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PROSPECTS FOR THE OIL-IMPORTING COUNTRIES OF THE CARIBBEAN

BY

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Abstract

As a region the Caribbean countries are net exporters of hydrocarbons. However, all exports of natural gas and crude oil are concentrated in one country, Trinidad and Tobago. The rest of the region taken as a whole is net importer of hydrocarbons. The largest countries in the region are heavily dependent on imported crude oil and products as their main source of primary energy. The trend has intensified over recent years. Net-importing countries in the region have more than doubled their annual per capita consumption of oil over the last two decades. Trinidad and Tobago could supply the region's hydrocarbon needs. However, very little effort has been made by the importing countries to substitute gas from Trinidad and Tobago for oil from other extra regional sources. There are a number of initiatives under way to reduce the region's dependence on imported hydrocarbons: Eastern Caribbean Gas Pipeline (ECGP); Eastern Caribbean Geothermal Energy Project (Geo-Caraïbes); Caribbean Renewable Energy Development Programme (CREDP); Petrocaribe Energy Cooperation Agreement and Production of Biofuels. The IDB together with CARICOM and the Caribbean Development Bank are concentrating efforts in to promote the development of biofuels in the region, with specific programs in the Dominican Republic, Haiti, Jamaica, and Trinidad and Tobago. Furthermore, there individual country efforts to implement mid-term plans to increase their energy efficiency and diversify their Energy Matrices away from oil, among these countries it is worth highlighting: Jamaica, Guyana and Barbados. Finally, the IDB is sponsoring a number of technical studies with the objectives of developing renewable energy and increasing energy efficiency. Beyond these initiatives, an avenue that is worth exploring is enhancing regional integration, especially through small-scale trading of natural gas between Trinidad and Tobago and the rest of the Caribbean.

JEL Classifications: F15, N76, 054, Q41.

Current Energy Context

Caribbean countries¹ are highly dependent on hydrocarbons for their energy needs. Table 1² demonstrates that the vast majority of primary energy consumed in 2005 was oil, while gas consumption played an important role in the energy matrices of Trinidad and Tobago, the Dominican Republic, and Barbados.³ Trinidad and Tobago and Suriname, the two largest hydrocarbon-producing countries, rely on hydrocarbons for 94 and 72 percent of their energy consumption, respectively. Jamaica, which depends on fuel oil for its bauxite/aluminum industry, is the second most dependent (79 percent). Barbados and the Dominican Republic count on hydrocarbons for more than 60 percent of their energy. Guyana and Haiti – the two poorest countries in this group – are less dependent on hydrocarbons because they rely on less expensive primary energy sources – firewood and bagasse – for more than half of their energy consumption.

Although the region is a net exporter of hydrocarbons, all Caribbean countries, except for Trinidad and Tobago, rely on imports to satisfy their consumption of hydrocarbons.⁴ The major Caribbean importing countries⁵ had net imports of 179,000 barrels of oil per day (mbd) and 23,000 oil equivalent barrels per day (mboepd) of natural gas in 2005. The region's dependence on oil reflects its inability to diversify its energy sources. Caribbean countries have not expanded their consumption of natural gas significantly despite Trinidad and Tobago's high production levels. Nor have they realized their potential for solar, wind, hydropower, and geothermal energy use, in spite of recent efforts in this area. If the current context of rising petroleum prices persists, the reliance of all Caribbean countries – except Trinidad and Tobago – on imported hydrocarbons, especially oil from outside the region, will have an adverse long-run impact on the region's competitiveness.

Table 1. Final Consumption of Primary Energy & Hydrocarbons Products 2005 (% of total energy and mboe/year/10,000 persons)												
	Oil + Products		Gas + Products		Coal		Firewood		Bagasse		Total Primary + Products	
	%	pc	%	pc	%	pc	%	pc	%	pc	%	pc
Barbados	54%	40.8	8%	2.0	0%	0.0	0%	0.0	11%	8.3	73%	54.8
DR	47%	20.0	14%	0.0	0%	0.0	13%	5.5	5%	2.0	78%	33.3
Guyana	40%	29.1	1%	0.0	0%	0.0	32%	23.2	19%	13.9	92%	67.3
Haiti	26%	5.2	1%	0.0	0%	0.0	63%	12.3	3%	0.6	92%	18.2
Jamaica	77%	80.1	2%	0.0	1%	1.1	2%	1.9	2%	2.4	84%	87.8
Suriname	68%	69.6	4%	0.0	0%	0.0	7%	7.5	0%	0.0	79%	81.1
T&T	7%	38.4	87%	476.0	0%	0.0	0%	0.0	0%	1.4	94%	518.8

Source: OLADE; World Bank World Development Indicators (WDI).

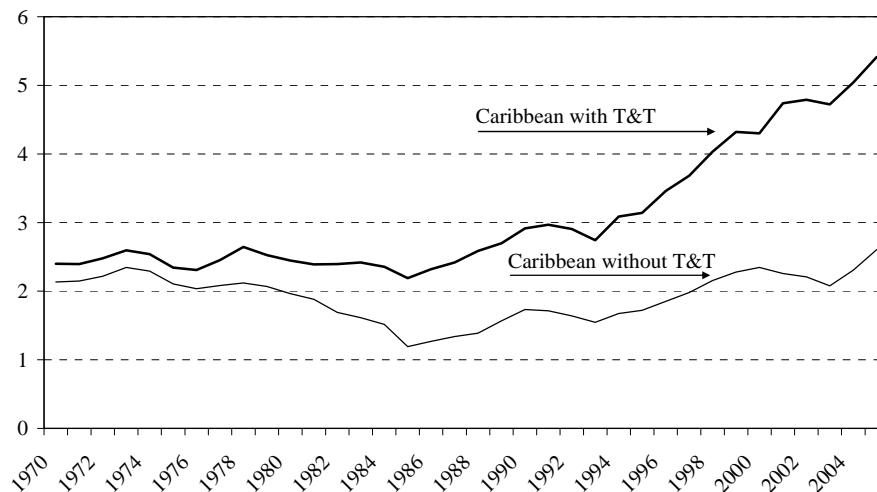
Recent Energy Trends

Consumption

The current regional dependence on imported oil is part of a trend of increasing consumption in hydrocarbons. Figure 1 demonstrates that per capita consumption of hydrocarbons in Caribbean countries has increased steadily since 1985. Net-importing countries in the region have more than doubled their annual per capita consumption of barrels of oil equivalent over the past two decades, reaching 2.6 in 2005. Per capita consumption has remained high in Suriname due to its rising oil production and has increased markedly for Jamaica since the mid-1990s as a result of growing demand from the electricity generation, transportation, and especially bauxite/aluminum industries.

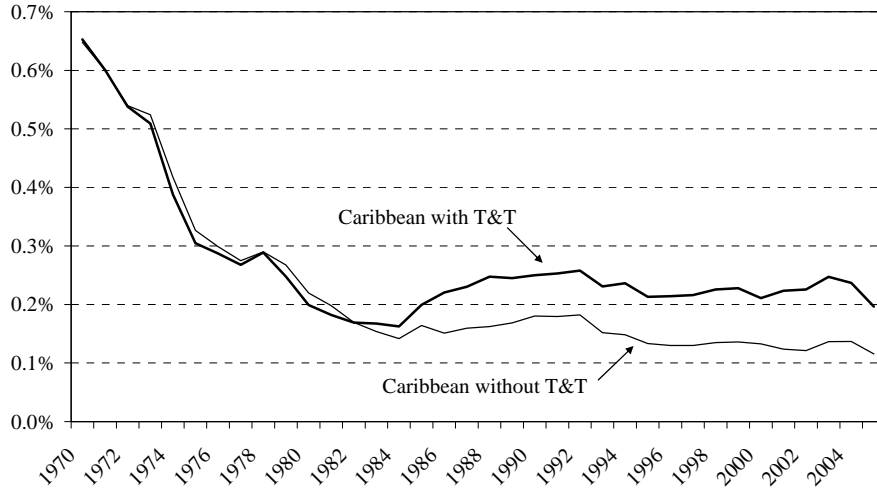
At the same time, the region has become more efficient in its consumption of hydrocarbons in relation to GDP (current US\$). Figure 2 shows that consumption has decreased from 0.16 to 0.12 percent of GDP for Caribbean importers since 1985. Suriname and Guyana, historically the least efficient consumers outside Trinidad and Tobago, have improved efficiency in recent years but remain significantly less efficient than the average. In contrast, Jamaica – also below average – experienced efficiency losses between 2000 and 2005.

Figure 1. Final Consumption of Hydrocarbons (boe/capita) 1970-2005



Source: OLADE; WDI.

Figure 2. Final Consumption of Hydrocarbons (boe/GDP) 1970-2005



Source: OLADE; WDI.

Production

Hydrocarbon production has increased dramatically in the past decade largely due to Trinidad and Tobago's advances in production. Figure 3 demonstrates that Trinidad and Tobago's share of production ranges between 97 and 100 percent of the region's total between 1970 and 2005, with small contributions by Barbados and Suriname. The recent production gains in hydrocarbons are almost entirely the result of natural gas; oil production has slowly declined since the late 1970s, as depicted in Figure 4.

Figure 3. Total Hydrocarbons Production by Country (mboed) 1970-2005

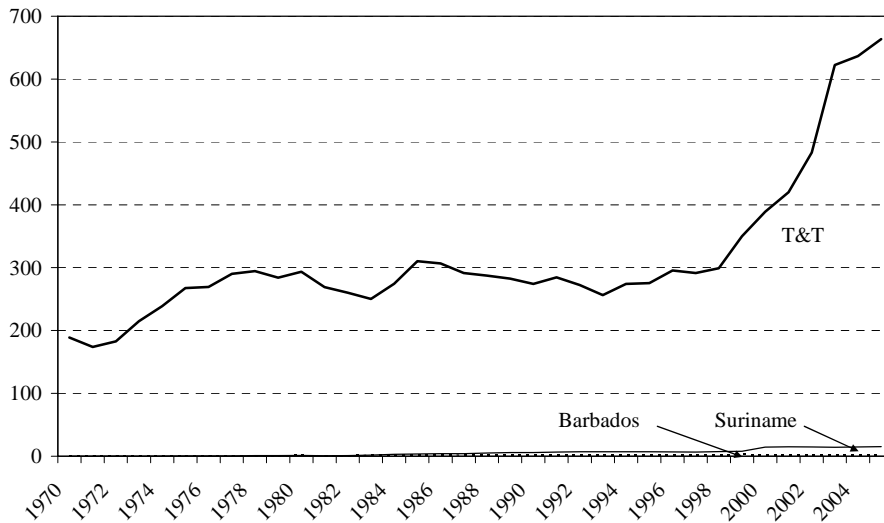
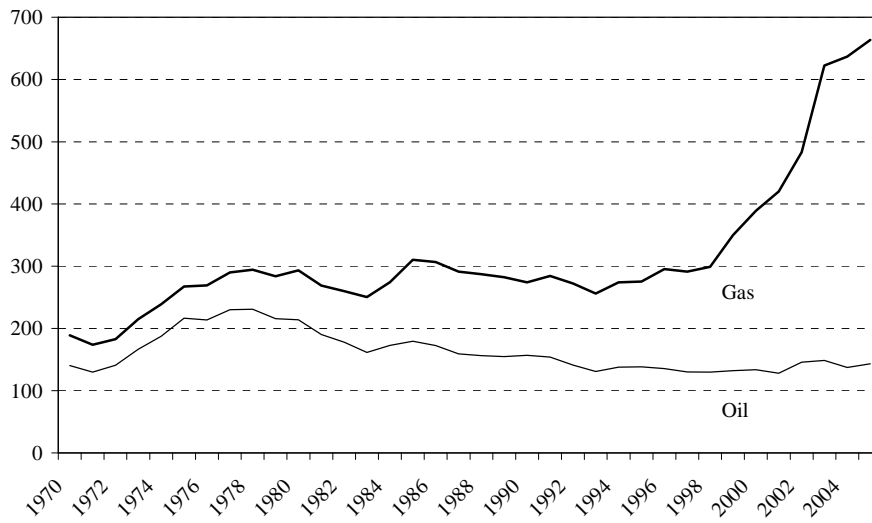


Figure 4. Total Hydrocarbons Production by Energy Source (mboed) 1970-2005



Source of Figures 3 and 4:: OLADE.

Exports and Imports

Trinidad and Tobago is the only significant hydrocarbon exporter in the region, with net exports of approximately 389,000 barrels of oil equivalent per day of hydrocarbons and products in 2005, 72 percent of which were natural gas. Figure 5 shows that Trinidad and Tobago's hydrocarbon exports could potentially supply all of the region's hydrocarbon needs. As seen in Figure 6, it has current capacity to supply half of the crude net imports of the region, which is expected to increase significantly after recent offshore discoveries by BHP Billiton.⁶ The country can easily make up the shortfall in petroleum supply with natural gas. But in spite of the known consequences of oil dependence and the available supply of natural gas, the region generally has been unable to tap into Trinidad and Tobago's supply and has only recently begun efforts to substitute natural gas for petroleum, as seen in Figure 7. Instead, Trinidad and Tobago exports most of its natural gas to the United States. In 2005, 71 percent of Trinidad and Tobago's liquefied natural gas went to the United States.⁷

Figure 5. Hydrocarbons: Net Exports of T&T vs. Net Imports of Other Caribbean Countries (mboepd) 1970-2005

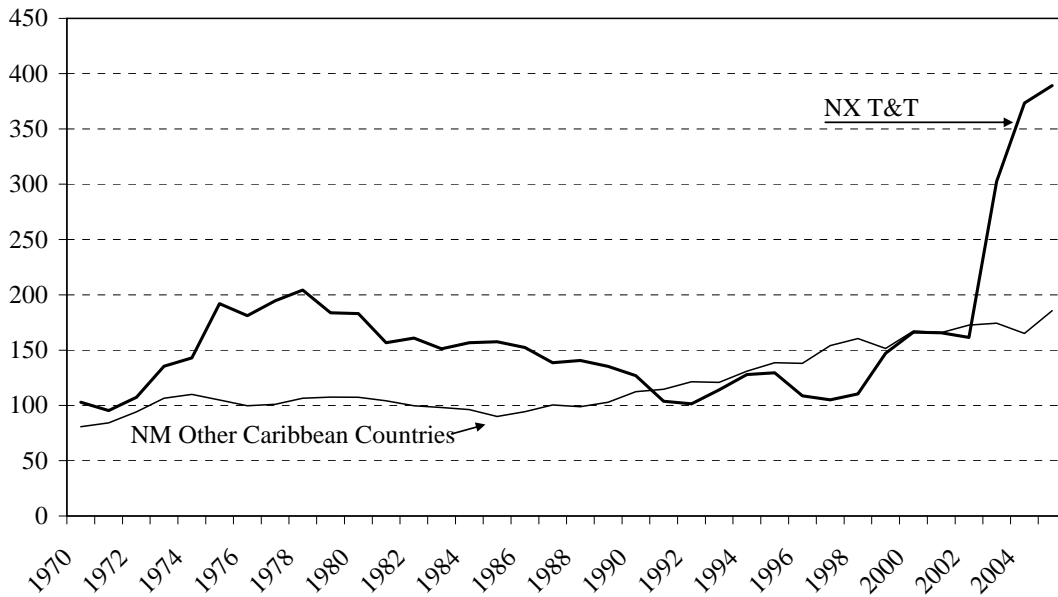


Figure 6. Hydrocarbons: Net Exports of T&T vs. Net Imports of Other Caribbean Countries (mboepd) 1970-2005

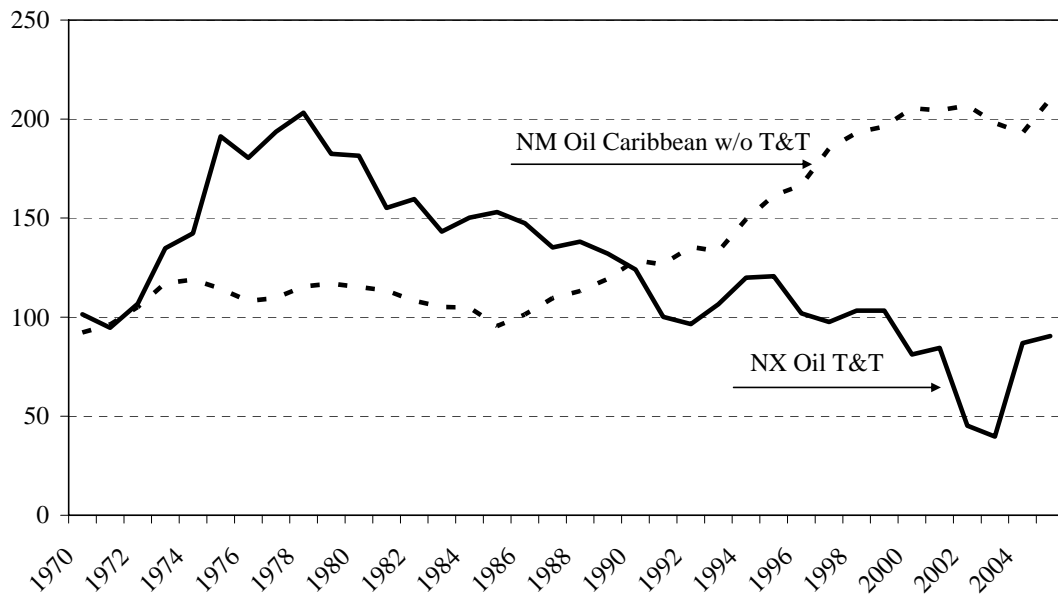
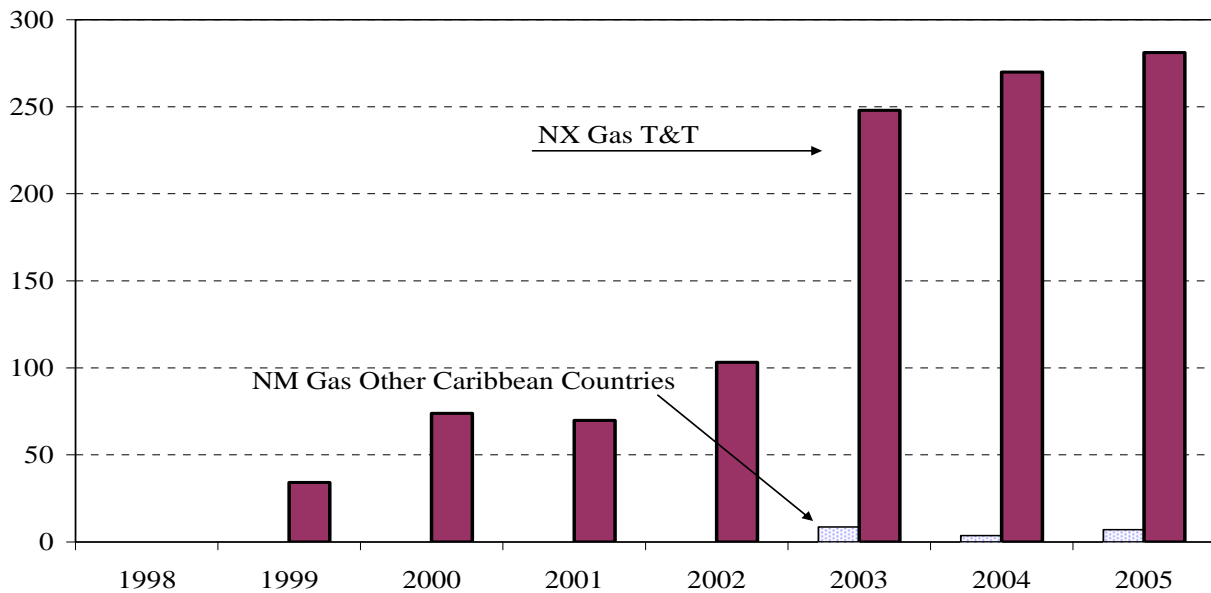


Figure 7. Natural Gas: Net Exports of T&T and Net Imports of Other Caribbean Countries (mboepd) 1998-2005



Source of Figures 5-7: OLADE.

In addition to exporting primary energy, the Caribbean has a refining capacity of 1.7 million barrels per day.⁸ The region's strategic location between Mexico, Venezuela, and the United States, combined with recent problems with domestic refining capacity in the United States, has led to considerable exports of oil products from the region. Although most refining for export to the United States occurs in the U.S. Virgin Islands, Trinidad and Tobago and Jamaica have recently taken steps to increase their refining capacity.

Policy Trends to Increase Competitiveness

Despite the slow progress in reducing their dependence on oil imports, Caribbean countries have taken great strides to do so during the past decade. All countries except Trinidad and Tobago have adopted similar energy policies implicitly or explicitly to soften the effect of high oil prices and maintain their competitiveness. These policies attempt to: 1) diversify energy sources; 2) improve energy efficiency; 3) reduce reliance on imported petroleum products; and 4) use innovative financial instruments, such as carbon financing and low-interest loans for petroleum, to lessen or smooth the impact over time.⁹ The implementation of these policies has taken place at the regional and domestic levels.

Regional Efforts

Projects and Initiatives

Eastern Caribbean Gas Pipeline (ECGP). Initiated in 2002 by the Intra-Caribbean Gas Pipeline Company, the ECGP aims to reduce Eastern Caribbean reliance on petroleum products by supplying natural gas from Trinidad and Tobago for power generation to seven Caribbean islands.¹⁰ A 2004 feasibility study concluded that the pipeline was commercially viable for all countries except Grenada and St. Vincent. The project is a public-private partnership with intergovernmental agreements on transit rights, tax regimes, and harmonization of regulatory regimes. It requires an estimated total investment of \$500 million. Key issues affecting its development are the timing of the country agreements, the gas supply agreements, the intergovernmental agreements, and the environmental impact.¹¹ In May 2007, the Barbadian Minister of Energy and the Environment, Elizabeth Thompson, announced that she would lead negotiations between the governments of Barbados and Trinidad and Tobago, the National Gas Company of Trinidad and Tobago, the National Petroleum Corporation of Barbados, and the private sector to move ahead with the Trinidad and Tobago-Barbados segment of the pipeline, which would set the stage for other segments to follow.¹²

Eastern Caribbean Geothermal Energy Project (Geo-Caraïbes). Geo-Caraïbes aims to reduce the dependence on fossil fuels for electricity of three countries with adequate geothermal potential and some of the highest electricity costs in the Americas: Dominica, St. Kitts and Nevis, and Santa Lucia. Endorsed by country governments in 2003, the seven-year, \$14 million project is funded by the Global Environment Facility and executed by the United Nations Environment Programme, the Organization of American States, and the Agence Française de Développement. The three principle objectives of the project are to establish a resource base through resource assessments, surveys, and exploration to attract investors; to improve financial viability using a Risk Reduction Financing Tool to mitigate risk for developers; and to promote institutional strengthening and capacity building to reduce the institutional, legal, and regulatory barriers to geothermal energy development.¹³ As of mid-2007, the Organization of American States has been trying to raise \$10 million for exploration and drilling following the Nevis Island

Administration's approval for West Indies Power to begin geothermal energy exploration on Nevis. St. Lucia and Dominica have also reported efforts to move forward during the 2006 stakeholder consultation.¹⁴

Caribbean Renewable Energy Development Programme (CREDP). CREDP is an initiative of CARICOM country Energy Ministers aiming to “reduce barriers to the increased use of renewable energy thus reducing the dependence on fossil fuels while contributing to the reduction of greenhouse gas emissions.”¹⁵ Program preparation began in the 1990s with a regional assessment that identified four main barriers to the development of renewable energy: inadequate policy, lack of awareness, inadequate capacity, and lack of financing in the area of renewable energy.¹⁶ In 2004, CREDP secured \$22 million in project funding over four years from the Global Environment Facility/United Nations Development Programme and the Deutsche Gesellschaft für Technische Zusammenarbeit. The project has four immediate objectives to achieve its overall aim: 1) support a policy environment that enables renewable energy development; 2) build capacity in the renewable energy field; 3) develop the regional renewable energy information network; and 4) demonstrate innovative financing mechanisms for renewable energy products and projects. The project includes Cuba and all CARICOM members except Haiti, and is executed by the CARICOM Secretariat.

Petrocaribe Energy Cooperation Agreement. The Petrocaribe Agreement was signed in 2005 by Cuba, the Dominican Republic, and all CARICOM countries except Trinidad and Tobago, Barbados, Haiti (which signed in 2006), and Montserrat. Building on the San José Agreement and the Caracas Energy Cooperation Agreement, Petrocaribe is an intergovernmental organization that aims to coordinate public policies among member countries in order to improve energy security, minimize energy transaction costs between countries, and develop mechanisms through which energy savings are used for social and economic development. Through Petrocaribe, Venezuela provides fixed quotas of oil to member countries that it helps finance through low interest loans that can be paid in part with goods and services. Although Petróleos de Venezuela Caribe (PV Caribe) – the entity in charge of the logistics of the agreement – has carried out some efforts in recent months, Petrocaribe needs external infrastructure investment in the storage of liquid fuels, port facilities, and strengthening of the distribution systems in the

region.¹⁷ Petrocaribe may help provide lower prices on average to member countries, although Trinidad and Tobago and Barbados have not joined the initiative, stating that it would have a negative impact on their petroleum exports to the Caribbean.¹⁸

Production of Biofuels. The Inter-American Development Bank (IDB) recently commissioned a comprehensive study of the global potential for biofuels production with an emphasis on the Americas.¹⁹ This publication represents a worldwide initiative to increase usage of biofuels and emphasizes the prospects of the Caribbean to enhance its competitiveness by improving energy security, environmental preservation, and socioeconomic conditions through production of biofuels. There are several initiatives currently underway in the Caribbean region. The Caribbean Basin Initiative (and Dominican Republic-CAFTA, in the case of the Dominican Republic) offers duty-free access to the U.S. markets for ethanol for up to 7 percent of U.S. ethanol production. In another effort, CARICOM, the Caribbean Development Bank, and the IDB have begun working together to promote the development of biofuels through technical cooperation to expand biofuels potential through carbon finance in Barbados, Guyana, and Jamaica. The IDB has also provided the Mesoamerican Biofuels Group, which includes Belize and the Dominican Republic, with support through technical cooperation and funding for feasibility studies. Finally, Brazil has signed biofuels and bioenergy cooperation agreements with France to promote the development of biofuels in the Caribbean and Africa.

Focus Countries

The study concentrates on four countries in the region: the Dominican Republic, Haiti, Jamaica, and Trinidad and Tobago. The Dominican Republic has great potential for production and consumption of biodiesel and ethanol. In addition to the aforementioned regional initiatives, the government has established an enabling environment through its legal and regulatory framework. Most recently, 2005 legislation provides key tax incentives for production of biofuels.²⁰ The country has the potential to increase its ethanol production, according to a study from the Dominican Republic's National Competitiveness Center, which recommends the creation of three biodiesel plants.²¹ The Dominican Republic's consumption of biofuels is also expected to

rise dramatically for ethanol – from 61 to 259 million liters per year – and for biodiesel – from 27 to 266 million liters per year – between 2006 and 2010.²²

The Dominican Republic is a prime example of the extent to which Caribbean countries can rely on biofuels for their energy needs. Table 2 compares the consumption estimates of the IDB study for the Dominican Republic with the country’s total predicted imports of hydrocarbons and their products.²³ Even assuming high consumption levels of ethanol and biodiesel (22 percent of gasoline and 20 percent of diesel, respectively), it is clear that biofuels will still only make up a small proportion of the Dominican Republic’s energy matrix at about 6 percent for 2010. Indeed, even Brazil – a key player in the biofuels market – relies on sugarcane for only roughly 13.5 percent of its energy matrix.²⁴

Table 2. Dominican Republic: Projected Consumption of Biofuels and Hydrocarbons (mboed) 2006-2010								
	Gasoline	Ethanol		Diesel	Biodiesel		Hydrocarbons Imports (OLADE)	Biofuels as % Total Imports
	mboed	% Used	mboed	mboed	% Used	mboed	mboed	%
2006	21.0	5%	1.0	22.7	2%	0.5	131.0	1.1%
2007	20.2	12%	2.4	22.7	5%	1.1	135.4	2.6%
2008	20.2	16%	3.2	22.7	10%	2.3	139.9	3.9%
2009	20.2	19%	3.8	22.7	15%	3.4	144.7	5.0%
2010	20.2	22%	4.4	22.7	20%	4.5	149.6	6.0%

Source: Garten Rothkopf (2007); OLADE.

Haiti is a second promising biofuels producer although it does not currently engage in production of biofuels. Due to high levels of deforestation, the study recommends that Haiti should focus on biodiesel production. Biodiesel would offer a substitute fuel source for the transportation and power generation industries, both of which currently rely on diesel oil. Haiti has taken steps to develop the industry, and signed an agreement to receive technical assistance from Brazil in May 2006. However, several barriers to Haiti’s competitiveness remain, including poor infrastructure, especially roads; high rates of deforestation; and a climate and topography that limit the potential of reviving the sugarcane industry for ethanol production. Another important factor is Haiti’s recent signing of Petrocaribe, which may have the mixed effects of encouraging consumption of hydrocarbons while enabling production of biofuels through its socioeconomic development incentives.

Jamaica is a third country that has significant prospects for increasing its biofuels production. Its recent energy policy strategy has promoted consumption of ethanol – to replace MTBE in gasoline – and biodiesel. It also encourages the development of the domestic and export-oriented ethanol markets. Brazil and Jamaica have signed a letter of intent to provide mutual support for the development of Jamaica’s sugar and ethanol sectors. Currently, Jamaica’s ethanol production capacity – mainly refining – is about 200 million liters per year and is expected to increase to around 370 million liters per year in the medium term. To put this in the context of its energy matrix, Jamaica produces 3,400 barrels of oil equivalent per day of ethanol, which represents some 4.6 percent of its imports of hydrocarbons. Potential impediments to the sector’s competitiveness include the restructuring of the sector, the ability of the government to attract investment to the sector, and road infrastructure.

Finally, Trinidad and Tobago has potential for biofuels production, despite its current focus on oil and gas. Although it has not yet taken steps toward regional cooperation with Brazil or enacted domestic legislation to promote the sector’s development, the government recognizes the growing global interest in biofuels and shares the incentives of its neighbors enshrined in the Caribbean Basin Initiative. Currently, Trinidad Bulk Traders Limited is the only ethanol producer in the country, with a capacity of 190 million liters per year (3,300 barrels of oil equivalent per day) and the potential to double its capacity with minimal investment. In addition, Trinidad and Tobago exported about 38 million liters to the United States in 2005. Therefore, with the appropriate legal and regulatory measures taken, Trinidad and Tobago could also build its biofuels sector, which would complement the oil and gas industries in the country and enhance its competitiveness as a global energy supplier.

Individual Country Efforts

In addition to the regional efforts, individual countries have also shown their commitment to increasing regional integration and reducing dependence on oil. The cases of Jamaica, Guyana, and Barbados exemplify these efforts.

Jamaica

In late 2005, the Government of Jamaica updated its 1996 energy policy and developed an energy strategy for 2006-2020.²⁵ The strategy aims to reduce the impact of high oil prices by

improving energy efficiency, diversifying energy sources, developing indigenous renewable resources, increasing ethanol production, upgrading oil refineries, and mitigating the impact of the country's electricity monopoly.

In addition to the specific biofuels measures discussed above, the updated strategy focuses on increasing the consumption of liquefied natural gas through imports from Trinidad and Tobago – efforts which began earlier in the decade. Following feasibility studies, which concluded that demand from the bauxite/aluminum industry and power sector was sufficient to make the investment (current market potential is 2.5 million tons per year), the government signed a Memorandum of Understanding with the government of Trinidad and Tobago in 2004 to supply 1.15 million tons per year of liquefied natural gas for a 20-year period to the Jamaica Aluminum Company and the Jamaica Public Service Company. There have been delays in implementation, which may threaten the chances of Jamaica receiving gas on schedule in 2009. These delays are the result of complications associated with developing the new liquefied natural gas train, which is required to supply Jamaica, and price negotiations.²⁶ Currently the Petroleum Corporation of Jamaica is in the process of selecting firms to develop the natural gas terminal in Port Esquivel that will receive gas from Trinidad and Tobago.²⁷

Guyana

Guyana has also developed a national strategy to reduce petroleum dependence. Guyana Power and Light (GP&L) created the Development and Expansion Program 2006-2010 in late 2005, which focused on replacing hydrocarbon-consuming self-generators with renewable energy. GP&L aims to increase bagasse consumption by developing a new sugarcane factory in Skelton and building bagasse storage capacity so that bagasse supply can increase from 27 to 40 weeks per year by 2010.

GP&L and Delta, a Dutch company, are negotiating the development of a 10 megawatt wind farm on the east coast of the Demerara following positive results of a 2003 feasibility study. Progress has been delayed by doubts about whether the avoided costs of the project are greater than the costs of moving forward.

Guyana also has significant hydropower potential, especially in Amaila Falls, which has been known since feasibility studies in the 1970s. The past decade has seen growing interest in an Amaila Falls project, culminating in the Government of Guyana signing a memorandum of

understanding with Synergy, outlining the characteristics and conditions for moving ahead with the project. There is still significant reticence, however, due to project risks related to low short-run demand for energy – caused by current dependence on self-generators – and the isolated location of Amaila Falls.²⁸

Barbados

In 2005, Barbados developed the National Strategic Plan 2005-2025, which focuses on diversifying energy sources, reducing dependency on imported fuel, promoting energy conservation, and rationalizing fuel taxes. With regard to conservation, Barbados is planning to implement the National Energy Conservation Program, which will provide tax incentives for purchasing energy efficient goods and services, such as construction materials, light bulbs, and home energy audits.

The effort to increase the use of renewable resources began long before this strategic plan. Since the mid-1970s, the Government of Barbados has provided tax and import incentives to produce solar-powered water heaters locally. By 2003, approximately one-third of water heaters (35,000) were solar-powered, producing 10 percent of total consumption of petroleum products (227,000 barrels of oil equivalent).²⁹ There is also significant wind energy potential. The government and Barbados Light and Power are currently undertaking the final steps needed to begin the development of a 10-megawatt wind farm that could save approximately 45,000 barrels of oil equivalent with an investment cost of \$15 million. As an incentive, the government is currently waiving import duties on the necessary equipment and materials for wind energy development. Finally, Barbados is making progress in transforming its sugar industry into a sugarcane industry, thereby promoting ethanol production.

Barbados is also working to increase imports of natural gas from Trinidad and Tobago, as mentioned above. The government recently decided to begin negotiations on building a liquefied natural gas pipeline after selecting this option over the alternative of compressed natural gas maritime transport. The potential demand for natural gas in 2010 is estimated at 24 million cubic feet per day and is expected to double to 50 million cubic feet per day by 2025. Initially, power generation would account for 90 percent of gas consumption and 10 percent would be distributed domestically.³⁰

General Recommendations

The Caribbean's energy policies at the regional and national levels suggest that countries are aware of the consequences of the current dependence on oil imports and have taken many steps toward addressing the drivers of the problem. Countries therefore need to continue focusing on diversifying energy sources, improving energy efficiency, reducing reliance on imported petroleum products, and using innovative financial instruments, such as carbon finance.

The current global attention to biofuels and renewable energy cannot draw attention away from the important gains that can be made in the region through increased regional integration in the oil and gas market. Regional integration is essential for mitigating the impact of high oil prices on these small island states. A central component of integration is the supply of natural gas throughout the Caribbean. In the past, technology in natural gas transport and regasification infrastructure has allowed for only large-scale trading, leaving most countries of the region unable to take advantage of Trinidad and Tobago's supply. However, recent technological advances in compressed natural gas maritime transport and smaller regasification terminals are rapidly reducing the costs of small-scale supply of natural gas in the region.

Biofuels production in the region is also an integral element of any energy policy for the Caribbean region, as it can reduce domestic consumption of hydrocarbons and enable the region to become a competitive biofuels supplier in the international market. Other national efforts toward energy conservation and the development of renewable energy sources must also continue to be pursued.

Recommendations for Further IDB Research

The IDB has stated its aim to increase engagement and its loan portfolio with the six Member states in the Caribbean and to continue working in collaboration with the Caribbean Development Bank and CARICOM to maximize their collective impact in the region. In a speech in September 2006, President Moreno emphasized four key areas in which the IDB is helping the Caribbean Region confront its energy challenges.³¹ The IDB is:

- Funding two Caribbean-focused technical cooperation programs with the objectives of developing renewable energy and energy efficiency

- Collaborating with CREDP to launch a technical cooperation program on expanding biofuel opportunities in Guyana, Jamaica, and Barbados through carbon finance
- Conducting an assessment of the environmental and social dimensions of biofuels to support domestic strategies in the sector
- Supporting infrastructure projects, including energy infrastructure, through the new Infrastructure Fund.

In parallel with the recent energy sector focus in the region, the IDB has conducted research on the global biofuels and renewable energy market through such publications as *A Blueprint for Green Energy in the Americas: Strategic Analysis of Opportunities for Brazil and the Hemisphere. Featuring: The Global Biofuels Outlook 2007*. It also has recently conducted a general assessment of the Caribbean energy sectors with a country focus on Jamaica, Guyana, Barbados, and Trinidad and Tobago.³²

This research addresses many of the policy priorities described in the previous section and the program focus described above by President Moreno, but also leaves great room for research in the region.

- The IDB should focus its research on enhancing regional integration, especially through small-scale trading of natural gas between Trinidad and Tobago and the rest of the Caribbean. Particularly important for IDB research is how technological advances in compressed natural gas transport can increase small-scale trade in the region.
- The IDB should also investigate ways in which it can provide financing to the region to stabilize energy prices. A price stabilization fund is a specific option that deserves further study.
- Infrastructure development is inextricably linked to regional integration. Further research in the following areas would enable the IDB to take full advantage of the newly launched Infrastructure Fund:
 - Studying the transport of gas is particularly important, including a comparative assessment of pipeline distribution versus compressed natural gas maritime transport throughout the region.

- Researching infrastructure for receiving natural gas and oil is also vital, especially the port facilities, storage, and distribution.
- Although the IDB's current research emphasis is already on biofuels, additional country-specific research would provide more detailed insight that could be used to tailor country policies.
- Small-scale renewable energy sources, including hydro, wind, and solar power, are areas in which the Caribbean has comparative advantage. Highlighted by President Moreno as being important avenues for diversifying the Caribbean energy matrix, the IDB has undertaken minimal research and would benefit from further study in this area.³³

ENDNOTES

- ¹ The countries included in these statistics are Barbados, the Dominican Republic, Guyana, Haiti, Jamaica, Suriname, and Trinidad and Tobago. Data are lacking for the remaining Caribbean countries.
- ² Table 1 shows the final consumption of primary energy and oil products (diesel oil, fuel oil, gasoline/alcohol, and kerosene) and natural gas products (liquid petroleum gas). Consumption of each energy source is expressed as a percentage of the total final consumption in each country and in per capita terms (thousands of barrels per year per 10,000 persons). Although electricity also relies on hydrocarbons for fuel in many of these countries, it is not included in these data. Hydropower, another important source of primary energy in Suriname (14 percent of total), the Dominican Republic (3 percent), and Haiti (2 percent), consumed as electricity, is not included here. There is also a lack of data on solar energy.
- ³ The OLADE database is the source for all of the data presented.
- ⁴ Barbados and Suriname produce some hydrocarbons, but not enough to satisfy domestic demand.
- ⁵ These countries include: Barbados, the Dominican Republic, Guyana, Haiti, Jamaica, and Suriname.
- ⁶ EIA Country Analysis Brief of the Caribbean, July 2006.
- ⁷ EIA Country Analysis Brief of the Caribbean, July 2006; Dussan 2006, page 25.
- ⁸ EIA Country Analysis Brief of the Caribbean, July 2006.
- ⁹ Dussan, Manuel I. "Energy in the Caribbean: General Assessment," 29 August 2006, p. 12.
- ¹⁰ Barbados, Dominica, Grenada, Guadeloupe, Martinique, Saint Lucia, and St. Vincent.
- ¹¹ Dussan, p. 16.
- ¹² Dussan, p. 52; "Natural Gas for All Soon." Nation News.com. 6 May 2007. Website: <http://www.nationnews.com/story/302781854886082.php> <Accessed 31 May 2007>.
- ¹³ "Eastern Caribbean Geothermal Development Project Brief" presented at the Eastern Caribbean Geothermal Energy Project (Geo-Caraïbes) Stakeholder Consultation. March 15-17, 2006. (Website: www.oas.org/dsd/reia/Documents/geo-caraibes.html).

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- ¹⁴ Gawell, Karl, and Griffin Greenberg. “2007 Interim Report: Update on World Geothermal Development.” May 1, 2007. Geo-thermal Energy Association Website (www.geo-energy.org) <Accessed: 21 May 2007>.
- ¹⁵ CARICOM Website (www.caricom.org/jsp/projects/credp.jsp) <Accessed 21 May 2007>.
- ¹⁶ Dussan, p. 17.
- ¹⁷ *Business News Americas*. “CAF Open to Petrocaribe Financing.” December 12, 2006. Website: <http://www.bnamericas.com/story.jsp?sector=9&idioma=I¬icia=375606>. <Accessed 23 May 2007>.
- ¹⁸ Ruiz-Caro, Ariela. “Cooperación y integración energética en América Latina y el Caribe.” CEPAL. April 2006, page 28.
- ¹⁹ Garten Rothkopf. “A Blueprint for Green Energy in the Americas: Strategic Analysis of Opportunities for Brazil and the Hemisphere. Featuring: The Global Biofuels Outlook 2007.” 2007.
- ²⁰ The 2005 law is called the *Law of Incentives for the Development of Renewable Energy Sources and Their Special Regimens*.
- ²¹ “Study Determines Dominicans Could Produce Biodiesel.” *Dominican Today* 12 October 2006, 31 May 2007 <http://www.dominicantoday.com/app/article.aspx?id=18558>.
- ²² Garten Rothkopf, p. 145.
- ²³ Table 2 uses the estimates provided in an IDB study for gasoline, ethanol, diesel, and biodiesel consumption. These estimates remain flat during the period but assume that biofuels will make up increasing proportions of gasoline and diesel, up to 22 percent and 20 percent for ethanol and diesel, respectively. These estimates are high considering Brazil – the leader in the industry – only consumes between 20 and 25 percent of these fuels as biofuels. Notwithstanding these high estimates, biofuels make up only 6 percent of total imports of hydrocarbons. These predictions offered by OLADE include oil, natural gas, and their products (liquid natural gas, gasoline/alcohol, kerosene, diesel oil, and fuel oil).
- ²⁴ Jank, Marcos S. “Potential Supply and Demand for Biofuels in the Coming Decade: Towards a US-Brazil Partnership.” Presented at the Woodrow Wilson Center on 20 February 2007. Website: <http://www.wilsoncenter.org/topics/docs/WWC%20Jank%2022fev%2007.pdf>. <Accessed 31 May 2007>.

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- ²⁵ Jamaica, Cabinet Office. *Green Paper: The Jamaica Energy Policy, 2006-2020*. Kingston: Cabinet Office, 20 February 2006.
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- ²⁸ Dussan, pp. 44-5.
- ²⁹ Dussan, p. 51; O. Langis and D. Ince, 2003, *Solar Water Heating, a Viable Industry in Developing Countries*; D. Ince, 1999, *Developing of Solar Water Heating and Other Renewable Energy Technologies in Barbados*.
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- ³¹ Moreno, Luis Alberto. 2006. “Energy and the Competitiveness of the Caribbean,” Port of Spain, 8 September. <http://www.iadb.org/news/> <Accessed 23 May 2007>.
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