

# **Context to the Regional Study on GHG Mitigation Potential due to Grid Connected Renewable Energy Electricity in the Caribbean**

**Regional Workshop on Capacity Building and  
Lessons Learned for Development of CDM  
Programme of Activities (PoA) and NAMAs**

**Kingston, Jamaica  
25-27 September 2012**

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# 1. Context of the Study

- Implemented by URC with regional and in-country support.
- Part of the regional activities being implemented as part of execution of the ACP-MEA Project in the Caribbean.
- Emphasis on identification of opportunities for mitigation within the energy sector at a regional program level.
- Provision of value added to identified stakeholders interested in pursuing programmes of action by assessing early stage opportunities.

# Geographical scope



# Countries included

- At a general contextual level

1. Antigua y Barbuda
2. Bahamas
3. Barbados
4. Belice
5. Cuba
6. Dominica
7. Granada
8. Guyana
9. Haití
10. Jamaica
11. República Dominicana
12. San Cristóbal y Nieves
13. Santa Lucía
14. San Vicente y las Granadinas
15. Surinam
16. Trinidad y Tobago.

At a more specific level (to be decided upon expressed interest and identifiable potentials)

# General indicators of the countries involved

No.	País	Superficie terrestre Km <sup>2</sup> (c)	Población 2009 10 <sup>3</sup> hab <sup>(b)</sup>	PIB 2009 10 <sup>6</sup> USD 2005 (b)	PIB por hab USD 2005
1.	Antigua y Barbuda	443	88	1079	12495
2.	Bahamas	13940	338	7483	22139
3.	Barbados	431	273	4393	14868
4.	Belice	22966	305	1343	4016
5.	Cuba	110860	11202	62278	4833
6.	Dominica	754	68	481	6293
7.	Granada	344	104	775	6471
8.	Guyana	214970	753	2025	2070
9.	Haití	27750	9927	6478	458
10.	Jamaica	10991	2731	12289	4135
11.	República Dominicana	48442	9770	46597	4488
12.	San Cristóbal y Nieves	261	52	688	10814
13.	San Vicente y las Granadinas	389	109	678	5584
14.	Santa Lucía	616	172	1105	5823
15.	Surinam	163270	520	2178	3402
16.	Trinidad y Tobago	5128	1336	19661	14208
		<b>Total</b>	<b>Total</b>	<b>Total</b>	<b>Promedio</b>
		<b>621555</b>	<b>37748</b>	<b>169531</b>	<b>4491</b>

(a) – OLADE –SIEE, 2010;

(b) – CEPAL, Anuario estadístico de América Latina y el Caribe, 2011

(c) - <http://www.celac.gob.ve/> (CELAC. Página oficial)

**SIDS countries**

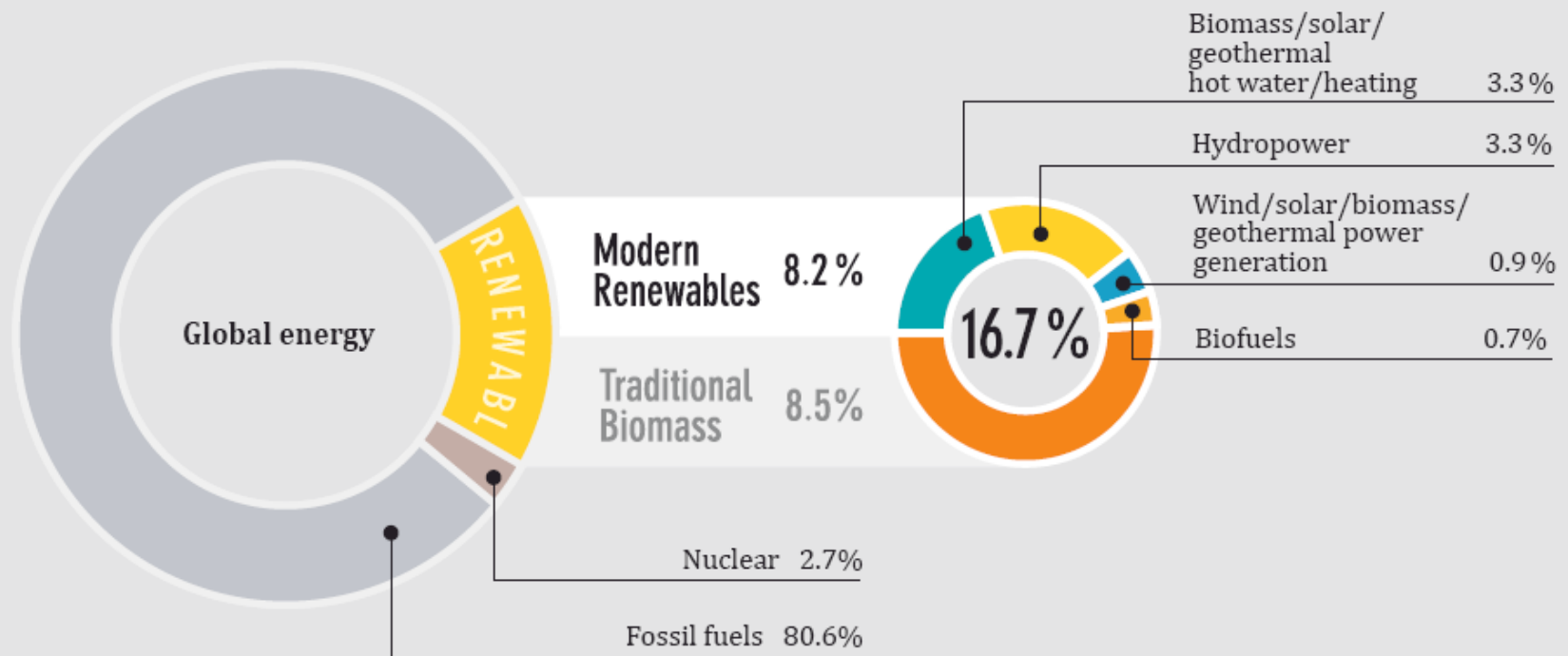
**Diversity**

**Complexities**

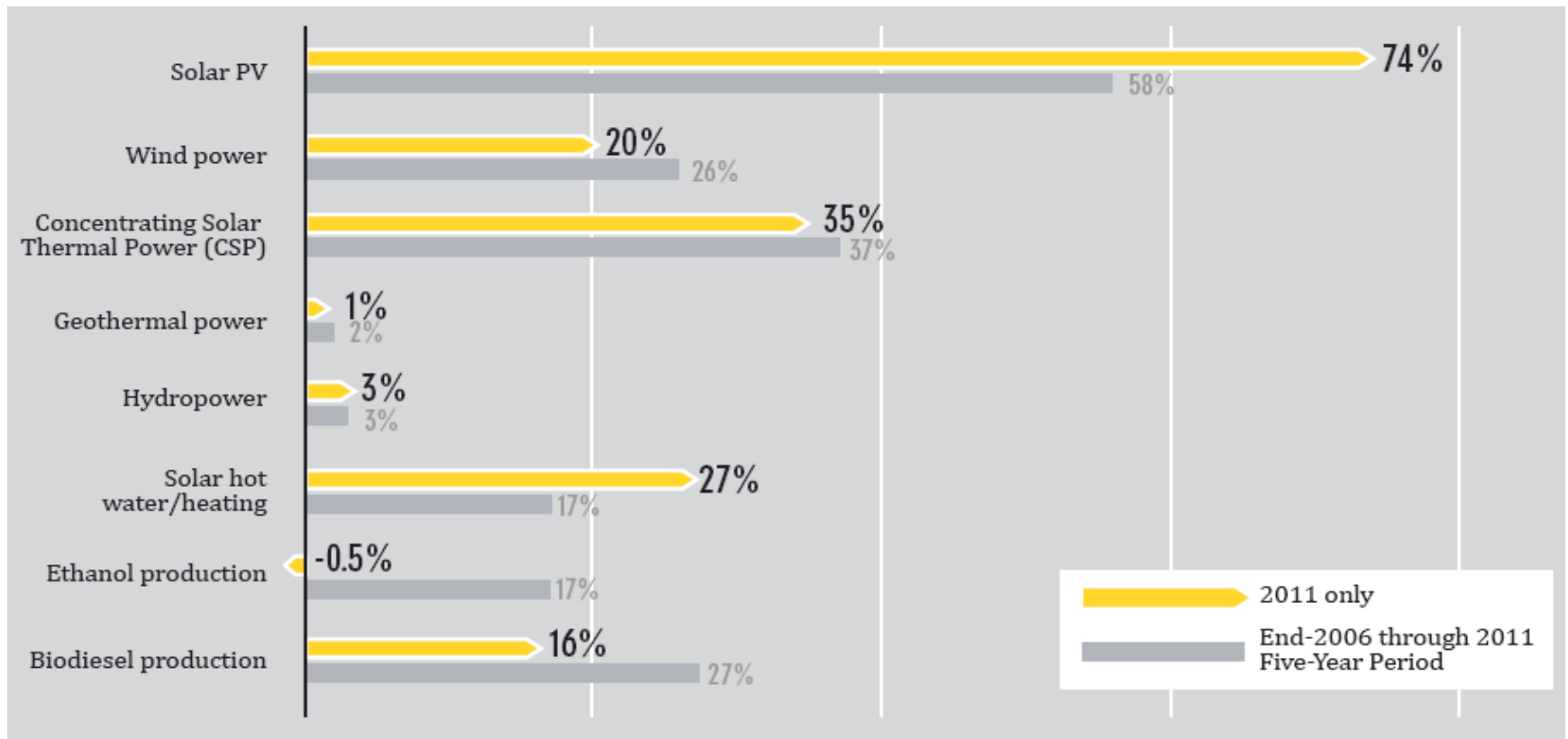
**Opportunities**

# 2. Renewable energy worldwide (REN21,2012)

FIGURE 1. RENEWABLE ENERGY SHARE OF GLOBAL FINAL ENERGY CONSUMPTION, 2010

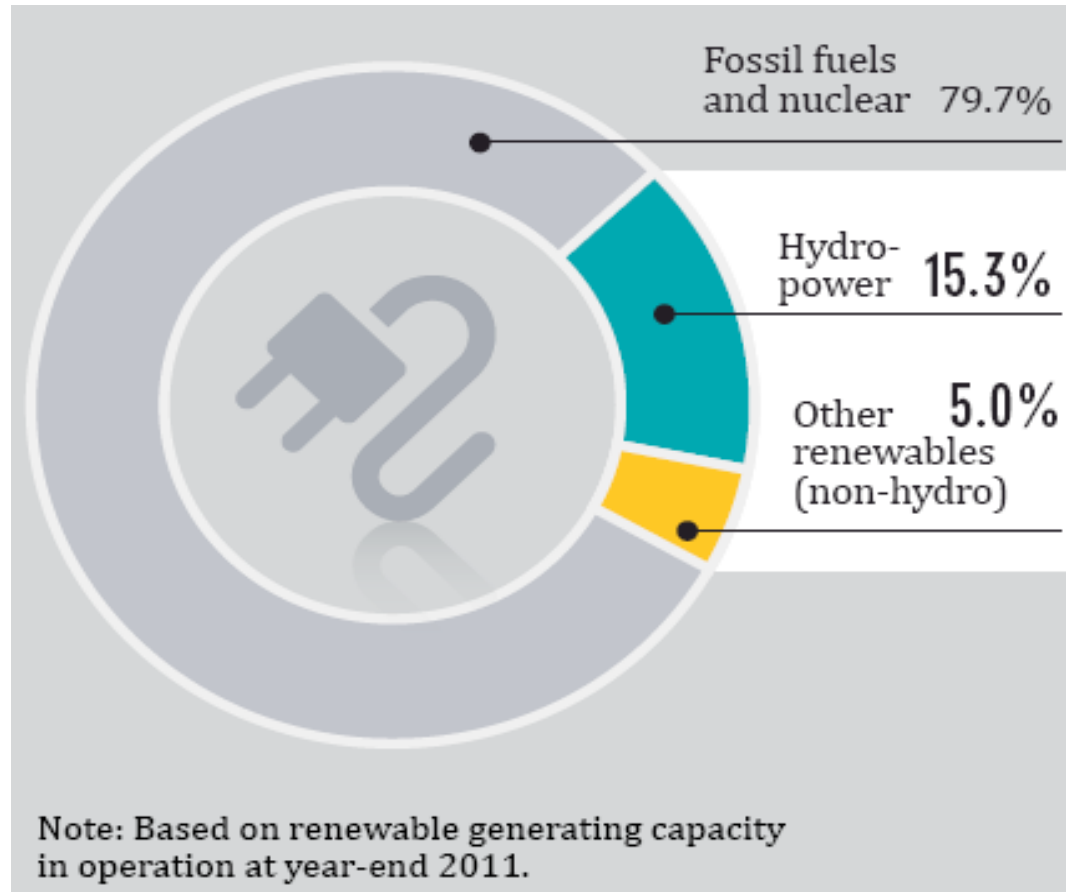


# Average growth rates of RE capacity and biofuels production 2006-2011

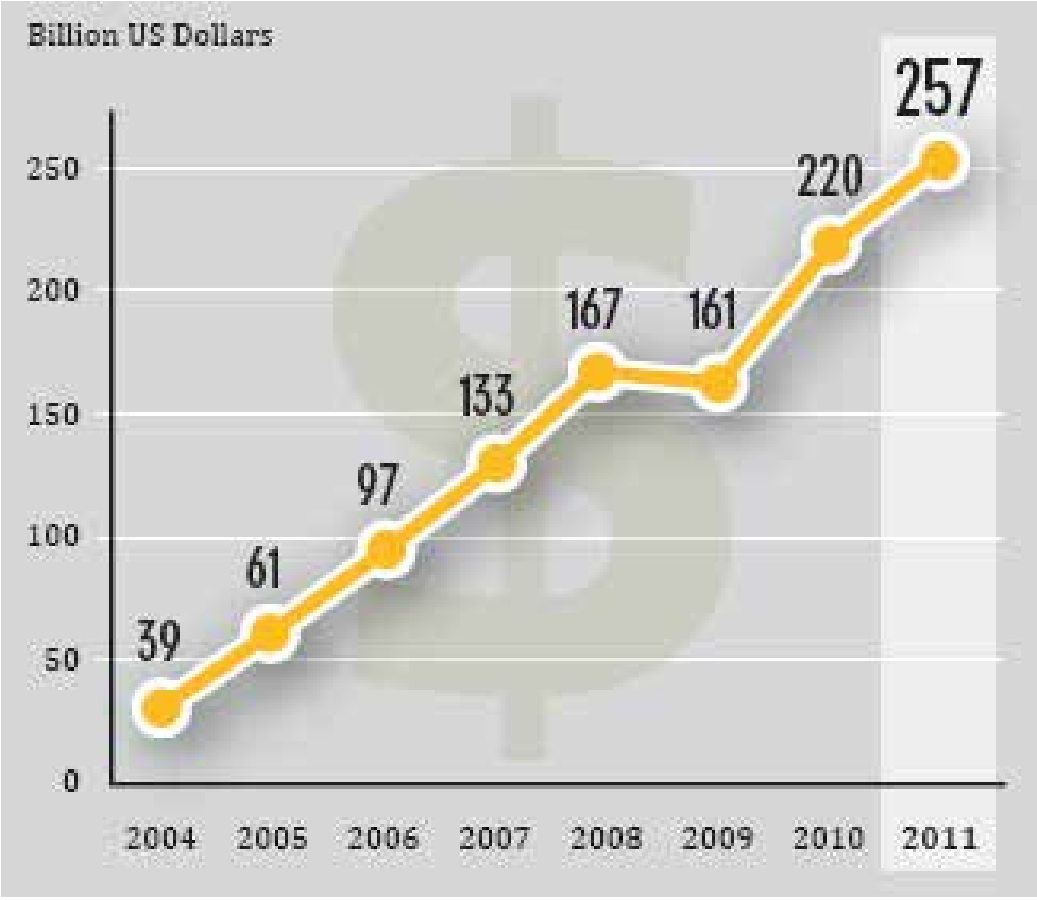




# Estimated renewable energy share of global electricity production in 2011



# Global new investments 2004-2011



# 2012 | POLICY MAPS

FIGURE 23. COUNTRIES WITH POLICIES, EARLY 2012



# +9

**NEW COUNTRIES  
DEFINED RENEWABLE ENERGY  
TARGETS IN 2011**

FIGURE 24. COUNTRIES WITH POLICIES, 2005



THE NUMBER OF COUNTRIES WITH RENEWABLE TARGETS MORE THAN DOUBLED BETWEEN 2005 AND 2012. A LARGE NUMBER OF CITY AND LOCAL GOVERNMENTS ARE ALSO PROMOTING RENEWABLE ENERGY.



## Regulatory policies

## Fiscal incentives

## Public Financing

# Summary of international situation

		2009	→	2010	→	2011
Investment in new renewable capacity (annual) <sup>1</sup>	billion USD	161	→	220	→	257
Renewable power capacity (total, not including hydro)	GW	250	→	315	→	390
Renewable power capacity (total, including hydro) <sup>2</sup>	GW	1,170	→	1,260	→	1,360
Hydropower capacity (total) <sup>2</sup>	GW	915	→	945	→	970
Solar PV capacity (total)	GW	23	→	40	→	70
Concentrating solar thermal power (total)	GW	0.7	→	1.3	→	1.8
Wind power capacity (total)	GW	159	→	198	→	238
Solar hot water/heat capacity (total) <sup>3</sup>	GW <sub>th</sub>	153	→	182	→	232
Ethanol production (annual)	billion litres	73.1	→	86.5	→	86.1
Biodiesel production (annual)	billion litres	17.8	→	18.5	→	21.4
Countries with policy targets	#	89	→	109	→	118
States/provinces/countries with feed-in policies <sup>4</sup>	#	82	→	86	→	92
States/provinces/countries with RPS/quota policies <sup>4</sup>	#	66	→	69	→	71
States/provinces/countries with biofuels mandates <sup>5</sup>	#	57	→	71	→	72

# Issues for discussion

- Trends in LAC, SIDS?
- Policy and stakeholder contexts.
- Asymmetries of participation in the scaling up of renewable energy development, absorptive capacities.
- Mobilizing financing schemes required.
- Many others ...

# 3. Caribbean energy situation

No.	País	Consumo final de energía 2009 <sup>(a)</sup> 10 <sup>3</sup> bep	Consumo final per cápita <sup>(a)</sup> bep /hab	Intensidad energética 2009 <sup>(a)</sup> bep / 10 <sup>3</sup> US\$ 2000
1.	Barbados	2202,61	8,60	1,16
2.	Cuba	64057,55	5,72	1,30
3.	Granada	537,27	5,17	1,16
4.	Guyana	6032,86	7,92	8,69
5.	Haití	17715,73	1,98	4,54
6.	Jamaica	19656,44	7,23	2,02
7.	República Dominicana	38738,76	3,97	1,06
8.	Surinam	4539,18	8,73	4,01
9.	Trinidad y Tobago	90148,86	12,77	6,14
Total		243629,26	6,65*	1,56**

UN CLASE CITE 2010

No	País	Capacidad total instalada (MW)	Termo (MW)	Hidro	Otros*
1.	Antigua y Barbuda <sup>(a)</sup>	90,20	90,20		
2.	Bahamas <sup>(a)</sup>	584,80	584,80		
3.	Barbados <sup>(b)</sup>	214,71	214,71		
4.	Belice	nd			
5.	Cuba <sup>(b)</sup>	5522,60	5456,90	58,0	7,70
6.	Dominica <sup>(a)</sup>	23.615	17.17	6.42	0.025
7.	Granada <sup>(a)</sup>	51,154	51,00	0,08	0,074
8.	Guyana <sup>(b)</sup>	308,00	307,50	0,50	0,0
9.	Haití <sup>(b)</sup>	240,00	178,00	62,00	0,0
10.	Jamaica <sup>(b)</sup>	840,70	798,50	21,50	20,70
11.	República Dominicana <sup>(b)</sup>	2992,55	2469,42	523,13	0,0
12.	San Cristobal y Nieves <sup>(a)</sup>	52,40	50,80		1,60
13.	San Vicente y las Granadinas	16,6 <sup>(c)</sup>	11,5**	5,1**	
14.	Santa Lucía <sup>(a)</sup>	76,10	76,00		0,10
15.	Surinam <sup>(b)</sup>	389,00	200,00	189,00	
16.	Trinidad y Tobago <sup>(b)</sup>	1424,70	1424,70		
		12827,129	11931,2	865,73	30,199

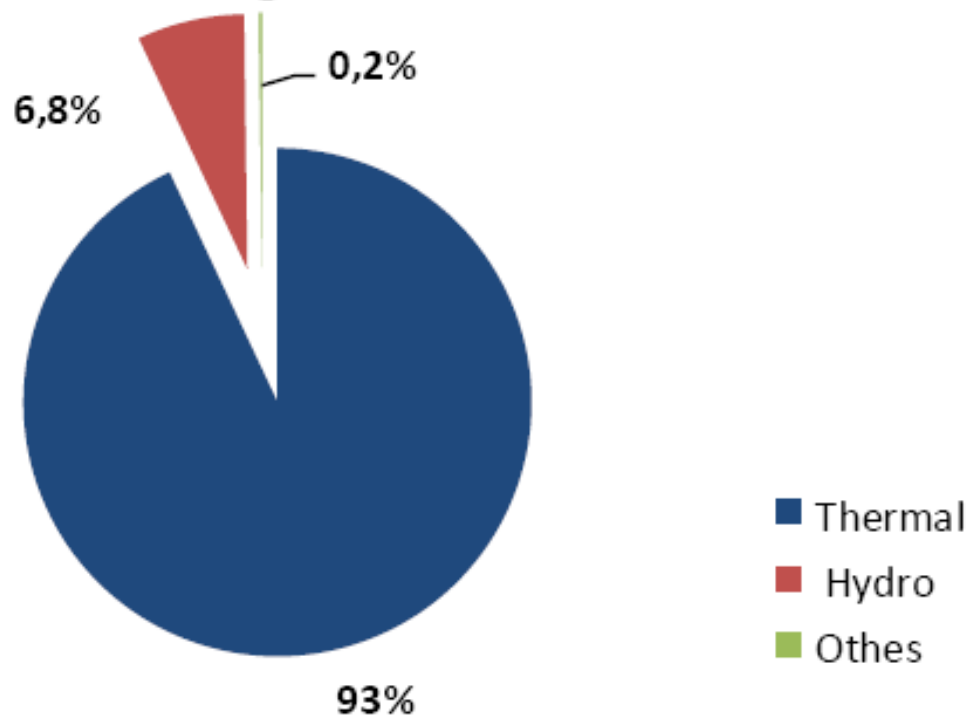
(a) - Energy Policy and Sector Analysis in the Caribbean (2010-2011), Assessing Antigua and Barbuda; the Bahamas, Dominica, Grenada, St. Lucia, St. Kitts and Nevis; and St. Vincent and the Grenadines, NREL, OAS.

(b) OLADE – SIEE, 2010

(c) – Initial National Communication on Climate Change St. Vincent and the Grenadines

# Power generation

### Installed capacity structure (%) in the Caribbean region





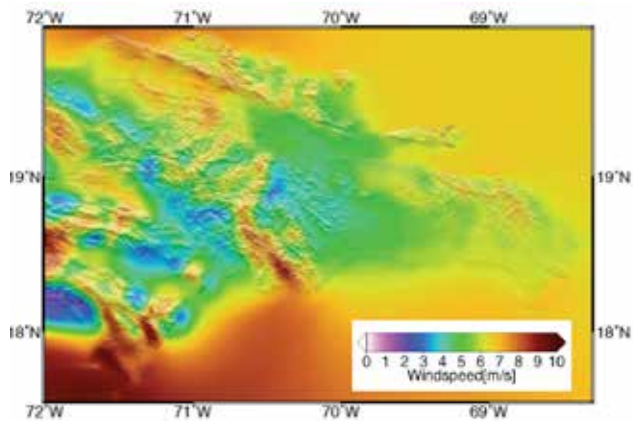
# To take note (WB, 2012) ...

- a) The Caribbean is a diverse region with disparate energy needs, ranging from large island nations with millions of people, such as the Dominican Republic and Puerto Rico, to extremely small ones with a few thousand inhabitants, such as Anguilla and St. Kitts and Nevis.
- b) The main challenge of these countries is similar: supplying a growing energy demand in a reliable and efficient manner.
- c) Given the distinct nature of the countries and the energy needs, no single development path will be suitable for all countries, and it is important to consider the various options.
- d) The countries of the Caribbean region face numerous energy challenges. Most urgently, they must manage their high and growing dependence on the imported oil and oil products that fuel their domestic economies.

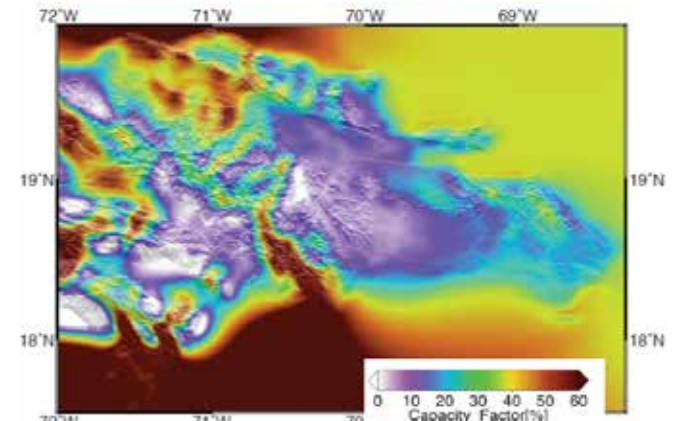
# AS WB (2011) has reported

Fuel Type	Technology	Usage in the Region	Potential
Oil	Distillate (MSD, LSD, GT)	Wide	Wide usage likely to continue without intervention.
	HFO (MSD, LSD, GT)	Wide	Wide usage likely to continue without intervention.
Coal	Coal (PC, CFB)	Limited	Potentially viable for many islands, but environmental externalities should be considered before implementation.
Natural Gas	LNG	Limited	Potential limited to countries with high demand.
	Mid-Scale LNG	None	Potential for many countries, but not studied in detail since it is a nascent technology.
	CNG	None	Potential limited to countries with high demand, but not studied in detail since the technology is nascent.
	Pipeline Gas	Trinidad and Tobago	Potential for other countries is limited to those few that a pipeline (not yet developed or agreed to) could reach.
Renewable	Solar Photovoltaics	Very limited	Potential, but capital costs are still high.
	Concentrating Solar Power	None	Potential limited by solar influx and land availability.
	Wind	Limited	Large potential on most islands.
	Geothermal	Very limited	Large potential on certain islands with resources.
	Hydro	Limited	Large potential limited to a few countries with rivers of note.
	Biomass	Very limited	Large potential, but further assessments are needed to identify specific sites.
	Emerging technologies (wave, tidal, OTEC, etc).	None	Potentially large, but not examined in this study.

# Wind in Dominican Republic (WRI)

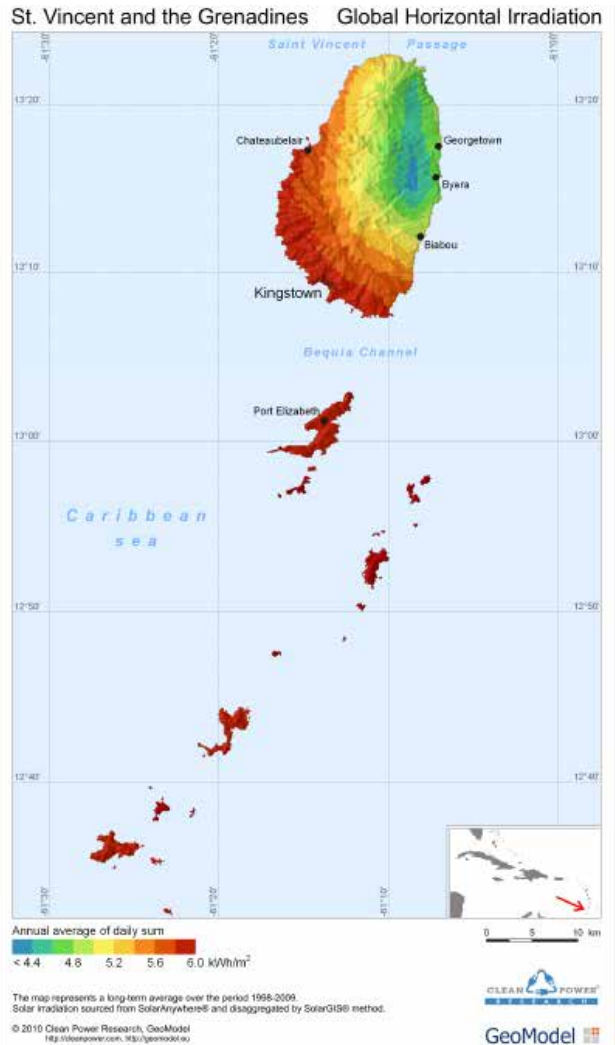


Plot of the long-term mean wind speed at 80m above the surface level. The data is averaged over the entire period.



Plot of the long-term mean capacity factor at 80m above the surface level. The data is averaged over the entire period.

# Solar in some countries (NREL, OAS)

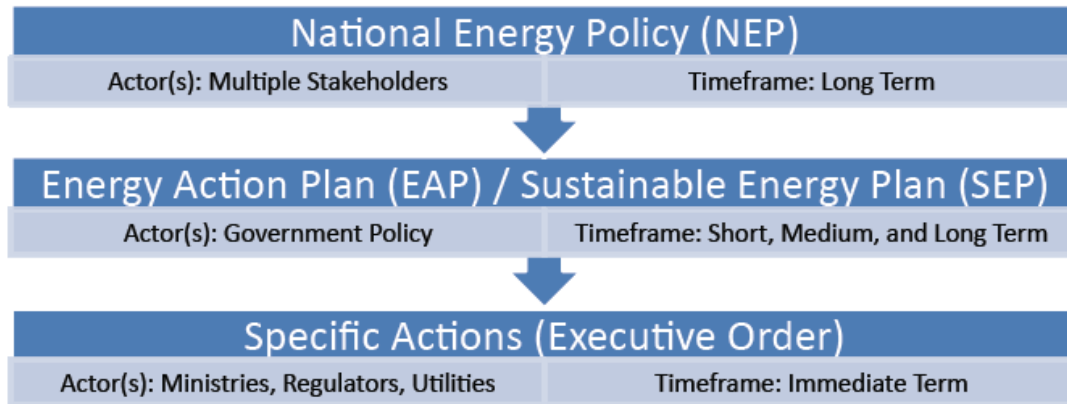


# Renewable energy potential is interesting

No.	País	Hidro (MW)	Eólica (MW)	Solar FV (MW)
1.	Antigua y Barbuda <sup>(a)</sup>	None indicated	400	27
2.	Bahamas <sup>(a)</sup>	None indicated	58	58
3.	Barbados <sup>(e)</sup>	0,0	60	5
4.	Belice <sup>(c)</sup>	46,4	250	40
5.	Cuba <sup>(d)</sup>	848	2005	2110
6.	Dominica <sup>(a)</sup>	17	30	45
7.	Granada <sup>(a)</sup>	0,5	20	Unknown
8.	Guyana			
9.	Haití	137,00 <sup>(b)</sup>		
10.	Jamaica <sup>(f)</sup>	25,00	40	
11.	República Dominicana	2095,00 <sup>(b)</sup>		
12.	San Cristóbal y Nieves <sup>(e)</sup>	None indicated	5	16
13.	San Vicente y las Granadinas <sup>(a)</sup>	10	8	23
14.	Santa Lucía <sup>(d)</sup>	0,15	40	36
15.	Surinam	2420 <sup>(b)</sup>		
16.	Trinidad y Tobago			
<b>Total</b>		<b>5599,05</b>	<b>2916,0</b>	<b>2360,0</b>

No.	País	Biomasa (MW)	Geotérmica	Otras	Potencial total (MW)
1.	Antigua y Barbuda <sup>(a)</sup>	Unknown	None indicated		427
2.	Bahamas <sup>(a)</sup>	1	None indicated		73
3.	Barbados <sup>(e)</sup>			50	125
4.	Belice <sup>(c)</sup>				336,4
5.	Cuba <sup>(b)</sup>	1340		2185*	8488
6.	Dominica <sup>(a)</sup>	Unknown	300		392
7.	Granada <sup>(a)</sup>	Unknown	Unknown		5,5
8.	Guyana				
9.	Haití				137,0
10.	Jamaica <sup>(f)</sup>			30**	95,0
11.	República Dominicana				2095
12.	San Cristóbal y Nieves <sup>(a)</sup>	10	300		331
13.	San Vicente y las Granadinas <sup>(a)</sup>	4	100		145
14.	Santa Lucía <sup>(d)</sup>		170		246,15
15.	Surinam				2420
16.	Trinidad y Tobago				
<b>Total</b>		<b>1355</b>	<b>870</b>	<b>2265,0</b>	<b>15265,05</b>

# Policies and regulations (OAS, 2012)



Nation	NEP		EAP / SEP		Notes
	Status	Date	Status	Date	
<b>Antigua and Barbuda</b>	Adopted	Nov 2011	-	-	NEP includes an action plan
<b>Bahamas</b>	-	-	Final	Sept 2010	The Energy Policy statements normally included in a NEP form integral part of the 1 <sup>st</sup> (Nov 2008) and 2 <sup>nd</sup> Reports (EAP) of the National Energy Policy Committee (established in 2008)
<b>Dominica</b>	Draft	2011	Draft	2011	
<b>Grenada</b>	Adopted	2011	-	-	NEP includes an action plan
<b>St. Kitts and Nevis</b>	Draft	2011	Draft	2011	As per December 2011, the NEP and EAP were being finalized
<b>St. Lucia</b>	Adopted	June 2010	Adopted	2006	SEP (GSEII) approved before conclusion of NEP
<b>St. Vincent and the Grenadines</b>	Adopted	Feb 2009	Adopted	April 2010	First SIDS among project countries to adopt both NEP and EAP

# Issues for discussion

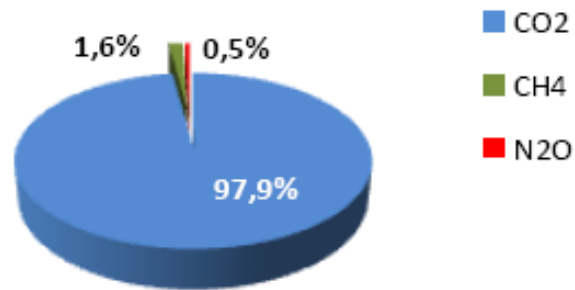
- Types of energy transitions in the region.
- Renewable energy vs. clean energy options.
- New approaches to see the electricity sector and planning and decision making.
- Investment flows and structures.
- Regulatory practices.
- Technology and resource options.

**Please add up your perspectives**

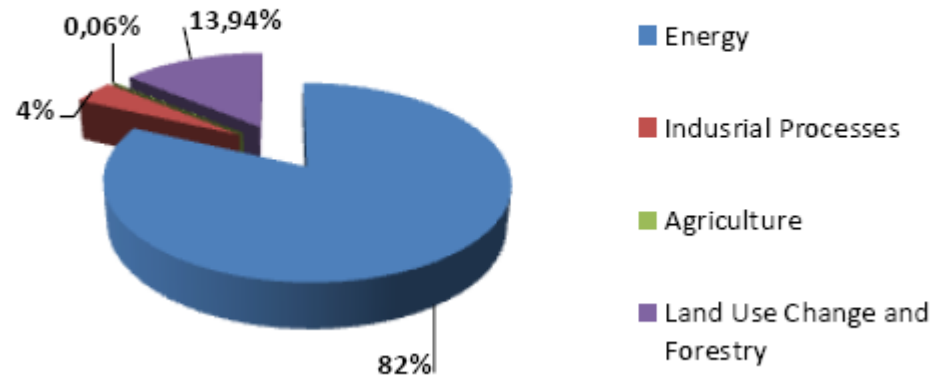


# 4. GHG emissions in the region

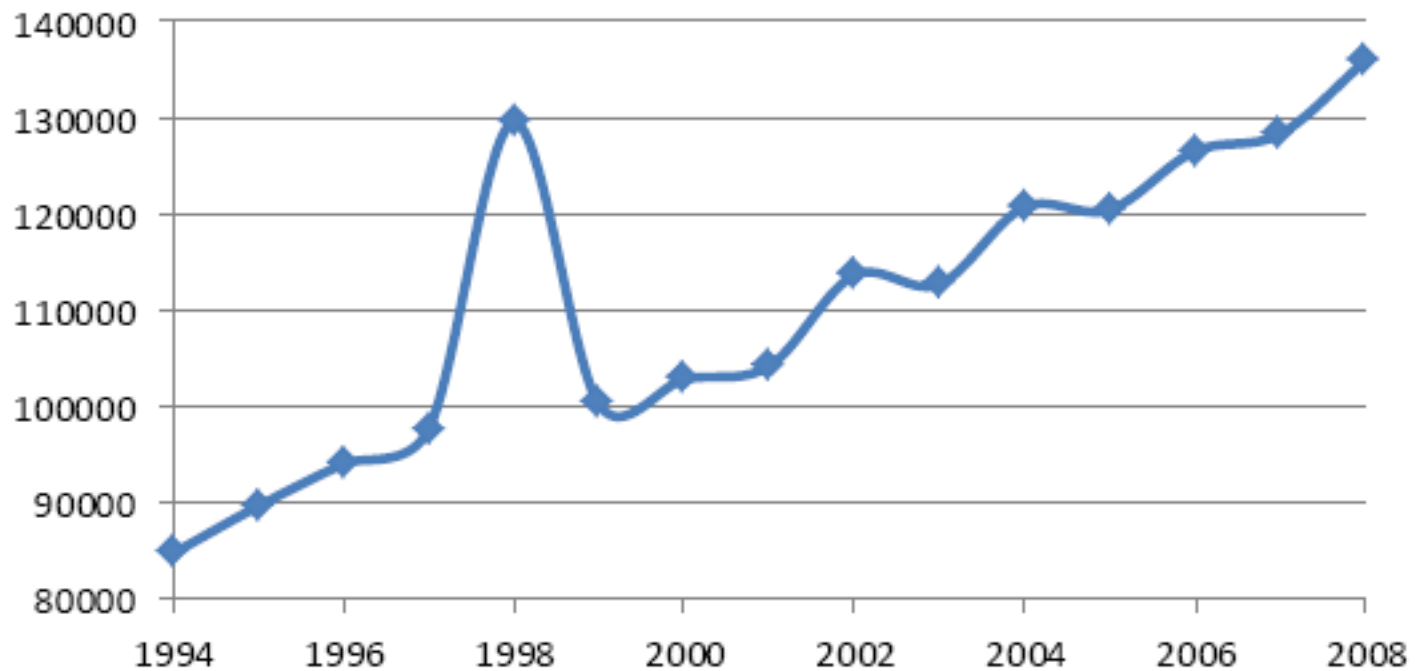
Estructura de las emisiones de GEI en el Caribe



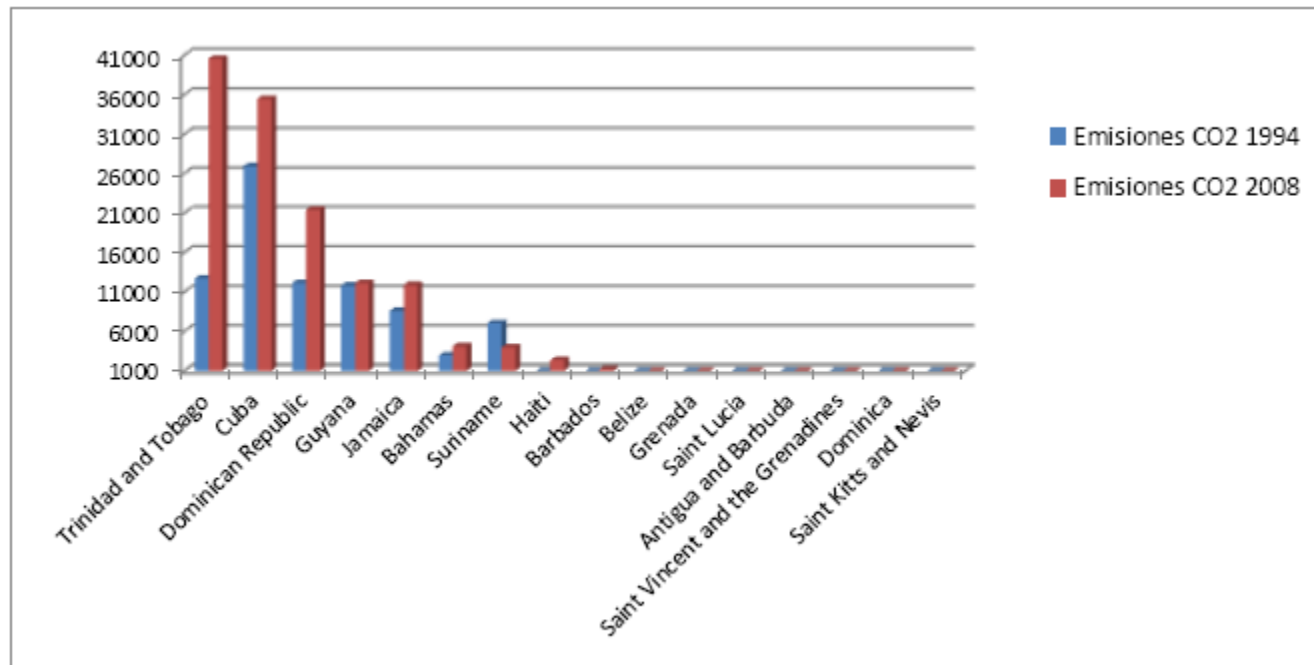
CO2 Source Category



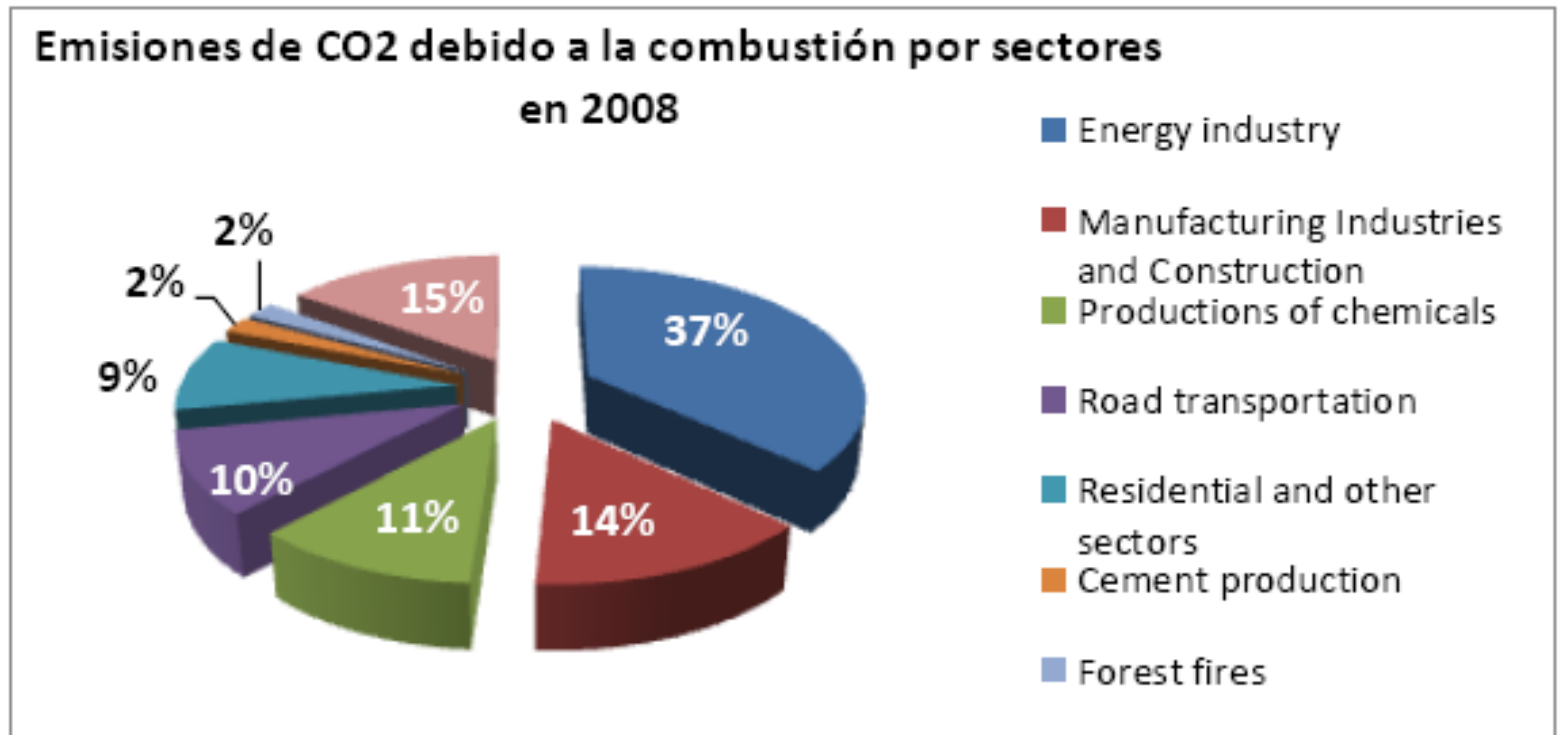
# Evolution of emissions due to combustion



# Emissions due to combustion by country



# CO2 emissions due to combustion by sectors



# Issues for discussion

- Due to country size, different sectors are perhaps drivers of emissions.
- State of action on mitigation actions and goals.
- Can energy issues and climate issues become a restriction, an opportunity or not?

**Many others to discuss**

# Final remarks

- On going appraisal of the region s opportunities for synergies in next phase of study.
- Feedback and support from in-country and regional institutions in improving initial data and focusing opportunities.
- Establishing initial building blocks for action at the PoA, or NAMA level ? but certainly a contribution for preparedness and capacity building in the region.