministry of Science, Technology, Energy and Mines (MSTEM), the Office of the Attorney General, the Petroleum Corporation of Jamaica (PCJ), the Office of Utilities Regulation (OUR) and Petrojam.

The Planning Institute of Jamaica (PIOJ). Since January 2007 this agency of the Office of the Prime Minister has led the preparation of a National Development Plan (NDP), named Jamaica Vision 2030. Twenty-seven task forces were appointed to develop plans for each sector. Among these, the Energy Task Force prepared an Energy Sector Plan to guide the development of the sector in the next decades.

The Ministry of Science, Technology, Energy and Mines (MSTEM). Has overall responsibility for the formulation and review of energy policy, including energy efficiency and conservation, identifying consumption trends and forecasting future demand scenarios. The Energy Division within the Ministry implements policy and monitors the functioning of the energy sector.

The Jamaica Energy Council. Serves as an energy decision-making forum that brings together diverse government and non-governmental stakeholders. MSTEM established the Council in early 2012 as a bipartisan, multi-stakeholder platform with the goal of reducing energy costs for households and businesses and increasing competition in the electricity sector. The Council is co-chaired by MSTEM Minister and the opposition party's Spokesman on Energy. Other members include representatives from the American Chamber of Commerce of Jamaica, the Jamaica Chamber of Commerce, the Private Sector Organisation of Jamaica, the Jamaica Manufacturers' Association, the Small Business Association of Jamaica, and renewable energy experts.

The Office of Utilities Regulation (OUR).Associated with the Office of the Prime Minister, the OUR has as its main functions the regulation of public utilities, including electricity. The OUR has recently acquired a role in the planning of the electricity sector and is responsible for the Long-Term Expansion Plan of the energy sector, which was formerly produced by the private utility company, Jamaica Public Service (JPSCo).

The Petroleum Corporation of Jamaica (PCJ). Under the MSTEM this statutory corporation plays an important role in the development of renewable energy through its Centre for Excellence in Renewable energy (CERE). PCJ also manages the oil refinery portfolio (through Petrojam) and the government-owned gasoline distribution company PETCOM and oversees exploration of crude oil.

The electricity sector is governed by a series of regulatory framework documents: the Electric Lighting Act of 1890, the Utilities Regulation Act of 1995 and the All-Island Electric License of 2001; as well as the OUR's Regulatory Policy on Guidelines for the addition of Generating Capacity to the Public Electricity Supply System and the Generation Expansion Plan 2010.

The Electric Lighting Act anchors the government's role in the sector. It holds the power to regulate prices and quality of the energy supply and to grant licenses to local authorities, companies or individuals to generate electricity. The Utilities Regulation Act of 1995 establishes the Office of Utilities Regulation as regulatory body allowing it determine price structure or fares, and to establish standards for the quality and safety, environment, reliability and efficiency of electricity service. The All-Island Electric License of 2011 regulates the distribution and transmission of electricity. It grants exclusive rights to JPSCo to function as sole transmitter and distributer of electricity for the next 20 years.

Outside the existing regulatory framework, the Rural Electrification Program Limited (REP), which functions as an executive agency of the government, has been providing rural electrification since 1975.

Jamaica Public Service Company Ltd is the dominant player in generation approximately 588 megawatts (MW) or over 66% of the total current generation capacity, some of which comes from renewable energy. By 2011, annual electricity generation alone from renewable energy sources accounted for approximately 5.6 % of total system generation with contributions of 3.5% and 2.1 % from hydro and wind respectively. Three hundred megawatts (300 MW) of this capacity has been provided by independent power producers (IPP) who sell power to JPS via power purchase agreements (PPA) for delivery unto the grid. These IPPs are Jamaica Energy Partners (JEP) = 124 MW; Jamaica Private Power Company (JPPC) = 60 MW; Wigton Wind Farm Limited = 38.7 MW; and Jamalco (bauxite company) = 11 MW. The utility recently added 3 MW of wind from its own generation and has a total of 21.3 MW of hydropower from previous generation plus some refurbished plants.

The gross peak demand to date is on the order of 640 MW (and gross generating capacity of 920 MW) but is projected to grow at an average rate of 3.8%[16] per annum over a twenty year (20) year planning horizon (2010 to 2029). Over the next 20 years, approximately 1,400 MW of new fossil fuel power plant capacity will have to be constructed in Jamaica including distributed generation system; to meet the projected demand for electricity and approximately 800 MW of this new capacity needs to be constructed in the coming decade.

JPS has an extensive transmission and distribution system which includes approximately 400 km of 138 kV lines and nearly 800 km of 69 kV lines. The system consists of twelve (12) 138/69 kV inter-bus transformers with a total capacity of 798 MVA and fifty-three (53) 69 kV transformers (total capacity of 1,026 MVA) which supplies the primary distribution system at 24 kV, 13.8 kV and 12 kV. The coverage of the overall electricity infrastructure of 14,000 km for transmission and distribution results in over 95% electrification of the country. Total system losses inclusive of technical and non-technical losses declined from 23% in 2009 to an average of 22.3% in 2011.

Electricity Sector Enterprise Team (ESET)[17] has been appointed as of June 2014, The purpose of the ESET is to lead and manage the procurement process in consultation with the OUR, JPS and the Minister for the development of additional base load generation capacity and related facilities in the short term in order to significantly reduce the cost of electricity to consumers while ensuring diversification in the fuel supply mix, and to review and recommend changes to the current procurement policy. The objectives of the ESET are to:

(I) Lead and manage the implementation of a comprehensive programme to urgently replace base load generation with more efficient plants, utilizing lower cost fuel in order to ensure that electricity is reliably provided to Jamaicans at affordable rates, including advice to the Minister on the terms of Licence(s) to be issued;

(ii) review the current policy for the procurement of additional generation capacity to the national grid; and

(iii) recommend, in accordance with principles of good governance, such changes in the said policy which it considers to be necessary to achieve a procurement process which has clarity, is fair, effective, and consistent. With best practices, responsive to the national requirements, and which is designed to minimize or prevent similar failures to secure a suitable solution in the future.

The specific policies in the Energy Sector include:

National Energy Policy 2009-2030

[16] Although it is recognized that demand projections may be lower as indicated in recent studies, for the purpose of the NAMA; the data as presented by OUR in its base demand growth scenario will be used throughout this document.

[17] http://jis.gov.jm/media/ESET-TOR-Final-June-3-2014-.pdf

The Jamaica Energy Policy[18] (NEP) developed by the Ministry of Science, Technology, Energy and Mines (MSTEM):

"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

National Renewable Energy Policy 2010-2030

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

[18] http://www.mstem.gov.jm/sites/default/files/documents/national_energy_policy.pdf

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 broard 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

2. Description of scope and objectives of NAMA to address the current situation

1-2 pages

Starting from the current situation describe in 3.2, describe in detail the general and specific objectives of the NAMA, including the main source of GHG emissions that would be reduced.

Describe the scope of the NAMA by describing where in the country the NAMA will be implemented (national, sectoral, local level) and how large will be the results/impacts (national, sectoral, local level).

Describe how the NAMA supports the existing legal/policy framework, the existing institutional framework and the existing regulatory framework.

Describe how the NAMA objectives contribute to the sustainable development objectives and sectoral mitigation goals.

The overall objective of the NAMA is to **contribute to GHG mitigation by the establishment of a long term enabling environment that will allow permanence of the scale-up contribution from Renewable Energy**

Generation Systems in Jamaica, while assisting in the creation of capacities for the development of a Renewable Energy Sector in the country.

The specific objectives of the NAMA are:

a) Facilitate efforts towards the implementation of the Jamaica Vision 2030, through the GHG mitigation associated to renewable energy scaling-up; and contributing to the establishment of the monitoring protocols necessary for tracking the renewable energy climate related mitigation contributions.

b) Contribute to the streamlining and implementation of key regulations supporting the development of the RE sector in the country, inclusive of a framework of relevant incentives appropriate for the context of the country.

c) Assist the GoJ in implementing financial instruments and financing facilities that could be supportive of the perceived needs to catalyze investment in RE project development, inclusive of risk mitigation schemes that could assist the private sector investment (mainly local) in RE electricity generation projects.

d) Assist in removing perceived barriers for RE project development related to permitting required by project developers in order to comply with national and local ordinances.

e) Provide targeted support for the removal of technical barriers and grid infrastructure deployment that is essential for improving the absorptive capacity of the Jamaica grid to speed the uptake of variable power renewable energy generation.

The main source of GHG addressed with the NAMA relates to CO_2 emissions generated due to the use of fossil fuels for generation (both grid or non grid connected) that will be displaced due to the use of generation of renewable energy electricity, to be incorporated to the national grid or used directly as captive generation by the targeted end use sectors.

The NAMA will be implemented at the National / Sectoral level, with sectoral pertaining to the electricity sector of the country mainly generation side and possibly at relevant end use sectors (commercial / industrial / residential).

The NAMA contributes to the Government of Jamaica (GoJ) efforts in scaling-up the contribution of Renewable Energy as stated in the Jamaica Vision 2030, by supporting a range of measures and programmes (previously listed) aimed at scaling up the contribution of Renewable energy to the energy mix in the country within the National Objective #10 related to Energy Security and Efficiency; and also contribute to the effort of reducing the rate of Climate Change within the National Objective #14 related to Hazard Risk Reduction and Adaptation (inclusive of contribution to slow down climate change through mitigation).

The NAMA is aligned with other relevant National Policies within the energy sector as well as with the Proposed Draft Climate Change Policy Framework and Action Plan, previously listed.

3. Identification of barriers and implementation options

3.1Analysis of barriers (financial, legal, regulatory, institutional, capacity, technology, etc.) that impede achievement of the NAMA objectives

(3 pages)*Starting from the key source of emissions addressed by the NAMA and from the existing legal/institutional/regulatory framework, explain the barriers that impede the achievement off the NAMA objectives. This chapter 4.1 should describe the barriers in detail.*

The groups of barriers covered could include:

- *Economic and financial*
- *Market failures*
- *Policy and legal*
- *Regulatory*
- *Institutional and organisational capacity*
- *Human capacity*
- *Social and cultural*
- *Others*

Several recent reports in Jamaica make assessments of barriers to renewable energy in country, for example in the Draft National Energy Policy Action Plan #2 (2013-2016), a review of the implementation of the First NEAP in Jamaica is included, identifying several common barriers that impede the progress of energy policies, programmes and projects:

- Renewable Energy Projects not fully pursued due to their initial cost (but long term life cost not considered).
- Lack of human and technical capacity to undertake / implement the tasks.
- Limited technical and management capacity within the GoJ to develop, implement, enforce and monitor initiatives.
- Lack of consumer awareness, which is the case of current financial facilities to improve solar penetration in the island.
- Perception that commercially viable funding is not available to potential investors.
- Low priority placed on some areas by central government where budgetary support is necessary.
- Lack of fiscal space in the national budget to pursue energy initiatives.
- Inadequate legal and regulatory frameworks.

Other important reference on barriers to the scaling-up contribution of Renewable Energy are analyzed in a recent report by WorldWatch Institute[19].

Having considered previous existing information available on barrier analysis and root cause assessments done on the issue of development of Renewable Energy in Jamaica, this section presents the most important barriers that the proposed NAMA intends to address through implementation:

1. Due to the critical and important short term quest to fulfil power sector objectives of diversification of the generation mix based on incorporation of other fossil fuels (likely to be natural gas), as well as reduction of end use tariffs to customers, *the longer term contributions and co-benefits of Renewable Energy may not be realized or scaled-up due to the lack of a strong renewable energy sector adequately supported by an effective and streamlined regulatory framework structure for promotion and incentives allocations*.

[19]ShakuntalaMakhijani, Alexander Ochs, et al., Jamaica Sustainable Energy Roadmap: Pathways to an Affordable, Reliable, Low-Emission Electricity System (Washington, DC: Worldwatch Institute, 2013). http://www.worldwatch.org/system/files/Jamaica-Sustainable-Energy-Roadmap-112013.pdf

2. Renewable Energy Project Developers in Jamaica face different levels of entry barriers due to interconnection issues as well as lack of facilitating conditions related to permitting processes in the different institutions and ordinances currently existing at different stages of project development.

3. Although the capacity within the Jamaican financial system to provide sustainable energy financing has improved somewhat over the last few years, there is still a *lack of full use of available financial instruments or facilities, reduced uptake of existing financing by project developers of such facilities and lack of other innovative financial approaches and facilities that could assist in reducing the perceived risks associated to RE lending in the country.*

4. The uptake of renewable energy in Jamaica is linked to the capacity of the electricity grid to accommodate and properly manage different effects that renewable energy generation may have on a grid. The Jamaican grid will surely require upgrades and expansions to not only accommodate the growing energy demand but also in pursuing the long term RE adscription goals proposed in the country. Although some studies on RE generation absorptive capacity are currently under development, there is a perceived barrier related to technical issues as well as on the infrastructure investment required to deploy the readiness at the grid level to manage variable renewable energy generation.

5. The energy sector institutional map in the country is complex with several layers of interacting institutions and organizations. Maintaining the focus on the expected targets for the contribution of RE towards 2030, requires further alignment of existing institutions in order to support the required coalitions and alliances that will deliver the synergies of change towards the proposed diversification sustaining the long term vision in the country.

3.2 Identification of possible options to address the barriers and selection of preferred options (=measures) to be implemented through the NAMA

(3 pages) *Starting from the barriers identified in 3.1, identify and describe in details the proposed solutions (=measures) to remove the barriers that will be addressed through the NAMA. Each barrier covered should be separately described, providing details of the background analysis undertaken in identifying the issue and designing the barrier. For example, if the barrier is a quality product, then provide an assessment of what the issues are in terms of the quality of the product, what measures could be taken to ensure quality and which of these measures will be implemented under the NAMA.*

For each solution (=measures), describe what the expected outputs of implementing the measure.

The Jamaica Renewable Energy NAMA is a policy instrument to realize GHG emissions reductions due to the scaling-up of renewable energy generation through enabling regulatory and institutional deployment frameworks.

The selected options to address the identified barriers in the proposed NAMA are include into the following strategic components:

a) **Stakeholder Alliance Integration (public-public, public-private):**This component aims at supporting the strengthening of the long term institutional setting, coalitions and alliances both public-public and public – private required for effective coordination and action oriented support to enable long term up take of renewable energy projects . It also looks at the required enhancement of coordination and regulations for the removal of entry level interconnection barriers for RE at the grid level by assuring adequate exchange and discussion of issues relevant to RE development at the level of the electricity

market stakeholders. **The outcome** of this component relates to a strengthen institutions focusing on relevant regulations, capacity to assess and implement actions to remove barriers of entry type to renewable energies and assure the Vision 2030.

b) **Capacity Building for Renewable Project Development Action:** This component looks at capacity building in general but also concentrated towards removing identified barriers related to: the risk perceptions on renewable energy investment in Jamaica, specially from local investors, the improvement of provision of information in two critical areas of sound technical studies on the absorptive capacities of the Jamaican grid for RE scaling up and also on the development of Monitoring-Reporting and Verification schemes that are likely going to be required for assessing the implementation of the NAMA and the measures, reporting internally in-country and internationally of the climate benefits derived from the implementation of the NAMA. The sector will be strength with more capable human resources and RE Associations participating in the NAMA. **The outcome** expected from this component looks at enhancing human capacities for projects and sector, delivering technical solutions to the introduction of variable power renewable electricity to the grid and also in the area of MRV required to continuously assessment of progress and identification of actions to keep focus on the long term contribution of RE to Jamaica according to Jamaica Vision 2030.

c) **Innovative Financial Mechanisms:** This component is aimed at supporting a first portfolio of projects, which will lower risk by means of demonstration and by means of the training and experience provided to stakeholders in the market —developers, financial institutions and communities— to create a catalytic transformation in the sector. In particular, it will use NAMA resources for three purposes: (i) provide financial capacity building and technical assistance to projects and local banks; (ii) catalyze and maximize the amount of finance available from MDBs and other partners, as well as commercial financing available for investment in grid-connected RE-projects, and (iii) support strategic finance for the necessary investment in grid upgrades for uptake of variable power renewable energy projects in the country. To catalyze commercial financing, a fund will be created/ or support will be provided to the existing efforts on the creation of a Jamaica Energy Fund with resources from climate finance, multilateral banks (with the possible involvement of other sources including pension funds, private investors and/or commercial banks), which will provide temporary and necessary financial support, including in the form of equity, to projects to enhance their bankability, as well as risk mitigation special purpose financial vehicles. **The outcome** of this component is a well articulated funding strategy and implementation for financial facilitating actions across technologies and project scales favoring investment development for RE projects.

d) **Streamlined Regulations in Support of Renewable Energy Scaling-Up**: The objective of this component is to support the development and implementation of policies, laws, regulations, rules, standards and incentive schemes aimed at improving the integration of renewable energy in the energy sector by reducing risks and transaction costs and encouraging investment in renewable energy. In particular, it will support the consolidation of a long-term energy policy to promote a higher mix of RE and a low-carbon development strategy; legislation and secondary regulations for promoting RE development; standards and specifications appropriate for each renewable technology; incentives model (including tariffs) for the effective development of each renewable technology, and which fully reflects their associated benefits; technical standards for renewable energy technologies; guidelines for obtaining construction, operation and supply permits; definition of intra and inter-agency responsibilities, and development of capacities of governmental and nongovernmental agencies to allow for future expansion of mitigation activities, including renewable energy. **The**

outcome expected from this component is a set of well articulated regulations with buy-in and coordination of stakeholders in support of diverse aspects of RE project development.

4. Description of the NAMA Action Plan

4.1 Description of detailed activities to implement the mitigation measures included in the NAMA and work plan for the detailed activities (2 pages)

Based on the measures identified in 3.2, describe the key output that will be achieved for each measure. Describe in detail the key activities to be implemented to achieve the respective output for each of the identified measure.

Describe how the outputs will contribute to the NAMA objectives beyond the limits of the mitigation measures, and how these objectives will promote the desired impacts.

An indicative presentation of suggested key activities of the NAMA as well as the indicative proposed workplan of the NAMA is presented in the following table.

NAMA Component	Outcome	Outputs and mechanisms	Indicative Related Activities	Coordinator or leader of the activity	Key stakeholders involve for coordination and negotiation	Implementation years													
						1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. NAMA Readiness	NAMA ready for implementation	NAMA Design	NAMA Design	MWLECC	MSTEM	■													
		NAMA Funding	NAMA Funding	MWLECC	MSTEM	■													
		MRV design	MRV design	JIP	MWLECC	■													
2. Stakeholder Alliance Integration	Strengthen institutions to remove barriers of entry type to RE and assure the Vision 2030	Institutions readiness for RE support	Institutional framework assessment for the energy sector	MSTEM	JIP	■													
		Alliances and partnerships in place	Agreements for institutional arrangement	MSTEM	MWLECC	■	■	■											
		Coordination spaces integrated	Awareness raising campaign design	MSTEM	MWLECC		■	■											
		Campaigns and stakeholder awareness raising	Execution of campaigns	MSTEM	Public Communication Entity		■	■	■	■	■			■		■			
		Improved process , protocols for RE projects development	Review of the RE project cycle in Jamaica	MSTEM	Ministry of Industry, Investment and Commerce of Jamaica, MIIC		■												
			Coordination for responsive regulatory action	MSTEM	MIIC			■	■		■	■			■				
			Regulatory improvement		MIIC			■	■	■	■	■	■	■	■	■			
3. Capacity Building for Renewable Project Development Action	Enhancing human capacities for project development and financing; and also in the area of MRV	Training programs (RE/financing)	Studies of capacity needs, based on inputs from Components 2, 4 and 5.	RE Association	Ministry of Education	■	■												
		Grid studies and proposal	Design of training	RE Association	International cooperation		■	■											

NAMA Component	Outcome	Outputs and mechanisms	Indicative Related Activities	Coordinator or leader of the activity	Key stakeholders involve for coordination and negotiation	Implementation years													
						1	2	3	4	5	6	7	8	9	10	11	12	13	14
		to improve and manage integration of variable renewable energy	programs																
		Promotion of RE Sector association	Implementation of training programs	Education entities	International cooperation														
		MRV	Financial support for RE associations	MSTEM	International cooperation														
		Technical and financial services for RE project developers	Coordination with NEAP-MSTEM, JAMAICA Vision 2030 and Climatescope for MRV adjustment	MSTEM	MWLECC/JIP														
		Grid infrastructure capacity building	MRV implementation	MSTEM	MWLECC/JIP														
		Procurement protocols	MRV application	MSTEM	MWLECC/JIP														
			Design of services	RE Association	RE investors														
			Finance the services	RE Association	RE investors														
			Implement the services	RE Association	RE investors														
			Grid studies	MSTEM	JPS														
			Protocols and restriction definition	OUR	JPS														
			Grid Investments	JPS	Multilateral Banks and MOF														
4. Innovative Financial Mechanisms	Well articulated funding strategy and implementation for financial facilitating actions favouring investment for development of RE projects	Risk/Guarantee Capital Fund	Assessment studies for design of financial mechanisms	DBJ	Multilateral Banks														
		Energy Fund	Design of Risk fund	DBJ	RE Association														
		Financial institutions readiness	Design of Energy Fund	MSTEM	DBJ														
		Pilot portfolio of RE projects	Negotiate Both Funds	Financial institutions	Funding institutions														
		Grid upgraded financial solutions	Implement Funds	Financial institutions	RE association														
			Support financial institutions	Academy	Financial institutions														
			Design new products	Financial institutions	DBJ														
			Increase capacities	Financial institutions	DBJ														
			Define a pilot portfolio	MSTEM	RE Association														
			Design a support program	MSTEM	RE Association														
			Support pilot projects	MSTEM	RE Association														

NAMA Component	Outcome	Outputs and mechanisms	Indicative Related Activities	Coordinator or leader of the activity	Key stakeholders involve for coordination and negotiation	Implementation years													
						1	2	3	4	5	6	7	8	9	10	11	12	13	14
			Define a Grid financial solution for grid infrastructure investment	JPS	Multilateral Banks and MOF														
5. Streamlined Regulations in Support of Renewable Energy Scaling-Up	A set of well-articulated regulations with buy-in and coordination of stakeholders in support of diverse aspects of RE project development	New Financial incentives New other incentives Reinforcement of existing incentives Procurement process New standards to support RE	Technical assessment about options of incentives	MOF	MSTEM														
			Reinforce existing regulations	MSTEM	MOF/MIIC														
			Design new mechanisms, regulations and incentives	MOF	MSTEM/MIIC														
			Built a favourable procurement framework	MSTEM	ESET														

4.2 Implementation arrangements: roles and responsibilities of different entities and stakeholders involved in implementation of NAMA, including institutional arrangements (2 pages)

Describe the actors in the implementation of NAMA. Describe their role and their responsibilities.

Describe the arrangements to coordinate the functioning of key actors in implementing NAMA. Describe the process of coordination to ensure continuous oversight and management of the implementation.

Provide a diagrammatic representation of the institutional arrangements put in place for NAMA coordination and implementation.

Describe the role of the private sector in the NAMA (if relevant).

The implementation of the NAMA requires a multi stakeholder effort involving existing institutions and organizations. It is envisaged that the NAMA requires at least the following governance bodies and arrangements to coordinate the functioning of key stakeholders within the key actions in the NAMA implementation. The different arrangements to be undertaken involve at least the following:

- At the upper level there needs to be a new, **NAMA related Political/Policy Board** (to be focused on Renewable Energy and mitigation) to be integrated by different institutions including high ranking policy/strategy ranks from MSTEM and MWLECC as NAMA supporters and the Ministry of Finance (MoF), the Planning institute of Jamaica (PIJ) and the Development Bank of Jamaica supporting financial and planning from the national perspective. This Board needs to have support (for logistics, integration of stakeholders, etc.) in terms of a secretariat (whose secretary needs to be integrated into the Board), as well as input from advisors, and other relevant stakeholders. The Board needs to develop a program of work since it meets normally on a bi annual basis to assess overall route and implementation of the NAMA during the different phases and assuring coherence with the Jamaica Vision 2030.

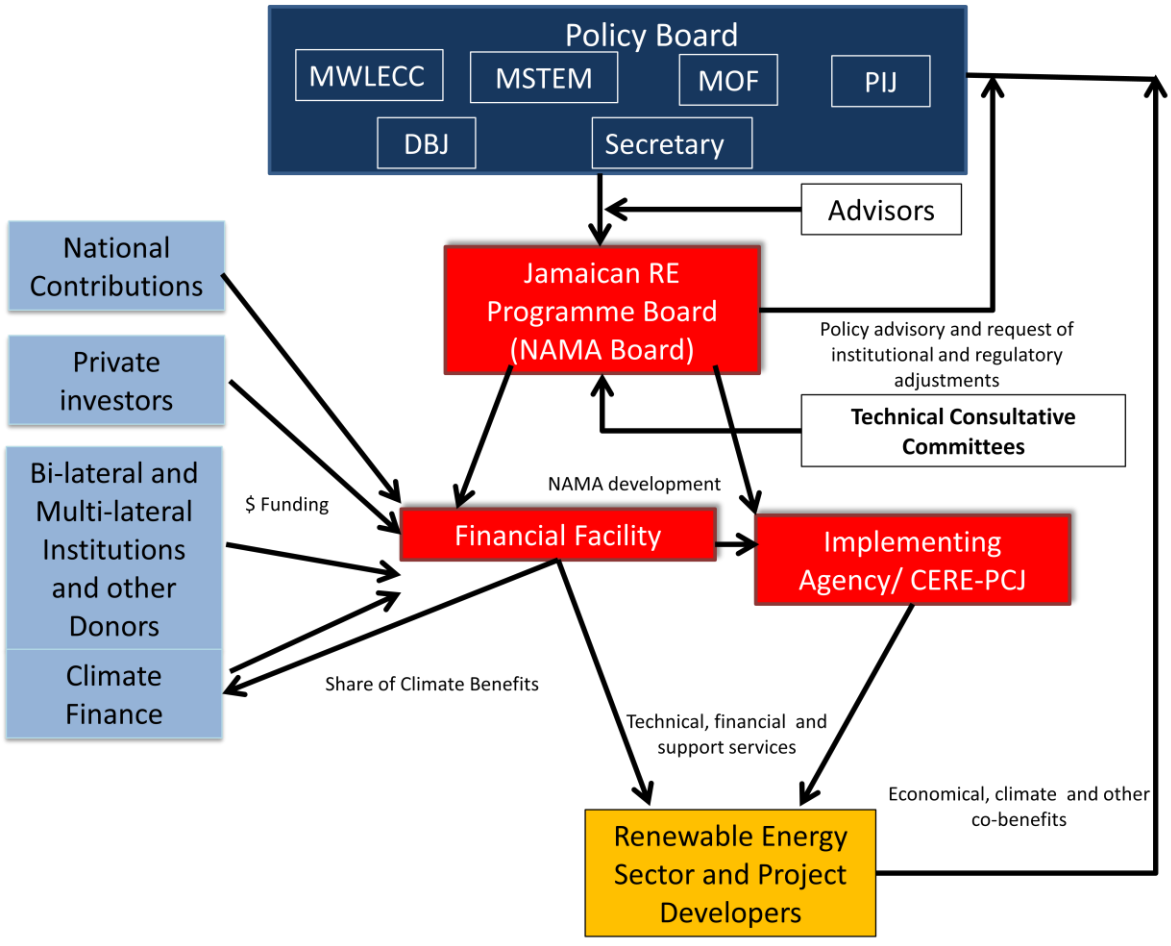
- Next, there is the **Jamaica Renewable Energy NAMA/Programme Board (NAMA Board)** whose main function is to galvanized interests, provision of technical support, facilitation of coordination and

provision of key early push and support. The denominated NAMA Board provides key programmatic development guideline to the NAMA Implementing Agency as well as policy advice and also funnels requests for institutional alignments supportive of implementation. The NAMA Board should likely be integrated by technical ranks with implementation/executing managerial capabilities from the institutions referred above.

- **Technical Consultative Committees** are the platform for technical definitions, consultations and validations with other stakeholders not included in the other boards. These could be integrated by a wide representation from stakeholders in the country on a per request basis to provide consultation support on issues relevant to the NAMA.

- At the implementation level of the NAMA there are two distinct set of players. On one side the needs to be an **Implementing Agency** chartered with the NAMA Implementation, together with a **Financial Facility** chartered with the implementation of financial instruments supportive to renewable energy project development. These two players could be integrated but due to the relative boundaries of their purpose, it is likely that they will have to be separate entities associated through an implementation agreement.

The next figure is an institutional proposal describing the arrangements to coordinate the functioning of key actors in implementing Jamaica RE NAMA and put in place those for NAMA coordination and implementation. The organizational chart of the NAMA governance could be depicted as follows:



	Direct Beneficiaries	Small capital	Indicative of service, resource or action
	Policy Board	→	Indicative of hierarchy or/and flow of service, resource or action
	Executing entities		Funding Source
	Advisory Board or stakeholder consultation		

Roles and responsibilities associated to stakeholders in the NAMA are depicted in the following table:

Type of actor	Stakeholder	Role	Responsibility
Government of Jamaica	MSTEM	NAMA leadership, participates in the Policy and NAMA Boards	Overall performance of the NAMA related to the Renewable Energy scaling-up and associated penetration target in electricity generation
	MWLECC	NAMA leadership, participates in the Policy and NAMA Boards	Overall performance of the NAMA related to the GHG mitigation target
	MOF	Participates in the Policy and NAMA Boards.	Approval of National Contributions as well as contribution to assure fiscal incentives counterparts. Assistance in streamlining cooperation with MDBs
	PIJ	Participates in the Policy and NAMA Boards. Competence role to support the NAMA, mainly in the MRV.	NAMA insertion into the national Planning system, including MRV
	Secretariat	Agenda and follow up of agreements from the Policy and NAMA Boards	Overall follow up of the NAMA performance and functionality, supporting MSTEM and MWLECC
Other public entities	OUR	Potential participation in the Technical Consultative Committees	Regulator know how support objectives
	PCJ and CERE	Potential participation in the Implementing Agency	
	DBJ	Participate in the Policy and NAMA Boards. Competence role to support the NAMA. Participating in the financial facility at the technical and funding side	Supporting financial issues for the NAMA development
Financial entities	Commercial banks	Funding of NAMA financial facility	Financing through debt availability to project development
	Multi-laterals	Funding of NAMA financial facility, provision of support for the capacity building and support for technical support. Contribution to MRV design and implementation	Technical, capacity building and financial contributions
Private sector	RE Associations	Potential participation in the Technical consultative Committees. Direct beneficiary. Pushers of the NAMA programme	Represent the sectorial interest and creation of capacities for development of the RE sector in country
	JPS	Potential participation in the Technical Consultative Committees	Coordination and participation in the needs of grid improvement, grid

Type of actor	Stakeholder	Role	Responsibility
			investments and relation with the energy system operation for RE. Protocols for RE interconnection
	RE Developers	NAMA participant/ direct beneficiary. They are pushers of the NAMA programme	Project development and investment of equity capital.
	RE Technology Suppliers	Pushing of the NAMA programme	Support the RE sector development

5. Estimate of National Sustainable Development Benefits and GHG Impacts

5.1 Baseline Scenario: narrative description of baseline situation in absence of planned NAMA measures

(1-2 pages) *Describe the scenario that would occur in the absence of the NAMA. The baseline section should cover the following information:*

1. *Description of existing situation in the sector/sub-sector in which the NAMA is being implemented.*
2. *Provide information on the key parameters influencing the GHG emission sources that are to be addressed by the NAMA. Provide projections of these key parameters. For example, if the NAMA is to implement Solar Home Systems, the emissions are from the use of energy for electricity. The section should provide information on the scenario for population change, the sources of electricity, the level of growth in electricity availability etc.*
3. *Describe the existing policies influencing the key parameters identified above and describe how these policies will affect the key parameters.*
4. *If there are mitigation policies, describe the impact of the implementation of these policies on the GHG emission sources related to the NAMA.*

Jamaica currently generates most of its electricity through the use of traditional fossil fuel plants that are largely inefficient. This has resulted in very high and increasing costs to the society and an overall impact on balance of payments as well as economic turndown and competiveness. Electricity consumption continues to increase at elevated rates yearly according to planning documents by OUR. The demand growth is spearheaded by specific sectors within the society inclusive of the public, commercial and tourism. Within this context, the GoJ has being working towards achieving a diversification of fossil fuel generation based on a decision towards a lower cost fuel likely to be natural gas and also on the incorporation of renewable energies in the generation mix using different technologies as well as project scales.

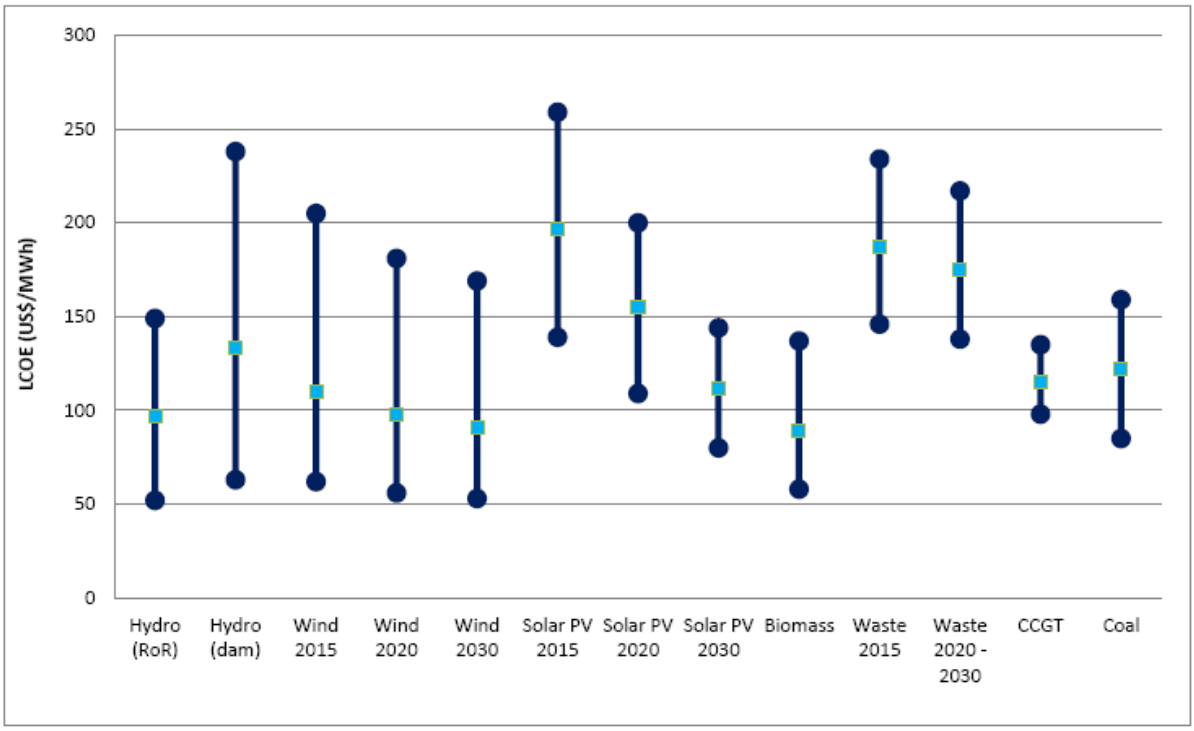
Jamaica has an installed power capacity on the order of around 850 MW and expected capacity additions to the year 2030 indicate that nearly another 1,400 MW of new capacity need to be installed (with nearly a 44% to be incorporated by 2020 and the rest in the next decade).

The baseline scenario of the NAMA for the period towards 2030 indicates that most fossil fuel power plant investment in the country will be natural gas based. Both politically where there is convergence towards natural gas adoption and also according to the OUR 2010 Expansion Plan, where natural gas becomes the least cost expansion scenario; this is the fuel of choice in the country for the period considered.

The GoJ is supporting the incorporation of RE generation in the mix, and that for such purpose has already conducted a first procurement process based on a bidding process for both firm as well as non firm RE

generation, in which the ceiling for bids is based on recognizing disparity of sources compared to the existing price signals for oil based generation.

Levelized cost of energy (LCOE) has been calculated in Jamaica for different sources of generation, as presented by MSTEM[20] in a recent report for the case of the baseline scenario based on natural gas.



Taking into account the expected LCOE of gas as well as its likely spread in comparison with the expected LCOE of different renewable technologies, it becomes apparent that once gas starts coming to be part of the matrix several technologies and ranges of projects may hardly be competitive to develop solely on the base of LCOE; therefore requiring further assistance in terms of incentives, capacity building and other barrier removal initiatives.

5.2 NAMA Scenario: narrative description of situation with the implementation of NAMA measures

Describe the scenario that would occur with the implementation of the NAMA. Describe, based on the activities identified above in section 5, how NAMA implementation will influence the key parameters identified in section 6.1.

The implementation of the NAMA measures will result in the fostering of an enabling environment for renewable energy project development in Jamaica. A portfolio of RE projects proposed will be implemented and therefore the country will reach the proposed target for a 30% participation in the generation of electricity in the country. Such portfolio will include several types of RE technologies as well as scales of implementation with a component of variable renewable energy participation at the grid level, that will be coming in line as effective regulation and procurement, innovative financing, capacity building and partnerships are developed.

[20] MSTEM. Grid Impact Analysis and Assessment for Increased Penetration of Renewable Energy into the Jamaican Electricity Grid Final report `Prepared by EDF and HINICIO. November 2013

5.3 Description of the benefits in terms of development (social, economic, and environmental)

(1 page) *Based on the descriptions in 6.1 and 6.2, describe the development benefits obtained from NAMA implementation:*

Social benefits: human benefits (health, education, etc.)

Economic benefits: jobs created, any costs reduced, national economic benefits, etc.

Environmental benefits (other than GHG reductions): positive impacts on forests, land degradation, biodiversity protection, any other natural resources, reducing pollution, etc.

Sustainable Development Benefits associated to the implementation of the NAMA are:

Social Benefits: The most important benefits in this category are related to the impacts in the education system in the country due to the improved value added for clean energy chains that will be establish through the NAMA implementation. It is likely that this effect will be noticeable not only for higher education professionals but also can create a new segment of technical training skills normally associated to different stages of project development.

On the institutional side, benefits can be expected within the institutional establishment related to the knowhow on improved coordination, overall management of transformational processes, coordination of public-public and public-private ventures, all of which are important to maintain focus on a long term vision for the sustainable Development of the country.

Economic Benefits: 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. The number of jobs added in the Jamaican society due to the renewable energy industry may be on the level of up to 1,000-2,000 depending on the final target RE penetration, but enough to make a sound case for the social, economic and gender implications of the path towards scaling-up of renewable energy.

Based on estimated levelized cost of energy including environmental externalities, the NAMA is likely to deliver expected economic benefits to the population based on the long term vision towards energy security and diversification, in terms of reduced balance of payments needs for business as usual practices

Due to the action oriented approach to improve regulatory framework it is expected that benefits can be accrued from the expected results related to reducing development costs to renewable energy projects, contributing to a more effective and efficient project development learning process in the country.

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.); as well as innovative development of risk management facilities that could have spill over effects to other important sectors needing investment in the country.

Environmental Benefits: The most important benefits derived on this category are likely to occur in the reduction of point source pollutants associated to the operation of fossil fuel power plants that otherwise will have to be installed or operated at larger capacity factors, understanding the potential trade-offs associated to the issues of larger Renewable Energy project development associated to risks perceptions associated to interconnection of such plants.

5.4 Estimate of GHG emission reductions resulting from implementation of NAMA measures, including description of methodology to estimate GHG emissions impact

(2 pages)*Calculate/estimate the GHG emissions related to the baseline scenario. Explain how the calculation/estimate has been made by explaining the methodology used, the hypothesis made, the formula used, etc.*

Calculate/estimate the GHG emissions related to the NAMA scenario. Explain how the calculation/estimate has been made by explaining the methodology used, the hypothesis made, the formula used, etc.

Calculate the potential of GHG emissions reductions by comparing the baseline and the NAMA scenario.

The information should be quantitative and should be linked to the descriptive narration of the baseline and NAMA scenarios described in the sections above. The section should provide detailed information on the data sources used, assumptions made, and methods used for estimating various data.

Baseline Scenario

The plausible proposed baseline scenario is based on continuation of current practices using existing oil based generation plants followed by introduction of natural gas plants that will gradually substituting and replacing as well as expanding the generation capacity of the country in order to satisfy expected demand towards 2030.

The energy demand growth in the baseline scenario is The Base Forecast – Net Generation and Net System Peak (2010 – 2029)[21], shown in the following table.

Year	Net Gen (MWh)	Net Gen Growth Rate (%)	Load Factor (%)	Net System Peak (MW)	Peak Growth Rate (%)
2009	4,213,981	-	77.6	619.9	-
2010	4,253,796	0.94%	77.6	625.8	0.95%
2011	4,373,845	2.82%	77.96	640.5	2.35%
2012	4,531,735	3.61%	78.28	660.8	3.17%
2013	4,725,330	4.27%	78.57	686.5	3.89%
2014	4,951,437	4.78%	78.84	717.0	4.44%
2015	5,190,379	4.83%	79.07	749.3	4.50%
2016	5,434,953	4.71%	79.28	782.6	4.44%
2017	5,681,720	4.54%	79.47	816.1	4.28%
2018	5,949,989	4.72%	79.64	852.8	4.50%
2019	6,223,245	4.59%	79.8	890.3	4.40%
2020	6,502,098	4.48%	79.93	928.6	4.30%
2021	6,786,213	4.37%	80.06	967.7	4.21%
2022	7,075,842	4.27%	80.17	1007.6	4.12%
2023	7,370,946	4.17%	80.27	1,048.3	4.04%
2024	7,671,693	4.08%	80.35	1,089.9	3.97%
2025	7,978,175	3.99%	80.43	1,132.3	3.89%
2026	8,290,569	3.92%	80.51	1,175.6	3.82%
2027	8,609,043	3.84%	80.57	1,219.8	3.76%
2028	8,933,808	3.77%	80.63	1,264.9	3.70%
2029	9,265,086	3.71%	80.68	1,310.9	3.64%

[21]Page 27 of Office of Utility Regulation, OUR. Generation Expansion Plan.2010.

The optimum generation expansion plan based on Natural Gas-only strategy from OUR Generation Expansion Plan 2010, presented in the following table is used as baseline assumption for new natural gas plants entry into operation.

Year	Plant Type to be added to the System	No. of units x Capacity (MW)
2014	Natural Gas-fired Combined Cycle Gas Turbine unit	3 x 120
2016	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2017	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2018	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2019	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2020	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2022	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2024	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2025	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2026	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120
2028	Natural Gas-fired Simple Cycle Gas Turbine unit	1 x 40
2029	Natural Gas-fired Combined Cycle Gas Turbine unit	1 x 120

Within the NAMA baseline scenario, there is some degree of renewable energy plants that will be entering the power mix, for example the current plants associated to the bid put out by OUR. It is also expected that other renewable plants are highly likely to enter into operation by the time or shortly after the entry into operation of the first mega generation natural gas plant.

The already established as well as proposed renewable plants (described in the MSTEM recent report on grid analysis for incorporation of variable renewable energy cited above) are included in the baseline scenario; although the timing of entry into operation is decided based on the expert criteria of the NAMA designer reflecting the respective LCOE and the time required for implementation typical of such plants. Annex II presents a table depicting the proposed indicative addition of power plant capacity for each year of the baseline scenario (as well as the NAMA scenario). Potential project sites are included as part of the NAMA scenario later on.

The MSTEM alternative portfolio selected for the variable renewable energy grid analysis with its capacity factor and indicative annual energy generation is presented below.

#	Technology	Site	Status	Selected capacity (MW)	Capacity Factor	Annual Energy (GWh)
1	Wind	Wigton I	existing	20,7	30%	54,4
2	Wind	Wigton II	existing	18	38%	59,1
3	Wind	Munro	existing	37	29%	92,4
4	Wind	Rose Hill	proposed	30	35%	92
5	Wind	Winchester	potential	98,5	40%	345,1
6	Hydro	Rio Bueno A	existing	2,5	60%	13,1
7	Hydro	Rio Bueno B	existing	1,1	60%	5,8
8	Hydro	Maggoty Falls	existing	6,3	60%	33,1
9	Hydro	Upper White River	existing	3,8	60%	19,9
10	Hydro	Lower White River	existing	4	60%	21
11	Hydro	Roaring River	existing	3,8	60%	19,9

#	Technology	Site	Status	Selected capacity (MW)	Capacity Factor	Annual Energy (GWh)
12	Hydro	Constant Spring	existing	0,8	60%	4,2
13	Hydro	Ram's Horn	existing	0,6	60%	3,1
14	Hydro	Great River	proposed	8	60%	42
15	Hydro	Laughlands	proposed	2	60%	10,5
16	Hydro	Back Rio Grande	proposed	10	60%	52,5
17	Hydro	Martha Brae	potential	12,9	33%	37,3
18	Hydro	Rio Cobre	potential	1	60%	5,2
19	Hydro	Negro River	potential	1	60%	5,2
20	Hydro	Yallahs River	potential	2,6	60%	13,6
21	Hydro	Wild Cane River	potential	2,5	60%	13,1
22	Hydro	Morgan's River	potential	2,3	60%	12,1
23	Hydro	Spanish River	potential	2,5	60%	13,1
24	Solar	Paradise 1	potential	49,5	22%	93,2
25	Solar	Paradise 2	potential	30	22%	56,5
26	Solar	Old Harbour	potential	30	21%	55,7
27	Solar	Kelly's Pen A	potential	20	22%	38,4
28	Solar	Micham	potential	25	21%	46,2
29	Solar	Parnassus	potential	43	21%	80,2
30	Co-gen.	Appleton	potential	20,5	61%	109,5
31	Co-gen.	Monymusk	potential	15	52%	68,3
32	Co-gen.	Frome	potential	27,5	53%	127,7
33	Waste	Riverton (Kingston)	potential	45	77%	301,6
34	Waste	Retirement	potential	20	77%	134
			Total	597,4		2079

The majority of bulk emissions reductions in the period are associated to the introduction of the diversification into LNG and this is part of the baseline scenario.

Therefore it is considered that the renewable capacity first and a set of NG plants will enter into operation, some of which are to displace existing thermal fuel oil capacity, with renewable displacing less efficient thermal plants.

The estimation process starts by using the simulated value of electricity to be generated by the fossil fuel plants (both oil and natural gas) and multiplying by an emission factor that is estimated based on a proposed operational mix of such plants using the normal approaches used within greenhouse inventory development and CDM methodologies. An Excel spreadsheet has been developed showing the methodological approach used for the estimations included.

The approach for emission factor estimation is based on:

$$EF_{conv,y} = \frac{\sum_k EG_{k,y} \times EF_{EL,k,y}}{\sum_k EG_{k,y}}$$

Where EGk,y is the energy generated by each source operating with each fossil fuel ky EFEL,k, obtained from:

$$EF_{EL,k,y} = \frac{3{,}6\ EF_{CO2,i}}{\eta}$$

Where 3,6, is a conversion factor (TJ/GWh),EFCO2,iis CO2 emission factor of fossil fuel type i, (tCO2/GJ) (IPCCC default values)and η = default efficiencies for source, CDM.

The defaults values are:

Default efficiency factors for sources (CDM, EB 35, Annex 12, version 01.1)

	Old (before 2000)	**New (after 2000)**
Oil		
Open cycle	30%	40%
Combined cycle	46%	46%
Natural gas		
Combined cycle	46%	60%

EFCO2,i = CO2 emission factor of fossil fuel type i (tCO2/TJ) IPCC Guidelines 2006

Fuel Type	**tCO2/TJ**
Diesel oil	72,6
Residual fuel oil	75,5
Natural gas	64,2

The results of estimations for the baseline scenario are presented below:

Year	**Electricity supplied by conventional (fuel based) plants to the grid in Baseline, year y (MWh)**	**Average CO_2 emission factor of conventional plants, in Baseline in year y (t CO_2/MWh)**	**Baseline scenario emissions (t CO_2)**
2014	4.546.825	0,688	3.128.676
2015	4.704.825	0,688	3.237.396
2016	4.916.425	0,513	2.523.292
2017	5.061.425	0,518	2.623.066
2018	5.311.425	0,472	2.508.523
2019	5.586.425	0,466	2.602.228
2020	5.861.425	0,427	2.504.887

Year	Electricity supplied by conventional (fuel based) plants to the grid in Baseline, year y (MWh)	Average CO_2 emission factor of conventional plants, in Baseline in year y ($t CO_2/MWh$)	Baseline scenario emissions ($t CO_2$)
2021	6.146.425	0,411	2.529.116
2022	6.436.425	0,389	2.505.889
2023	6.731.425	0,398	2.680.195
2024	7.031.425	0,386	2.716.449
2025	7.336.425	0,388	2.843.091
2026	7.661.425	0,385	2.951.181
2027	7.961.425	0,386	3.074.694
2028	8.311.425	0,386	3.209.281
2029	8.626.425	0,386	3.331.064
2030	8.626.425	0,386	3.330.617

NAMA scenario

The NAMA scenario of introduction of RE is estimated in order to show the stated policy objectives, with a target stated as "percentage of renewable generation in the energy generation mix" (targeting 30% by 2030[22]).

The NAMA Scenario raises the level of incorporation of RE to an order of nearly an additional 760 MW, most of which would likely come from Solar Energy generation technologies from 2020, with the baseline being LNG as a fuel of choice. It is worth noting that emissions levels of 2015 are maintained over the period, therefore achieving the objective of decoupling emissions growth from overall economy/sector growth, which can be a major low carbon development goal within the natural gas implementation path. It is worth suggesting that it can be possible to maintain emissions levels of 2017 by 2030, which clearly represents a transformation for the electricity sector of the country.

The estimation process for the NAMA scenario follows an approach similar to the other one presented before, taking into account the path of entry into operation of the renewable plants.

The results of estimations for the NAMA scenario are presented below:

Year	Electricity supplied by conventional (fuel based) plants to the grid in NAMA, year y (MWh)	Average CO_2 emission factor of conventional plants, in NAMA in year y ($t CO_2/MWh$)	NAMA scenario emissions ($t CO_2$)
2014	4.546.825	0,688	3.128.676
2015	4.704.825	0,688	3.237.396
2016	4.916.425	0,513	2.523.292
2017	5.061.425	0,518	2.623.066
2018	5.263.725	0,470	2.475.701
2019	5.154.825	0,447	2.305.243

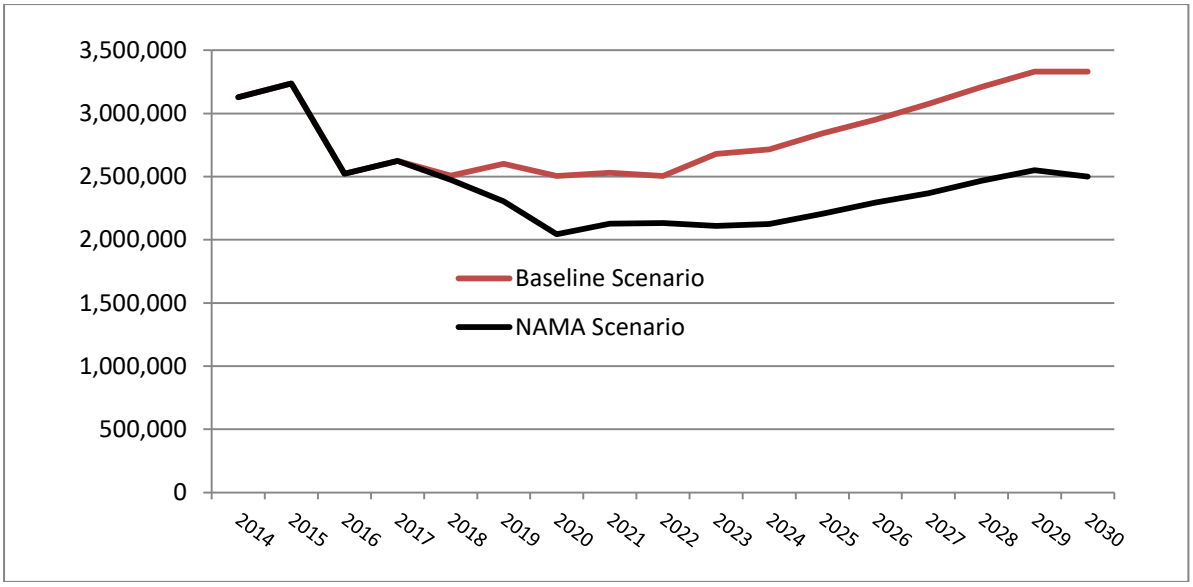
[22]Government of Jamaica, MSTEM.Grid Impact Analysis and Assessment for Increased Penetration of Renewable Energy into the Jamaican Electricity Grid.2013.

2020	5.307.225	0,385	2.044.343
2021	5.523.925	0,385	2.127.816
2022	5.536.525	0,385	2.132.669
2023	5.474.225	0,385	2.108.671
2024	5.513.825	0,385	2.123.925
2025	5.726.374	0,385	2.205.799
2026	5.957.910	0,385	2.294.987
2027	6.145.752	0,385	2.367.344
2028	6.402.287	0,385	2.466.161
2029	6.623.822	0,385	2.551.496
2030	6.492.971	0,385	2.501.093

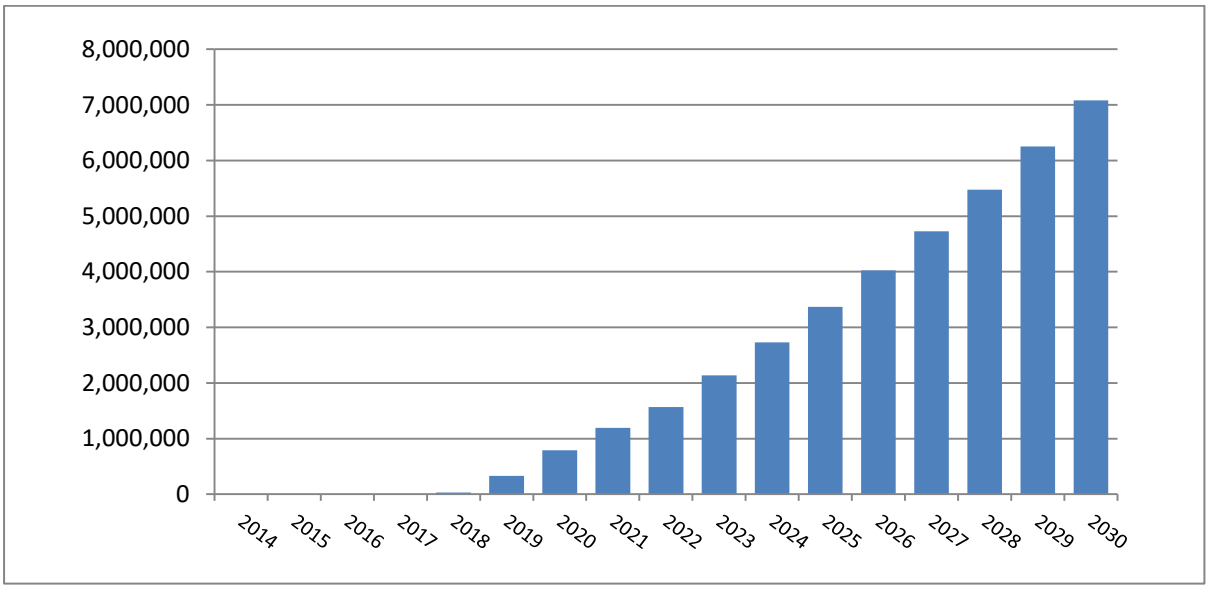
The Baseline scenario, NAMA scenario and reduction emissions (yearly and accumulated) resulting from the estimation are shown in the following table and figures.

Year	Baseline Scenario	NAMA Scenario	Reduction Emission	Accumulated Reduction Emission
	ton CO_2e/year	ton CO_2e/year	ton CO_2e/year	ton CO_2e/year
2014	3.128.676	3.128.676	0	0
2015	3.237.396	3.237.396	0	0
2016	2.523.292	2.523.292	0	0
2017	2.623.066	2.623.066	0	0
2018	2.508.523	2.475.701	32.822	32.822
2019	2.602.228	2.305.243	296.985	329.807
2020	2.504.887	2.044.343	460.544	790.351
2021	2.529.116	2.127.816	401.300	1.191.651
2022	2.505.889	2.132.669	373.219	1.564.870
2023	2.680.195	2.108.671	571.524	2.136.394
2024	2.716.449	2.123.925	592.524	2.728.917
2025	2.843.091	2.205.799	637.292	3.366.209
2026	2.951.181	2.294.987	656.194	4.022.403
2027	3.074.694	2.367.344	707.350	4.729.753
2028	3.209.281	2.466.161	743.120	5.472.873
2029	3.331.064	2.551.496	779.567	6.252.440
2030	3.330.617	2.501.093	829.524	7.081.965

The expected pattern of baseline scenario and NAMA scenario emissions is depicted below.



The yearly accumulated reductions from the NAMA implementation are shown below, indicating a total accumulated emissions reductions in the order of 7 million tonnes of CO2.



5.5 Description of the transformational impact of NAMA, including its sustainability

(1 page)*For each solution (=measure) identified in 4.2, describe what will be the expected impacts (long term) of implementing the measure. Further, describe how the planned measures will have a long-term impact on the way different stakeholder make choices. For example, how will the implementation of NAMA change the private sector's choice of options, and how will it influence policy- and strategy-making for sustainable development.*

Explain how the measures suggested in the NAMA will be sustained beyond the implementation of the NAMA. For example, if funding is requested for a standard setting and testing lab, how will the activities of this lab continue beyond the NAMA implementation?

The Jamaica Renewable Energy NAMA contributes to transformational change in Jamaica through its rooting in bringing the country on a low-carbon development trajectory with (climate) benefits. At the international level, the NAMA is also rooted in the Jamaica Vision 2030 related to contributing effectively in the effort to reduce the global rate of climate change. The NAMA becomes an enabler of significant evolution in terms of scope (e.g. scaling-up the use of renewable energy), favouring a faster change or a significant shift from one state to another (attaining a deviation from business as usual practices). In alignment with international observations on transformational impacts[23] of NAMAs, the Jamaica case implies development of catalytic effects and leverage as well as coordination to ensure the sustainability of the impacts, local ownership and political will, the use of innovative technologies or approaches, etc.

Transformational Aspect of the NAMA	Comment
Is the NAMA an element of a broader programme or policy framework, which contributes to achieve a sectoral or national emission reduction target or implement a low emission development strategy?	The NAMA is an element of a broader program represented by the Jamaica Vision 2030 which in two specific national outcomes (#10 for energy security and efficiency and #14 for hazards risk reduction and adaptation) include specific actions and targets related to sectoral objectives as well as emission reduction targets.
Would the achievement of the emission reduction target or implementation of the low emission development strategies imply transformational change?	Taking into account the existing practices in the energy sector, achieving the emissions reductions proposed in the NAMA is directly related to a transformational change in different strategic areas related to development of alliances and partnerships for effective regulation, development of innovative mechanisms for financing, capacity building within organizations and maintenance of a long term vision for a energy sector with improved resilience.
Does the NAMA fit into a broader context of mitigation activities in the respective sector?	As stated within the Jamaica Second National Communication to the UNFCCC, the emissions contribution of the energy sector and the electric generation are of the most single importance to address within mitigation efforts in the country.
Does the NAMA contribute to changing the prevailing structures of the sector?	Certainly, in many respects the NAMA provides assistance in transforming prevailing structures associated to the regulatory path, development of partnerships for project action, financing structures and vehicles for sound investment in new emerging technologies, etc.
Does the NAMA help to over-come systemic barriers to the reduction of emissions?	Through the specific components the NAMA is responsive to perceived critical barriers for renewable energy scaling up in the country, the barriers to attaining emissions reductions from renewable energy are correlated to the systemic barriers for renewable energy development.

[23] http://nama-facility.org/fileadmin/user_upload/pdf/NAMA_Facility_General_Information_Document_April2014.pdf

Transformational Aspect of the NAMA	Comment
Does the NAMA develop capacities to reduce future GHG emissions beyond the scope of the project?	The NAMA is instrumental in spearheading the development of an MRV system that needs to be aligned with what is established in the country´s vision and provides for an initial test ground for the approaches, scaling and replicability within other sectors related to climate change mitigation.
Is the NAMA replicable with respect to its applicability in other regions, countries and internationally?	Being Jamaica a Small Island State located in the Caribbean, the NAMA can be replicable within the Caribbean context in many respects related to application of measures, coordination of similar types of stakeholders and implementation of larger targets (i.e. the ones suggested by CARICOM) across technologies and territories. As such, the NAMA could be the initial step in the design consideration for regional mitigation activities in the Caribbean, mobilizing different levels of stakeholders and coalitions.
Does the NAMA serve to strengthen national systems?	One particular area of national strengthening relates to increase capacities for monitoring performance of programs and partnerships, for example it is expected that as result of the NAMA, the NEAP process in Jamaica can significantly improve in the short term.
Does the NAMA use an innovative approach for the reduction of emissions, which can have impacts beyond itself (e.g. technology transfer; general support approach)?	Critical innovative approaches of the NAMA involve the development of alliances and partnerships, both public to public and public to private, as well as targeted development of critical financial vehicles to catalyze investment in specific Re technologies; therefore the spill over effects can be commanding in creating new spaces to tackle other important areas of investment, technology development and also climate mitigation.
Does the NAMA Support foresee the participation and/or development of the private sector?	The NAMA intends to create enabling spaces required for private sector development and as cornerstone of sustainability the NAMA focuses in assisting the development of a strong private sector engagement, development of renewable energy value added chains and a representative sector responding to the needs of renewable energy project development.

6. Measuring, Reporting and Verification

6.1 Description of key parameters to assess progress of implementation of the NAMA

(1 page) *List and define the parameters/indicators that will be used to measure the progress of the NAMA implementation. Indicators should be identified for each of the outputs of the NAMA.*

For each of them, specify whether it is a qualitative or quantitative parameter. In the case of qualitative parameters, define the qualitative scale that will be used. In the case of quantitative parameters define the units.

6.2 Description of key parameters to assess the national sustainable development benefits and GHG emission impacts

There are 2 distinctive directions for the MRV of the NAMA: MRV of the GHG benefits and MRV of the proposed sustainable development benefits.

6.2.1 *List and define the parameters/indicators that will be used to measure the national sustainable development benefits of the NAMA implementation.*

For each of them, define whether it is a qualitative or a quantitative parameter. In the case of qualitative parameters, define the qualitative scale that will be used. In the case of quantitative parameters, define the units.

The NAMA Sustainable Development Benefits are associated to the economic, social and local environmental contributions. A first assessment of the types of criteria that could be used is presented below, depicting whether or not within the NAMA MRV, the criteria is to be monitored or not.

Sustainable Development Criteria	Possible Indicator	Monitoring within the NAMA
Economic Benefits		
Increased job creation due to enhance renewable energy sector and project development activities	Estimated number of job posts associated to implementation of value chains in the renewable energy sector	Monitored
Increase degree of attractiveness for renewable energy project development	Renewable energy installed capacity Growth rate of renewable energy installed capacity Structure of value chains in the renewable energy sector (possibly by type of technology) indicating developments in service sectors	Monitored
Increased mobilization of private investment	Amount of local private investment in terms of associated project activities Number of projects participating in national procurement processes for renewable energy Number of local developers participating within national procurement processes	Monitored

Sustainable Development Criteria	Possible Indicator	Monitoring within the NAMA
Increased development of new financial facilities and instruments for renewable energy project development	Number of financial facilities implemented (loans, grants, grants programs, risk management facilities, etc.)	Monitored
Social Benefits		
People with new skills acquired in technical and financial areas related to RE	Number of training programs and people (disaggregated by gender) implemented both in higher education as well as technician level Number of training programs and people (disaggregated by gender) trained in financing for renewable energy projects	Monitored
New or improved institutional coordination for the objective	Number of public-public and public-private partnerships developed Number of policies, regulatory instruments and incentives proposed Number of policies, regulatory instruments and incentives adopted Number of policies, regulatory instruments and incentives effectively implemented	Monitored
Environmental		
Local pollution reduction	Aerial pollutants	Not monitored

6.2.2 *List and define the parameters/indicators that will be used to measure the GHG emissions impacts of the NAMA implementation.*

For each of them, specify whether it is a qualitative or a quantitative parameter. In the case of qualitative parameters, define the qualitative scale that will be used. In the case of quantitative parameters, define the units.

Taking into account that the GHG emission impacts will be due to the implementation of specific RE projects, the most conservative reliable approach will be the use of parameters used in the monitoring of CDM renewable energy projects.

The typical project involved in the NAMA involves the construction and operation of power plants that use renewable energy sources and supply electricity to the grid (Greenfield projects). The retrofit, capacity additions of existing renewable energy plants could also be present in this context.

The parameters to be used for monitoring are:

1. Participation of renewable energy in the generation mix of Jamaica in %,
2. Electricity supplied to the grid for each renewable energy projects part of the NAMA in MWh, and
3. Emissions reductions in tones of CO2.

6.3 Measuring and Reporting Plan

(2 pages)

For each of the parameters defined above:

- *Give the baseline value*
- *Explain how the parameters will be measured*
- *Explain who will perform the measurement*
- *Explain how many times the parameters will be measured*
- *Describe the system for storing the data*

Describe how the values of the different parameters will be collected together and who are the stakeholders involved in this process. Explain who will be in charge of writing the report on/compiling the parameters measured.

Use the following table to summarize the information

The following table includes information on the different target values, and data collection/Reporting involved in the Jamaica Renewable Energy NAMA MRV.

		Target Values			**Data Collection and Reporting**		
	Baseline	**YR5 (2020)**	**YR10 (2025)**	**YR14 (2030)**	**Frequency and Reports**	**Data Collection Instruments**	**Responsibility for Data Collection / Reporting**
Impacts indicators							
GHG Reductions							
Participation of renewable energy in the generation mix of Jamaica in %	8.1%	18.4%	28.2%	30%	Yearly frequency, reported annually for performance, for 2015 and 2030 for the Jamaica Vision reporting; and bi annually for National	Reports from grid system operator	MSTEM

					Contributions reported under BURs within the UNFCCC		
Electricity supplied to the grid by renewable energy projects part of the NAMA in MWh	400,000	6,500,000	2,240,000	2,270,000	Yearly, only reported for the NEAP	Reports from grid system operator	MSTEM
Emissions Reductions in tones CO2	0	460,000	637,292	829,524	Yearly frequency, reported annually for performance and bi annual for National Contributions reported under BURs	Reports from grid system operator and protocols for methodological estimation based on conservative practice	MSTEM and MWLECC
Sustainable Development Benefits	To be determined as the NAMA readies it design and conceptualization	To be determined	To be determined	To be determined	Yearly, reported annually for the NAMA performance and assessment of transformational aspects	Collection instruments include consultations with relevant stakeholders, protocols and methodologies like those available in ClimateScope, as well as other instruments as developed in country at the NAMA level and with support from Jamaica Vision MRV processes	MSTEM and MWLECC The responsibility for data collection includes the appropriate coordination with the MRV component of Jamaica Vision 2030 as well as the development of an strategic alliance with ClimateScope in order to strengthen the coherence of MRV approaches and information management and processing
Progress indicators							

6.4 Description of verification process

(1 page)

Describe who will be in charge of the verification process and how the information will be exchanged between the stakeholder in charge of writing the report and the stakeholder in charge of the verification.

The NAMA is to be verified locally in-country, through the reporting done by MSTEM and MWLECC. The verification of the NAMA is proposed to be under the coordination from the Planning institute of Jamaica (PIJ), the Statistical Institute of Jamaica (STATIN) and the Jamaica National Agency for Accreditation (JANAAC).

7. Non-financial support required

7.1 Description of the technical and the capacity-building needs

(1 page)

Describe in detail any international support needed on technical and/or capacity-building issues. This section should provide information on the nature of technical assistance activity and scope of capacity development, as well as the technical expertise required to support the activities. The financial requirement for these should be included in the financial section. Please also provide a paragraph on how this enables capacity development in country to sustain the change beyond NAMA implementation. This would be connected to the barriers identified in earlier sections.

According to a recently published report by Climate Scope 2014[24], Jamaica places 39th among the 55 nations surveyed for Climatescope 2014, and within the 26 Latin American and Caribbean nations it ranked 18th. Assessing technical and capacity building needs is normally associated to the level of development of the institutions charter with the policy and regulatory aspects that define the vision and its implementation. It also should assess the state of development of value chains associated to different renewable energy technologies in relation to service providers (ancillary products & services, developers & utilities, marketing services, financial &legal services), sector value chains (presence of specific segments normally needed in order to develop projects in different renewable energy technologies) and status of presence of financial institutions (banks, special purpose funds, corporate finance and private equity/venture capital).

Jamaica has a sound vision incorporating longer term policies and targets both for participation of renewable energies as well as GHG mitigation contributions in order to move into a sustainable development path. It has a set of institutions that aim at responding effectively to the task ahead of diversification, tariff reduction in the energy sector. Nevertheless the country, as it readies to move into a low carbon development path needs to strengthen several key aspects related to institutional coordination, focus on long term vision goals and development of frameworks that could enable the desired implementation of the renewable energy sources of the country.

In the area of value chains, the country needs to strengthen a varied portfolio of components in the areas of increasing capacities at the service provider level, composition and capabilities within different Re technologies, and increase presence of financial facilities and stakeholders.

Most of the capacity building needed in this aspect of institutions and regulations is centred at the development of increased coordination, command and control structures for effective regulations and incentives setting, and promotion of partnerships for project development action (public-public and public-private).

This effort requires capacity building and technical support directed at responding at new paradigms which are inclusive of:

a. Legitimacy needed to provide coherent alignment of interests,
b. Reflexive governance within the sector,
c. Agile institutions capable of realigning models, networks and practices,
d. Adaptable infrastructures with transformative capacities to accommodate change,
e. Responsive coordination based on good information and attention capabilities,
f. Flexible strategies that can revert “lock-in” in commitments, and

[24] http://global-climatescope.org/en/country/jamaica/#/details

g. Capacities to manage diverse portfolios mixing varieties of apparently disparate technologies, regulatory approaches and financial choices.

International cooperation is needed in order to address these set of perceived areas of strengthening at the level of institutions and value chains for the NAMA to be effective as it becomes ready to support the country´s vision and implementation.

8. Financial resources

8.1 Full cost of implementing the NAMA

(1 page)

Include detailed information about the total cost of NAMA implementation by each proposed measure and the respective costs for each measure.

In this section include information about specific financing instruments (loans, concession loans, risk insurance, subsidies, and equity) for financing the proposed measures. For example, if activity is to implement EE technology, indicate the loan part, equity by investors, subsidies, etc.

Also include an analysis of the likely risks that may threaten cash flows and delay or hinder the implementation and successful operation of the NAMA.

The full cost of implementation of the required portfolio of renewable energy projects needed in order to satisfy the target of 30 % participation from renewable energy electricity generation is depicted below in the following table. The suggested investment CAPEX is derived from the recent grid analysis report for VRE additions in the Jamaica grid described elsewhere in this document.

	RE Power Capacities (MW)				**CAPEX (US$/KW)**			**Investment (US$ Million)**				
	Short Term	**Medium Term**	**Long Term**	**Total Power Capacities Added**	**Short Term**	**Medium Term**	**Long Term**	**Short Term**	**Medium Term**	**Long Term**	**Total Investment per RE Technology**	**Contributions to Power Installed by RE Technologies**
	Before 2020	**Before 2025**	**Before 2030**		**2020**	**2025**	**2030**	**2020**	**2025**	**2030**		
Hydro Run of River	22,3	2,5	0,0	24,8	3500	3500	3500	78,1	8,8	0,0	$87	5,1%
Wind	98,5	0,0	0,0	98,5	2080	1825	1700	204,9	0,0	0,0	$205	12,1%
Solar PV	0,0	177,5	330,0	507,5	2690	2100	1500	0,0	372,8	495,0	$868	51,4%
Biomass	0,0	63,0	0,0	63,0	3000	3000	3000	0,0	189,0	0,0	$189	11,2%
Waste	0,0	65,0	0,0	65,0	5900	5250	5250	0,0	341,3	0,0	$341	20,2%
Total				758,8							$1.690	100

The total estimated investment on the proposed renewable energy capacity additions is in the order of 1,690 Million US$ for the 758 MW needed from RE sources; accounting for a 70/30 percent relationship for the debt

to equity ratio normal in these kinds of projects, the total debt component of the package is nearly a 1,183 Million US$ and the equity component is on the order of approximately 507 million US$.

The **estimated indicative full cost for implementation of the NAMA** is presented below.

NAMA Cost Component	Details	Private Investors (M US$)	ICAs/CC related Agencies (M US$)	MDBs (M US$)	Commercial Banks (M US$)	GoJ (M US$)	Estimated Total NAMA Budget (M US$)
Preparation/Design of the NAMA	Includes actions related to NAMA concept detail development, conduct initial institutional convergence and buy-in, initial readiness activities	-	$0,50	-	-	-	**$0,50**
RE Project Pre-Investment Equity	Includes the estimated project equity leverage for financial arrangements of the NAMA portfolio of RE project	$506,90	-	-	-	-	**$506,90**
Risk/Guarantee Financial Facility for RE projects	Estimated on leverage required for early start up of risk mitigation for RE projects (based on risk managing facilities commonly design for RE scaling up programs across similar contexts)	-	$5,00	$15,00	-	$30,00	**$50,00**
RE Project Debt	Estimated on available benchmarks for CAPEX of RE projects internationally	-	-	$354,83	-$827,94	-	**1.182,78**
Grid Infrastructure Investment to support RE Project Uptake	Reinforcement of grid, estimated from the MSTEM grid analysis for VRE additions to the Jamaica grid, investment at the utility level	$10,35	-	$15,52	-	-	**$25,87**
Studies/consultancies	Grid capacity, dispatch cost, vulnerability cost assessment, land cost, design of financial mechanisms, permit process,	-	$2,00	-	-	-	**$2,00**
Capacity Building for RE Network / Partnership Development	Support to RE Associations, development of public-public and public-private partnerships	-	$1,40	-	-	-	**$1,40**
Regulatory Support for RE Project Action Enhancement	indicative level of the potential incentives (Fiscal),and savings related to improved permitting processes related to RE project development estimated to be 12% of the investor project expected return	-	-	-	-	$13,00	**$13,00**
NAMA Operation Expenses During Implementation	Includes coordination teams, any secretariat, integrators required for the implementation of the NAMA	-	$1,60	-	-	$0,32	**$1,92**

NAMA Cost Component	Details	Private Investors (M US$)	ICAs/CC related Agencies (M US$)	MDBs (M US$)	Commercial Banks (M US$)	GoJ (M US$)	Estimated Total NAMA Budget (M US$)
MRV	Includes costs associated and supportive structures for relevant monitoring, reporting and verification	-	$0,75	-	-	$0,30	**$1,05**
Total		**$517,25**	**$11,25**	**$385,36**	**$827,94**	**$43,32**	**$1.785,12**

The total implementation cost for the NAMA is in the order of US$ 1,785 Million with a degree of participation of:

a. 46.38% leveraged through commercial bank lending (local or international),
b. 28.97% through private sector equity placing,
c. 21.58% leveraged through Multilateral Development Banks involvement,
d. 2.42% from GoJ contributions in kind, labour and allocation of incentives, and
e. 0.63% through leverage from International Cooperation Agencies and Climate Financing for NAMA development.

Annex I.

Details of Proposed NAMA Coordinating Entity and NAMA Approving Entity

	NAMA Coordinating Entity	NAMA Approving Entity
Name of Institution:	Ministry of Science, Technology, Energy and Mines (MSTEM)	Ministry of Land, Water, Environment and Climate Change (MWLECC)
Contact Person:		Mr. Gerald Lindo Senior Technical Officer Mitigation. Ministry of Water, Land, Environment and Climate Change (MWLECC)
Address:		16A Half Way Tree Road Kingston 5, Jamaica
E-mail:		gerald.lindo@mwlecc.gov.jm Skype: gerry.lindo
Tel:		Office: +1-876-633-7352 Mobile: +1-876-579-8280

Annex II

Simulations of Baseline and NAMA Scenario GHG Emissions

Baseline Scenario Simulation

	2014		2015		2016		2017		2018		2019		2020		2021	
EnergySource	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	PowerGeneration (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	688,9	4.546,8	712,9	4.704,8	314,9	2.078,2	336,8	2.223,2	218,2	1.527,1	206,5	1.486,7	113,3	815,7	109,1	785,3
Natural Gas	0,0	0,0	0,0	0,0	360,0	2.838,2	360,0	2.838,2	480,0	3.784,3	520,0	4.099,7	640,0	5.045,8	680,0	5.361,1
Hydro	37,6	197,3	37,6	197,3	37,6	197,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3
Wind	75,7	205,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9
PV	0,0	0,0	0,0	0,0	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Waste	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total renewable	113,3	403,2	143,3	495,2	163,3	533,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6
Total	802,2	4.950,0	856,2	5.200,0	838,2	5.450,0	880,1	5.700,0	881,5	5.950,0	909,8	6.225,0	936,6	6.500,0	972,4	6.785,0
Renewable participation (%)	**14,1 %**	**8,1%**	**16,7 %**	**9,5%**	**19,5 %**	**9,8%**	**20,8 %**	**11,2%**	**20,8 %**	**10,7%**	**20,1 %**	**10,3%**	**19,6 %**	**9,8%**	**18,9 %**	**9,4%**

	2022		2023		2024		2025		2026		2027		2028	
Energy Source	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	17,9	129,2	58,9	424,2	5,4	38,6	11,5	83,1	0,0	0,0	5,4	38,7	5,2	37,5
Natural Gas	800,0	6.307,2	800,0	6.307,2	920,0	6.992,8	920,0	7.253,3	1.040,0	7.661,4	1.080,0	7.922,8	1.200,0	8.273,9
Hydro	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3	57,6	302,3
Wind	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9
PV	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Waste	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total renewable	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6	183,3	638,6
Total	1.001,2	7.075,0	1.042,2	7.370,0	1.108,7	7.670,0	1.114,8	7.975,0	1.223,3	8.300,0	1.268,7	8.600,0	1.388,5	8.950,0
Renewable participation (%)	**18,3%**	**9,0%**	**17,6%**	**8,7%**	**16,5%**	**8,3%**	**16,4%**	**8,0%**	**15,0%**	**7,7%**	**14,4%**	**7,4%**	**13,2%**	**7,1%**

	2029		2030	
Energy Source	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	5,5	39,7	5,2	37,5
Natural Gas	1.200,0	8.586,7	1.240,0	8.588,9
Hydro	57,6	302,3	57,6	302,3
Wind	105,7	297,9	105,7	297,9
PV	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0
Waste	0,0	0,0	0,0	0,0
Total renewable	183,3	638,6	183,3	638,6
Total	1.388,8	9.265,0	1.428,5	9.265,0
Renewable participation (%)	**13,2%**	**6,9%**	**12,8%**	**6,9%**

NAMA Scenario Simulation

Energy Source	2014		2015		2016		2017		2018		2019		2020		2021	
	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	688,9	4.546,8	712,9	4.704,8	314,9	2.078,2	336,8	2.223,2	211,3	1.479,4	146,5	1.055,1	0,0	0,0	0,0	0,0
Natural Gas	0,0	0,0	0,0	0,0	360,0	2.838,2	360,0	2.838,2	480,0	3.784,3	520,0	4.099,7	640,0	5.307,2	680,0	5.523,9
Hydro	37,6	197,3	37,6	197,3	37,6	197,3	57,6	302,3	72,5	350,0	79,9	388,8	82,4	401,9	82,4	401,9
Wind	75,7	205,9	105,7	297,9	105,7	297,9	105,7	297,9	105,7	297,9	204,2	643,0	204,2	643,0	204,2	643,0
PV	0,0	0,0	0,0	0,0	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4	20,0	38,4
Biomass	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	20,5	109,5	35,5	177,8
Waste	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Total renewable	113,3	403,2	143,3	495,2	163,3	533,6	183,3	638,6	198,2	686,3	304,1	1.070,2	327,1	1.192,8	342,1	1.261,1
Total	802,2	4.950,0	856,2	5.200,0	838,2	5.450,0	880,1	5.700,0	889,5	5.950,0	970,6	6.225,0	967,1	6.500,0	1.022,1	6.785,0
Renewable participation (%)	**14,1%**	**8,1%**	**16,7%**	**9,5%**	**19,5%**	**9,8%**	**20,8%**	**11,2%**	**22,3%**	**11,5%**	**31,3%**	**17,2%**	**33,8%**	**18,4%**	**33,5%**	**18,6%**

Energy Source	2022		2023		2024		2025		2026		2027		2028	
	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Natural Gas	800,0	5.536,5	800,0	5.474,2	920,0	5.513,8	920,0	5.726,4	1.040,0	5.957,9	1.080,0	6.145,8	1.200,0	6.402,3
Hydro	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9	82,4	401,9
Wind	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0	204,2	643,0
PV	99,5	188,1	129,5	243,8	197,5	370,2	247,5	462,7	297,5	556,1	357,5	668,3	407,5	761,7
Biomass	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5	63,0	305,5
Waste	0,0	0,0	45,0	301,6	65,0	435,6	65,0	435,6	65,0	435,6	65,0	435,6	65,0	435,6
Total renewable	449,1	1.538,5	524,1	1.895,8	612,1	2.156,2	662,1	2.248,6	712,1	2.342,1	772,1	2.454,2	822,1	2.547,7
Total	1.249,1	7.075,0	1.324,1	7.370,0	1.532,1	7.670,0	1.582,1	7.975,0	1.752,1	8.300,0	1.852,1	8.600,0	2.022,1	8.950,0
Renewable participation (%)	**36,0%**	**21,7%**	**39,6%**	**25,7%**	**40,0%**	**28,1%**	**41,8%**	**28,2%**	**40,6%**	**28,2%**	**41,7%**	**28,5%**	**40,7%**	**28,5%**

Energy Source	2029		2030	
	Power Capacity in use (MW)	Power Generation (GWh/Year)	Power Capacity in use (MW)	Power Generation (GWh/Year)
Petroleum	0,0	0,0	0,0	0,0
Natural Gas	1.200,0	6.623,8	1.240,0	6.493,0
Hydro	82,4	401,9	82,4	401,9
Wind	204,2	643,0	204,2	643,0
PV	457,5	855,2	527,5	986,1
Biomass	63,0	305,5	63,0	305,5
Waste	65,0	435,6	65,0	435,6
Total renewable	872,1	2.641,2	942,1	2.772,0
Total	2.072,1	9.265,0	2.182,1	9.265,0
Renewable participation (%)	**42,1%**	**28,5%**	**43,2%**	**29,9%**