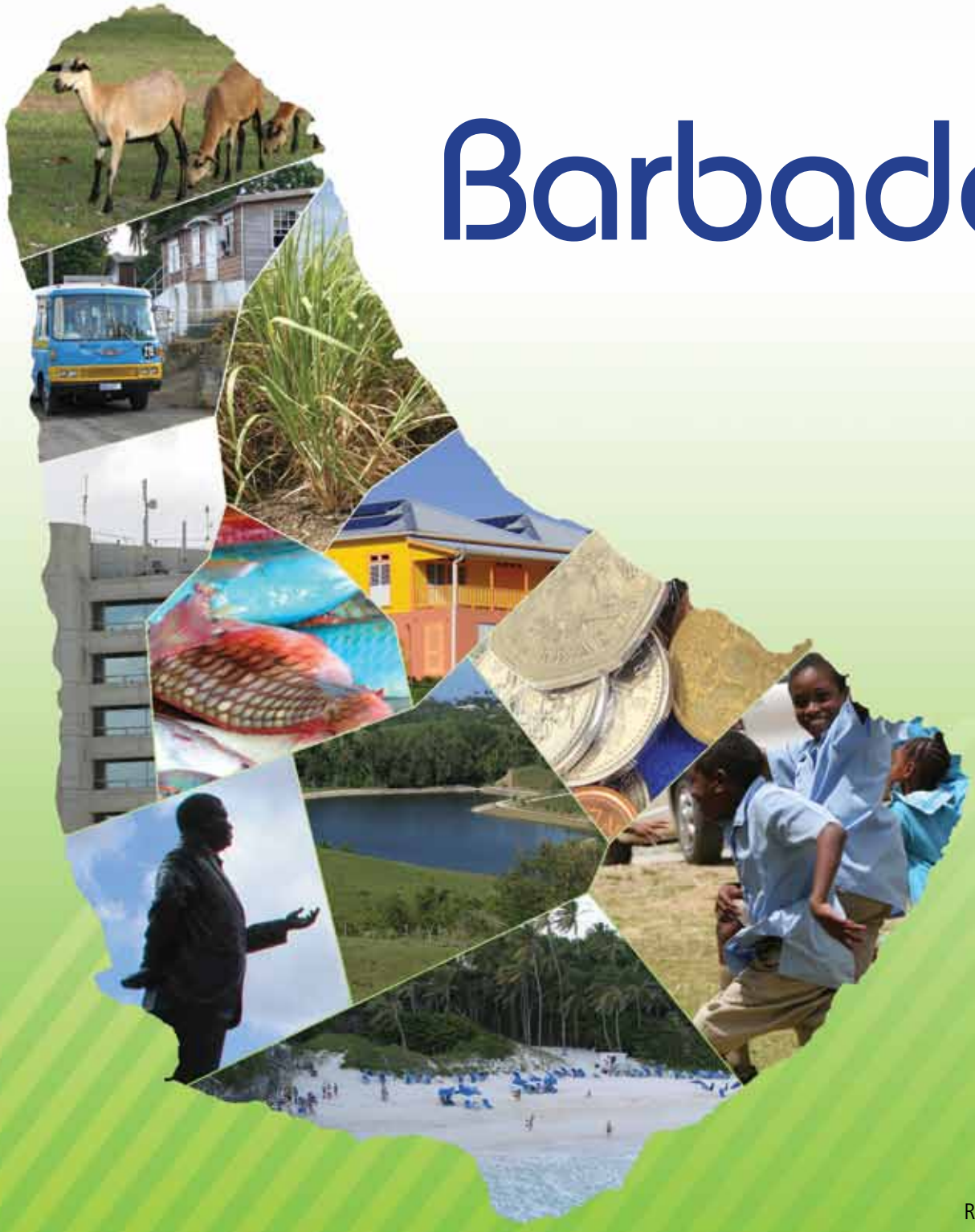
UNEP

GREEN economy

Scoping Study Synthesis Report

Barbados



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List of acronyms

ACS Association of Caribbean States
BCCI The Barbados Chamber of Commerce and Industry
BNSI Barbados National Standards Institution
BPOA Barbados Programme of Action
BRT Bus Rapid Transit
BTA Barbados Tourism Authority
BWA Barbados Water Authority
CARICOM Caribbean Community
CCRIF Caribbean Catastrophe Risk Insurance Facility
CFL Compact Fluorescent Lamp
CGEF Caribbean Green Economy Forum
CPS Country Programme Strategy
CSI Collaborative Standards Initiative
CSME CARICOM Single Market and Economy
CTO Caribbean Tourism Organisation
DFID Department for International Development, United Kingdom
EAF Ecosystem Approach to Fisheries
ECLAC The Economic Commission for Latin America and the Caribbean
EMAS Eco-Management and Audit Scheme
EMLUP Environmental Management and Land Use Project
EPD Environmental Protection Department
EU European Union
FAC Fisheries Advisory Committee
FDI Foreign Direct Investment
FTC Fair Trading Commission
GBI Green Building Initiative
GDP Gross Domestic Product
GEF Global Environment Facility
GEF SGP Global Environment Facility Small Grants Program
GESS Green Economy Scoping Study
GETSC Green Economy Technical Steering Committee
GIS Geographical Information System
GISS Geographic Information Services and Solutions
GOB Government of Barbados
ICT Information and Communication Technologies
IDB Inter-American Development Bank
ILAC Initiative for Latin America and the Caribbean
IPCC Inter-governmental Panel on Climate Change
LEED Leadership in Energy and Environmental Design
MBSS Modernisation of Barbados Statistical Systems
MEA Multilateral Environmental Agreement
MIF Multilateral Investment Fund
MOT Ministry of Tourism
NCSA National Capacity Self Assessment Project
NTESC National Trade and Environment Sub-Committee
NGO Non-Governmental Organization
OAS Organization of American States
OECD Organisation for Economic Co-operation and Development
PV Photovoltaic
RETIC The Resource Efficiency and Technology Innovation Centre
SCORE Strengths-Challenges-Opportunities-Responses-Effectiveness
SIAF Sustainability Policy Impact Assessment Framework
SIDS Small Island Developing States
SIDS-TAP SIDS Technical Assistance Programme
SMEs Small and Medium Enterprises
SWH Solar Water Heaters
TBBA The Barbados Bankers' Association Inc.
TCDPO Town and Country Development Planning Office
TEEB The Economics of Ecosystems and Biodiversity
UDC Urban Development Commission
UNEP United Nations Environment Programme
UNEP-FI UNEP Finance Initiative
UNEP ROLAC UNEP Regional Office for Latin America and the Caribbean
UNWTO United Nations World Tourism Organization
UWI-CH University of the West Indies - Cave Hill
WTO World Trade Organization
WTO TRIPS WTO's Agreement on Trade-related Aspects of Intellectual Property Rights

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Foreword by the Prime Minister of Barbados

Twelve months ago, in March 2011, the Government of Barbados (GOB), the University of the West Indies-Cave Hill Campus (UWI-CH), and the United Nations Environment Programme (UNEP) agreed to undertake a macro analysis of the Barbados economy.

The assessment exercise, formally dubbed the Barbados Green Economy Scoping Study (GESS), signalled a series of "firsts", including:

- The initiation of the GOB-UNEP "Partnership for a Resource-Efficient Green Economy in Barbados";
- The establishment of a series of learning, innovation and business solutions fora under the leadership of the Cabinet-appointed Green Economy Technical Steering Committee; and
- The articulation of a model participatory method for sector analysis and planning.

As a result, the Government has been presented with a comprehensive suite of policy, investment and governance options that can assist in its quest to further integrate environmental considerations into this country's social and economic fabric. I invite you to digest and share the findings for the five sectors, namely Agriculture, Fisheries, Building/Housing, Transport and Tourism.

The dynamic synergies created during the GESS are testimony to the strength of the Social Partnership in Barbados and its commitment to sustainable development.

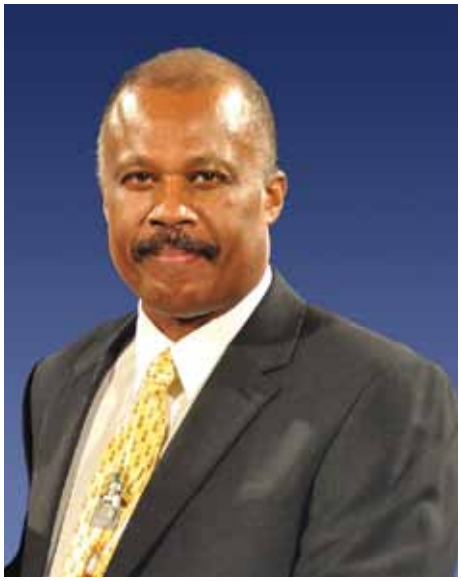
The Barbados GESS holds additional significance in the context of the June 2012 Rio +20 United Nations Conference on Sustainable Development, which will address two thematic areas, including the "Green Economy in the context of Sustainable Development and Poverty Eradication". What is critical for Barbados and other Small Island Developing States (SIDS) is that the Green Economy debate recognizes our structural vulnerabilities, offers a model to assist us in further realising our sustainable development aspirations, and creates the institutional platform that would enable us to participate in innovative partnerships in the fight to save our planet, against mounting unsustainable consumption and production patterns.

I offer heartfelt thanks to the UWI-CH and UNEP. I also laud the governance and technical leadership shown by the Green Economy Technical Steering Committee.

I commit my Government to working assiduously with the Social Partnership to ensure that the measures identified in the Barbados GESS, which can contribute to a more prosperous and environmentally sensitive Barbados, will be implemented expeditiously.

Freundel J. Stuart
Prime Minister of Barbados

Foreword by the Pro-Vice Chancellor and Principal of the University of the West Indies, Cave Hill Campus



Barbados' developmental record since independence is remarkable, with a high level of human development, quality public services and a stable political climate. This record has been achieved despite its limited size, access to natural resources and opportunities for economic diversification. A green economy has the potential to reduce these limitations.

The University of the West Indies, Cave Hill Campus was therefore a very willing partner in this Green Economy Scoping Study, which focuses on the potential for `greening' five key industries: tourism, agriculture, fisheries, building/housing and transportation. The analysis also addresses the cross-cutting issues of water, energy, waste and land-use. One of the features of the report is its integrated approach. All stakeholders were consulted during this study, which is as a result firmly grounded in their views. This should enhance the support for implementation.

The Cave Hill Campus was an ideal partner for this Green Economy Scoping Study. For some time now, The University of the West Indies has been at the vanguard in relation to issues of resource efficiency. Furthermore, given the important role of human resource development in enabling a green transition, The University of the West Indies has a critical role to play. This Green Economy Scoping Study report not only reflects The University of the West Indies' commitment to the Green Economy transition, but also the beginning of a fruitful partnership on this new path of sustainable development in Barbados and the Caribbean.

Professor Hilary Beckles, K.A.
The University of the West Indies
Cave Hill Campus

Foreword by the Executive Director of the United Nations Environment Programme

During the last decade, the world has witnessed a rapid succession of global crises that have included food, fuel and, more recently, financial and economic. These issues do not only represent significant and historic challenges to our generation, they are also opportunities for change.

For governments, a clear assessment of resource endowments, environmental risks, and potential ecological scarcities is critical to securing the appropriate institutional and public support needed to ensure a more sustainable pathway forward.

UNEP is honoured to partner with the Government of Barbados and the University of West Indies – Cave Hill Campus on this joint study, which examines how a developing country can strengthen its policies and harness its investments to move towards a low-carbon, resource-efficient and sustainable economy, while enhancing social equity and environmental protection.

Barbados has long been a leader in the Caribbean region in this realm. Its current National Strategic Plan (2006-2025) clearly identifies "Building a green economy: Strengthening the physical infrastructure and preserving the environment" as of one its key aims.

Barbados' ambitions can play an important role amongst other small island states through the sharing of its strategies and lessons along the way. Furthermore, its actions serve as a beacon for the international community, which is set to discuss the issue of Green Economy in the context of sustainable development and poverty eradication at the upcoming United Nations Conference on Sustainable Development (Rio+20) in Brazil, this June.

I would like to applaud the Government of Barbados for its courage, determination and leadership. This report is a critical step on the road to a sustainable and green Barbados, and the Caribbean as a whole.

Achim Steiner
Executive Director, United Nations Environment Programme
United Nations Under-Secretary General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Introduction

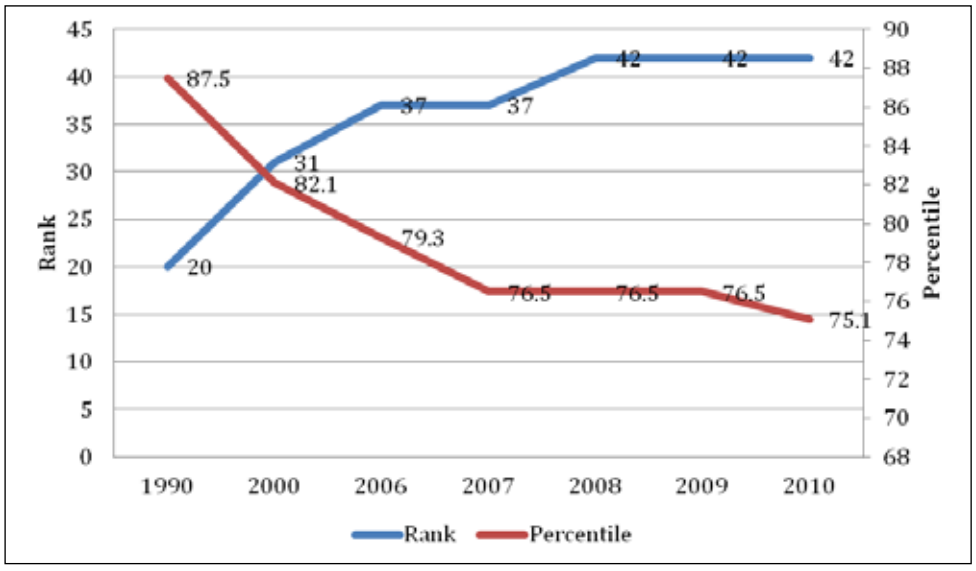
Country Profile

With a total land area of just 431 km^2, Barbados is one of smallest independent states in the world, but by no means insignificant. Barbados is one of the highest ranked countries in the United Nations Development Programme's Human Development Index (Figure 1). The most recent World Bank estimate for Gross National Income per capita (Atlas method) was USD 12 660, classifying it as a high-income non-OECD country. The country also has one of the highest rates of literacy, a commendable 99 per cent, largely due to the significant public investment that successive administrations have made in education. Furthermore, the political climate on the island is quite stable and boasts one of the oldest Westminster-style parliaments in the western hemisphere.

The recent financial and economic crises have, however, had a significant effect on the country's economic performance. In 2010, its nominal GDP was estimated at USD 3.7 billion or 3 percentage points lower than in 2009, and just barely above the level of output produced by the economy in 2006. This economic slowdown has magnified the country's fiscal imbalances: in the fiscal year 2010/11 the fiscal deficit was estimated at 8.8 per cent of GDP. Most of the island's natural resources experience stress from economic activities, mainly because of its relatively small size. Groundwater is the main source of potable water on the island. Barbados is classified as a water scarce country and since the year 2000, a part of its water needs have been met via a 30 000 m^3/day reverse osmosis desalination plant. Most of Barbados' primary energy requirements are met via imported fossil fuels, which account for about one-fifth of the island's imports.

In terms of its marine ecosystem, Barbados has over 50 hard coral species and 600 species of fish. Owing to the clearing of the island's natural vegetation (less than 2 per cent of the island is covered by primary forest) during the colonial era, terrestrial biodiversity on the island is somewhat limited.

Figure 1. Human Development Index of Barbados by rank and percentile



Nevertheless, species of flowering plants, birds, mammals, reptiles and amphibians can still be found on the island. While temperatures and seasonal variations are modest, the island is susceptible to tropical storms between June and November. The country does, however, have a strong policy and institutional commitment to sustainable development. The key mechanisms include:

- Long-term and medium-term strategic frameworks and fiscal strategy (outlining economic, social and environmental goals),
- Social Partnership (a social compact constituting the Government, the Private Sector and the Trade Unions that oversees the development and execution of a Social Protocol, which integrates the three pillars of sustainable development),
- National Sustainable Development Policy (articulates national principles of sustainable development and an Action Plan),
- Physical Development Plan (identifying land-use practices, community facilities and physical infrastructures that would support developmental objectives), and a
- National Sustainable Energy Framework (outlining strategies that encourage investments in renewable energy sources and energy efficiency).

In addition to the above, the island also has a comprehensive set of legislation aimed at protecting the integrity of ecosystems (Table 1).

The genesis of transforming Barbados into a green economy can be traced to the National Strategic Plan 2006-2025 and the Budget Speech of 2007. The process was given further impetus in 2009 when the then Prime Minister, the Honourable David Thompson, laid down the challenge of committing Barbados to become the "most environmentally advanced, green country in Latin America and the Caribbean". Against this development goal, and given the unique special challenges faced by Barbados, the Government of Barbados (GOB) and UNEP established a partnership to support the country's transformation to a green economy. The first phase of the agreed partnership involved undertaking a scoping mission 3and developing a Green Economy Scoping Study (GESS), a synthesis of which is being presented in this report.

Table 1. Examples of legislation aimed at protecting ecosystem services

Legislation	Provisions	Agency
Standards Act (2006)	Standards for pesticide application in homes	Department of Commerce and Consumer Affairs
Town and Country Planning Act (2003)	Control of development	Town and Country Planning Department
Coastal Zone Management Act (1998)	Preservation of marine areas and discharge standards	Coastal Zone Management Unit
Marine Pollution Control Act (1998)	Control of marine pollution	Environmental Protection Department
Environment Levy Act (1996)	Levy on non-biodegradable imports	Ministry of Finance and Economic Affairs
Shipping (Oil Pollution) Act (1994)	Prevention of pollution by oil	Ministry of International Business and International Transport
Barbados Water Authority Act (1980)	Management of water resources	Barbados Water Authority
The Fisheries Act (1993)	Preparation of fisheries management plan, protection of marine life (including coral reefs)	Fisheries Division
Health Services Act and Regulations (1969)	Removal and disposal of refuse	Ministry of Health
Soil Conservation Act (1959)	Utilisation of lands in the Scotland District	Ministry of Agriculture, Food and Fisheries
Underground Water Control Act (1953)	Control of use of underground sources	Barbados Water Authority
Petroleum Winnings Operations Act (1951)	Obliges licensee to prevent pollution of territorial waters	Natural Resources Department of the Energy Division

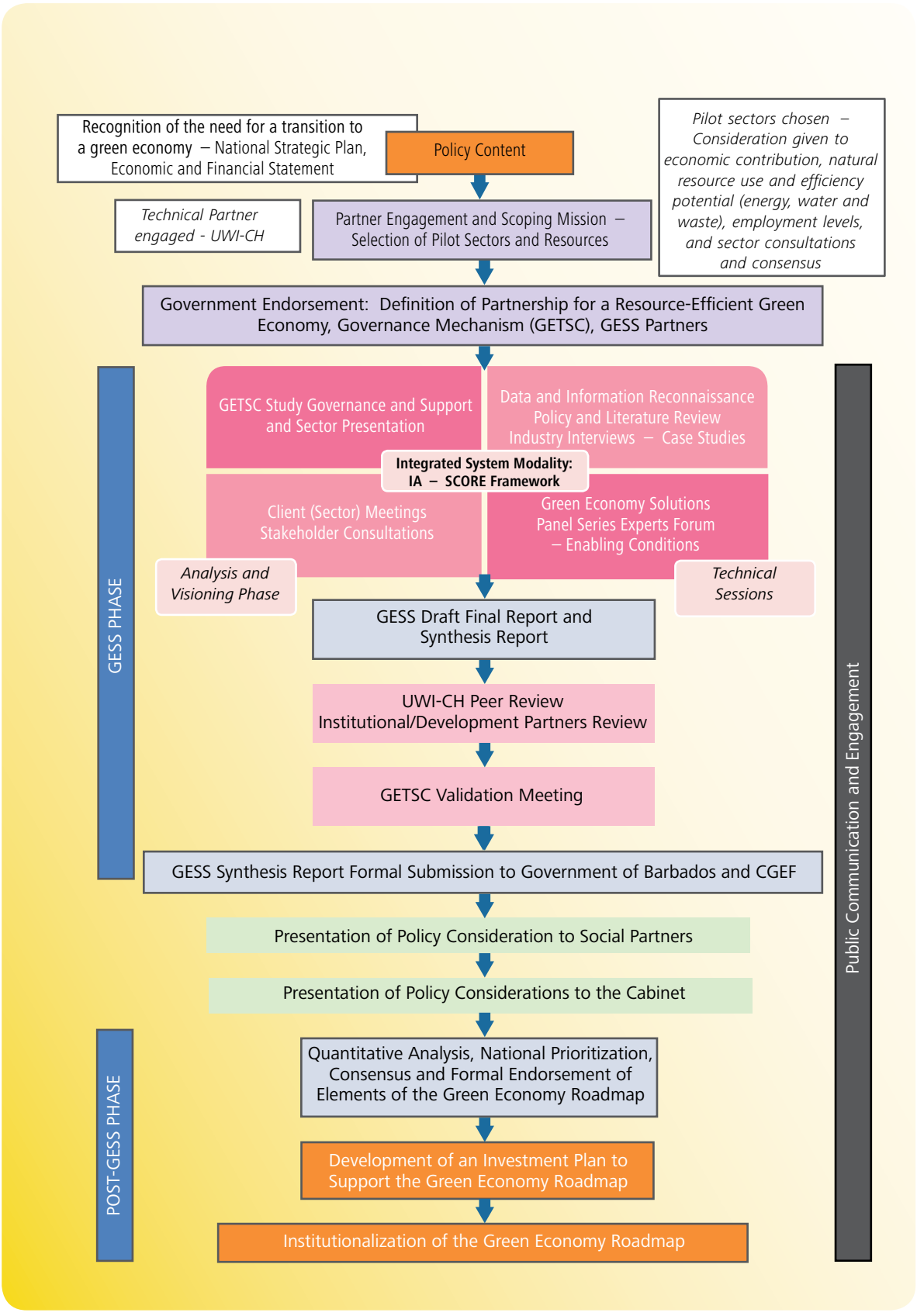
Methodology of the study

The study used a methodological approach that combined qualitative, limited quantitative analyses, stakeholder consultations and engagement, as well as strengths-challenges-opportunities-responses-effectiveness (SCORE) analysis. This approach is presented in Figure 1 (GOB, 2011). It focused on five sectors (agriculture, fisheries, building, transportation and tourism) and four cross-cutting issues (waste, water, energy and land). The data gathering for the report involved meetings with key government agencies and stakeholders in the sectors listed previously. In addition, a series of technical seminars were held to facilitate the articulation of the enabling environment for the country's transformation to a green economy.

One of the key components of this process was the Green Economy Technical Steering Committee (GETSC), which was established to handle technical oversight. The GETSC consisted of representatives of government institutions, trade unions, NGOs, the business sector and the UWI-CH technical team.

One of the many GESS stakeholder meetings (Photo courtesy of Natural Heritage Department)

Figure 2. Barbados Green Economy Scoping Study Methodological Approach (GOB, 2011)



Transformation to a green economy

With the topic of green economy at the core of the United Nations Conference on Sustainable Development (Rio+20), the definition and philosophical underpinnings of the concept are the subject of a great deal of discussion. UNEP (2011a) defines a green economy as "one that results in improved human well-being and social equity, while significantly reducing environmental risks and ecological scarcities". For some, this definition harks back to the three pillars of sustainable development (environmental protection, social development and economic development) popularised by the Rio Earth Summit in 1992. For others, it represents a new way of envisioning sustainability that puts the economy at the centre of the policy debate on social and environmental outcomes. In this regard, many commentators suggest that a green economy can be a means of achieving sustainable development; others see it as an amalgam of the complementary ideas including a low carbon economy, a circular economy, sustainable consumption and production, green growth, sustainable development and a Green New Deal.

Applicability of the green economy concept to Small Island Developing States

Economies in small states have six key common characteristics:

1. Small population, market and geographical size
2. Limited resource-base
3. Narrowness of output and exports
4. Openness to trade
5. Vulnerability to natural disasters and external economic shocks
6. Social homogeneity

These characteristics also have direct implications for monetary, exchange rate and overall macroeconomic policy. The narrowness of domestic output implies that it tends to be very inelastic with respect to relative price changes, as labour and other factors may not be easily redeployed into the production of other goods and services. Helleiner (1982) notes that expenditure-switching measures, such as changes in the exchange rate, are unlikely to address any balance of payments difficulties that small nations may encounter. Armstrong and Read (1998) also add that since currency markets in these countries are likely to be relatively thin, exchange rates may be relatively volatile and influenced by structural problems. Given the openness of the economy, such volatility is likely to feed through to the domestic economy and impact production costs and overall price stability. Exchange rate variations can also result in a redistribution of income, as devaluation tends to benefit exporters and disadvantage purchasers of imported goods, while an appreciation negatively affects domestic exporters and assists consumers of imported goods.

It is against the backdrop of these common characteristics that the first Global Conference on SIDS was held in Barbados in April 1994 to evaluate how SIDS could address these issues. The outcome document – the Barbados Programme of Action (BPOA) for the Sustainable Development of Small Island Developing States (UN, 1994; ECLAC, 2011) – identified areas for action that could be fully embraced at the national, regional and international levels to aid the process of sustainable development in these countries (Table 2).

Table 2. Areas for action of the Barbados Programme of Action for the Sustainable Development of Small Island Developing States

• Climate change and sea-level rise	• Natural and environmental disasters
• Management of waste	• Coastal and marine resources
• Land resources	• Energy resources
• Tourism resources	• Biodiversity resources
• National institutions and administrative capacity	• Regional institutions and technical cooperation
• Transport and communication	• Science and technology
• Human resource development	• Implementation, monitoring and review

The green economy concept for SIDS and the framework of the BPOA (in addition to the Follow-Up Mauritius Strategy for the Further Implementation of the BPOA) complement each other strongly as they share many of the prioritized areas such as energy resources, tourism resources, management of wastes and coastal and marine resources.

UNEP (2011a) provides numerous examples of developing countries adopting green strategies in order to enhance resource-efficiency and economic growth. In this context, most SIDS will require assistance in the areas of financing the transition to a green economy, particularly given the level of national indebtedness (Cas & Ota, 2008). They will require special supporting mechanisms that are tailored to the specific characteristics of SIDS including their vulnerability to external shocks (Streetan, 1993) and the limited capacity of markets (Srinivasan, 1986).

Concept of a green economy in the context of Barbados

In the context of the ongoing dialogue at the international level, the pursuit of a greener path to economic development is attractive to Barbados, especially given its limitations in relation to size and dependence on natural resources and fossil fuels. A green economy approach gives consideration to the level of available natural resources and ensures that they are used in a sustainable manner, and contributes to the maintenance and rehabilitation of important ecosystems and ecosystem services.

As a small island, Barbados is dominated by marine and coastal ecosystems. A close look at Barbados' ecosystems reveals that their integrity is at risk from external and internal factors. One of these external forces is climate change, which results from global increase in greenhouse gas (GHG) emissions. If the level of these emissions is not reduced, climate change will negatively impact marine and coastal ecosystems of Barbados and the Caribbean. In particular, island nations, such as Barbados, could experience a loss of marine biodiversity, fisheries and their shoreline (Munday, et al., 2009). Coral reefs, which are among the most bio-diverse ecosystems, are highly sensitive to increases in sea surface temperature. In fact, a 2°C increase in sea surface temperature, associated with CO_2 concentrations of 500 ppm, threatens most coral reefs around the world, particularly those within the Caribbean (Hoegh-Guldberg, et al., 2007). This means that the bio-diverse ecosystems in the Caribbean are among the most threatened in the world.

In a green economy, economically-viable resource and energy-efficiency measures are supported and promoted. The land-use policies would seek to prioritise uses that contribute to the maintenance of natural resources and

ecosystem services. This approach to land use would be complemented with a sustainable approach to the built environment and the adoption of alternative means of ground transportation. While the island is a very small net contributor to global greenhouse gas emissions, the utilisation of renewable energy and the promotion of energy-efficiency would address vulnerabilities in relation to energy supplies and price. It will also reduce the bill for energy imports that heavily influences the balance of trade for Barbados and many other SIDS.

Another dimension, which must be taken into consideration in the transformation to a green economy in Barbados, is the country's obligations under the various Multilateral Environmental Agreements (MEAs) to which it is a party, and how the rights and obligations contained therein are binding on its citizens. These MEAs provide a framework for international cooperation on regional and transboundary environmental issues as well as protect the rights of Member States. They are underpinned by a number of principles of international environmental law (i.e. polluters pay principle etc.), which are fundamental to the process of transitioning to a green economy.

In the above-mentioned context, Barbados defines a green economy as:

Barbados National Trust Hikers exploring the East Coast of Barbados – Site of the Proposed Barbados National Park
(Photo courtesy of the Anne E Gonzalez Collection©)

The potential for greening various sectors

Key messages

- Critiques of conventional farming practices state that this method is detrimental to the environment as it results in damage to soil structure, creates potential health hazards in food, reduces food quality, consumes energy, employs intensive and unethical animal production systems and brings about exorbitant social costs.

- The stakeholders' vision for a green agricultural industry reflects a desire to revitalise the industry as well as enhance resource- efficiency.

- Public and private sector investments can enable the agricultural sector to meet domestic demands for fresh produce (conventional and organic) and other value-added products, including packaged and graded produce, processed mixed vegetables and increased exports, as well as provide greater support to the agro-processing industry.

- The opportunity for forging stronger linkages with tourism/hospitality and processing/ distribution sectors should contribute to the strengthening of the economy through foreign exchange earnings/savings, new employment opportunities and skills enhancement.

- There is a need to develop medium- to long-term strategic plans for the agricultural industry. Policy-makers should lead the coordination of planning and implementation of such strategies. There is also a need to improve communication between ministries and stakeholders, in addition to reinforcing implementation.

Agriculture

Overview

Agriculture in Barbados is by and large dominated by the sugarcane industry, while production trends for most non-sugar crops are erratic. The sugar industry has the largest share of total planted acreage, foreign exchange earnings and domestic earnings. Over the last three decades, however, the industry has contracted significantly, owing to the loss of preferential market access to the European Union. Poultry is the predominant product in the livestock and dairy segment of the industry, but is geared primarily to meet local demand.

Strengths, challenges and investment gaps

Agriculture is dependent on water – a primary input of production processes. Given the scale of agricultural activity worldwide, it is easy to see why it appropriates between 60 to 70 per cent of the world's water resources. In an effort to conserve water and reduce input costs in the local industry, drip irrigation has been disseminated widely. However, there is a need to train farmers to match water application to growth stages and water crop needs. Energy, on the other hand, is primarily used for the operation of irrigation systems, agricultural machinery and animal husbandry.

Agriculture also produces waste material, the disposal of which can be problematic as in the case of animal husbandry and sugar processing.

Local farmers selling their produce
(Photo courtesy of Anne E Gonzalez Collection©)

Land preparation and tillage practices impact groundwater recharge, surface water run-off, pounding/flooding, soil erosion and loss of topsoil. Table 3 summarises strengths and challenges of greening agriculture.

Table 3. Strengths and challenges of greening agriculture

Strengths	Challenges
A strong interest in 'wellness' exhibited at the individual and community levels	Maintenance of a strong commitment to enhancing wellness at the individual and community levels
The sociability/friendliness displayed by the Barbadian people	An emerging anti-social subculture
The availability of a highly literate workforce	The capacity of families, social institutions and government to maintain support for education and training of youth
Technical and financial support by the Caribbean Agricultural Research and Development Institute, The University of the West Indies.	The ability of regional institutions to garner adequate resources to deliver relevant training and technical assistance
Food and Agriculture Organization, The Inter-American Institute for Cooperation in Agriculture	The financial capacity of international organizations
Strong education and training institutions at the primary, secondary, tertiary, and vocational levels	Ability to attract and retain high quality teachers / instructors and maintain the quality of plant and other facilities
Fairly well established research and development infrastructure in sugar cane breeding	Neglect of succession planning
A highly trained public service	Decline in professional standards

To close the critical investment gaps identified in the study, public and private sector investments should enable the sector to meet domestic demands for fresh produce (conventional and organic) and other value-added products, including packaged and graded produce along with processed mixed vegetables. Such investments would increase exports and provide greater support to the agro-processing industry. The ranking of investment gaps is presented in Table 4.

This study also suggests that there is an urgent need to address investment gaps in relation to: limited access to capital for the upgrading of technology, physical plants and animals; delays in the upgrading of the regulatory framework to meet international standards; shortages of trained manpower; weak extension services; inadequate laboratory facilities for testing, research and development; inefficient marketing systems; and minimal technical capacity for planning by the Barbados Agricultural Society.

Measures and potential returns

It is envisioned that greening the agricultural sector would be characterised by increasing the use of farming practices and technologies that simultaneously enhance farm productivity, reduce negative externalities and rebuild ecological resources, such as soil, water, air and biodiversity. Conventional farming practices tend to have major negative impacts, including damage to the environment and in particular the soil structure; the creation of potential health hazards in food; the reduction in food quality; a high use of energy; and, intensive animal production systems, which are ethically unacceptable and generate exorbitant social costs. Organic farming is increasingly being viewed as a solution to several of the negative externalities directly caused by conventional farming methods.

Over the past two decades, the industry has benefited from several initiatives aimed at enabling sustainable agricultural development. New legislation passed include the Fisheries Act, the Plant Protection Act and the Soil Conservation and Scotland District Act, among others. At

Table 4. Investment gap analysis for agriculture[4]

Challenges	Importance Score (1)	Performance Score (2)	Performance/ Investment Gap (3)=(1)-(2)
Water scarcity	7	4	3
Lack of R&D	9	7	2
Data deficiencies	4	1	3
Training farmers in crop rotation	5	5	0
Access to a wider pool of genetic resources	5	2	3
Capacity to produce materials locally	3	3	0
Lack of machinery	5	5	0
Institutional strengthening	10	3	7
Infrastructure	8	4	4
Training	8	4	4
Cultivation	9	3	6
Market development and intelligence	9	2	7

the same time, incentives have supported returning idle land to cotton production, utilising efficient irrigation systems, implementing soil conservation measures and underwriting the cost of obtaining organic farm certification, as well as the cost of components for greenhouses and hydroponics, and numerous other measures. The results of the study suggest that the key challenges facing the island's agricultural sector relate to the lack of quality of research and development infrastructure, the low financial capacity of regional and international institutions and the problem of praedial larceny.

In relation to opportunities for growth, the greening of a restructured sugarcane industry is likely to reverse the negative outlook for the industry. While such a venture will require both public and private sector investment in infrastructure, training, research and development as well as marketing, greening the sugarcane sub-sector would create an environment that recognizes and responds to the high- average age of workers and the competitiveness of the industry. Other growth opportunities identified include the increased production of locally-produced fertilisers, soil conditioners and animal feeds. A switch to organic farming would buttress economic growth in the local agricultural sector and contribute to poverty alleviation.

The growth of a vibrant sustainable agricultural industry can lead to economic growth in other sectors of Barbados' economy. The industry plays a critical role in maintaining a large component of the island's ecological landscape that visitors have come to appreciate and expect. Indeed, this has been one of the reasons advanced for the continued support provided to the sugarcane industry. The greening of agriculture also creates avenues for growth in energy production and waste management. To support this growth, however, a comprehensive and sustainable agriculture development plan will be required.

The major role of the government in supporting the transition to a sustainable agriculture will be in the areas of policy development and implementation, including the provision of incentives to the private sector.

The potential for greening various sectors

Key messages

- Fisheries play a major role in food security and in the economic, nutritional and cultural well-being of Caribbean countries. Current status and trends of coastal and marine resources in the region point to an increasing pressure from a number of sources. In Barbados, fisheries – which have been an important part of the national economy and culture from the earliest recorded times – are currently underperforming economically and socially.

- The sustainability of Barbados' fishing industry is inextricably linked to that of the Caribbean, given that the Caribbean Sea is essentially a common resource.

- Legislation, policies and plans relevant to the Barbados fisheries sector are numerous and may guide the process towards a green re-structuring of the fishing industry.

- A number of innovative management and governance tools are available that can be used to facilitate the transition of Barbados' fishing industry to one that delivers higher economic and social benefits.

- The fisheries sector can contribute to economic growth and poverty reduction through the following areas: conservation of marine resources; capacity-building; credit finance; improved communication and coordination among economic sectors; and collaboration in the management and development of transboundary marine resources. By investing to achieve sustainable levels of fishing, and implementing initiatives for improved management and efficiency of fisheries, the industry will ensure long-term economic gains.

Fisheries

Overview

The fisheries sector has historically been an important part of the social and economic fabric of Barbados. It provides food, recreational opportunities, ecosystem services, jobs, income and tax revenues. The fishing industry serves as an important social safety net, by providing work for those unable to find other employment and supplementing incomes of those employed in other activities. In 2006, the total value of local fisheries was estimated at about USD 25 million, and included both the ex-vessel value (the value of landed raw fish) and the on-shore value-added components of GDP. In terms of overall value, flying fish and mahi-mahi are estimated to be responsible for more than 80 per cent of the total value of fisheries.

Fish processing consumes significant quantities of energy, particularly fish harvesting operations, while water resources are consumed in the post-harvest process. In terms of waste, the island's largest public market (the Bridgetown Public Market) is estimated to produce 2-3 tonnes of fish offal daily. The island has more than 30 landing sites, with facilities of varying standards. The majority of the island's catch is landed at seven main sites – Bridgetown Public Market, Oistins Fish Market, Skeete's Bay Fish Market, Conset Bay Fish Market, Payne's Bay Fish Market, Weston Fish Market and Speightstown Fish Market.

It is envisioned that the concept of green fisheries is based on the notion of sustainable fisheries. Thus, greening the fisheries sector will require ecosystem-based management of the island's coastal and marine resources. This will enhance livelihoods and well-being within the fishing industry and related marine economic sectors, while allowing individuals and communities to maintain their social and cultural heritage. Given that most Caribbean coastal resources are considered to be under pressure from overexploitation, degradation, limited or poor management, and climate change, the concept of greening the fisheries sector holds significant potential for the region.

Challenges and priorities, including investment gaps

The key challenges for greening the fishing industry are conservation of marine resources, capacity building, finance, communication and coordination among economic sectors, and collaboration in managing and developing transboundary marine resources. These encompass the harvest and post-harvest sectors, as well as the accompanying supporting services and overarching resources and ecosystem that are the basis of the industry.

This study suggests that greater investment is needed in specific areas that are presented in Table 5.

Local pot fish (Photo courtesy of the Fisheries Division)

Table 5. Investment gap analysis for fisheries

Challenges	Importance Score	Performance Score	Performance/ Investment Gap (3)=(1)-(2)
Institutional development	9	2	7
Standards legislation	9	2	7
Market development	6	4	2
Target diaspora	7	2	5
Quality and safety	8	4	4
Eco -labelling	8	2	6
Regional certification	7	2	5

Measures and potential returns

The institutional and governance framework for sustainable fisheries on the island is enshrined in the Barbados Fisheries Act of 1993, which was introduced to provide for the management and development of fisheries in Barbados. The main objective of this legislation is to ensure the optimal utilisation of fisheries resources in the waters of Barbados.

Water conservation measures are currently being implemented at the fish markets and, to this end, there has been a directive from the Cabinet to install infrared sensors on taps at the processing bay at the Bridgetown Public Market and other markets across the island. This is particularly important in promoting economic efficiency by lowering operational costs through reduced water utility charges.

There are opportunities, too, for greening the fisheries sector in the areas of clean technologies, processing fish offal into high value added products and the use of mahi-mahi skin as fish leather. Fish offal has tremendous potential as a fertilizer in compost or dried and made into pellets for feed. It is worthwhile to note that the Barbados poultry industry already has the technology to convert its waste into a commercial asset, and the same could be possible for the fishing industry as long as the necessary technical assistance and funding is provided. Table 6 presents extracts of the potential returns and issues related to greening the fisheries sector.

Greening the post-harvest sector and implementing best practices will have no economic impact on the industry if the resource base and its ecosystem are not properly managed and protected. In this regard, the control of entry into fisheries to achieve sustainable levels of harvest must be considered, and the establishment of a Marine Management Agency and a Code of Conduct for Responsible Fisheries should also be given priority.

Additionally, consideration must be given to the complexity of the Caribbean region and the fact that most resources, exploited and non-exploited, are shared across different marine jurisdictions and resource-use regimes. Although few marine boundaries have been negotiated, it is clear that there is considerable interaction of people and issues across jurisdictions due to proximity (Mahon et al., 2010). Therefore, the greening of fisheries is also a transboundary matter.

Table 6. Synoptic table of potential returns and issues pertaining to greening the fisheries sector

Area	Economic growth and poverty reduction	Job creation and transmigration	Environmental improvement
Conservation of marine resources	• The global fisheries crisis is an external driver towards greening the fishing industry, as policy advisers and policy-makers become more aware and informed of the potential economic and social value of the fishing industry.	• Educated, capable young people may be more willing to enter the fishing industry seeking the planned professional certification of sustainable fishing occupations.	• International pressure favours sustainable management and livelihoods, but current fisheries legislation is inadequate for the proper management of the fishing industry. • Variability in the abundance and availability of marine resources will be exacerbated by climate change, making sustainable fisheries planning and development more difficult.
Capacity-building	• Government procurement policies and draft fisheries legislation can be tailored to support green economy initiatives. • Training, outreach and capacity enhancement need to be intensified.	• Training institutions exist with potential to offer training for green technology access and the transfer of skills. • Technologies for processing fish silage and producing fish leather are available; and it is consistent with small business and green job promotion to facilitate such entrepreneurship.	• Control of entry into fisheries to achieve sustainable levels of harvest is possible through the enforcement of appropriate legislation currently in draft, and through execution of comprehensive fisheries management plans. • Potential for increased economic returns to the sector and national economy must be articulated in fisheries management and other development plans.
Credit	• Taxation, incentives and fiscal reform require practical and technical guidance to support greening projects. • Credit is not easily available to persons involved in the fishing industry.	• Opportunities exist to diversify fisheries once venture capital or development funds and technical support are available to facilitate research and development. • Tariffs, trade competitiveness and investment policies must be explained to stakeholders who are used to protectionism and demand it despite the changing world trade regime.	• Change requires new attitudes towards environmental practices; funding policies and incentives (tax and duty concessions) need to be re-designed and monitored to support desired changes.
Communication and coordination among economic sectors	• Governance in the fisheries sector has become more participatory through the provision made in the Fisheries Act for a Fisheries Advisory Committee (FAC). However, lack of communication hinders participatory governance. • Vertical integration and harmonisation of the various stages of the fishery value chain may be possible. Its success would promote a more equitable distribution of post-harvest benefits.	• Policies are needed to promote sustainable use of water. • Higher food standards may provide assurance to stakeholders in the tourism industry and lead to a strengthening of ties with the local seafood industry, which could reduce imports of competing fish products.	• There is the need to apply the business model for a marine management agency to marine protected areas; this model should be developed in combination with an implementation plan. • Barbados is moving too slowly towards an ecosystem approach to fisheries (EAF)[5] and related approaches.
Collaboration for managing and developing transboundary marine resources	• Trade tariffs currently favour value-added, locally manufactured seafood products. Their production can be strengthened. • Seafood has been part of Barbados' policy on food security, but can be strengthened through placing more emphasis on policies that address the import and export of fishery products.	• Lucrative niche markets for fishery product exports are believed to exist. • The CARICOM Common Fisheries Policy may provide opportunities for improved products and quality as well as resource conservation.	• Engagement in transboundary resource management increases available options. • A code of conduct for responsible fishing would provide guiding principles for Barbados' fisheries management plans.

The potential for greening various sectors

Key messages

- The construction of commercial and residential buildings imapcts on natural and human resources through the unsustainable use of land and energy, the removal of natural materials, transport of construction materials, liquid and solid waste generation, poor utilization and recycling of building materials, and the use of hazardous building materials.

- In a sustainable state, buildings are resource-efficient, produce minimal waste, use non-toxic substances, support healthy indoor environments and provide access to public transport.

- There is currently no single vision for greening the building/housing industry that represents a coordinated effort from all stakeholders – including government, industry associations, educational institutions and companies. Such a vision could foster a national strategic framework that addresses these impending issues and explores best practices.

- The enabling conditions needed to achieve a sustainable building/housing industry include energy conservation initiatives, international environmental certification programmes, fiscal incentives, a supporting institutional framework, and access to international grant funding to provide a strong institutional platform for greening the industry.

- The enactment of legislation to formalise the existing voluntary use of the Barbados National Building Code.

- Some of the key challenges to greening the industry are: the relatively high costs of newer technologies; the absence of an overarching policy framework; limited training programmes and regional experts in green design, standards and monitoring processes; the lack of low-cost green housing solutions; cultural preferences for the detached housing units, and; limited financial and economic resources.

Building / Housing

Overview

The building or construction industry is a major contributor to the country's economic growth and development. In 2010, the total value-added of the industry was USD 185.5 million or about 5 per cent of GDP. In addition, the industry employs about 15 000 persons, almost 2 000 more than Barbados' main industry – tourism. Over the years, there has been an expansion of the built environment through the construction of transportation infrastructure along with private and public buildings. Urban settlement is located within a continuous linear coastal urban corridor that extends along the entire length of the west and south coasts. Traditionally, most persons lived in wooden and chattel houses (73 per cent in 1970). This ratio has, however, fallen dramatically in recent years due to rising standards of living. In 2000, (the most recent estimate available), 45 per cent of houses were made entirely of concrete blocks.

The construction of commercial and residential buildings puts a strain on natural and human resources through energy use, land use, the removal of natural materials, transportation of construction materials, liquid and solid waste generation, poor utilisation and recycling of building materials and the use of hazardous building materials. In 2009, the single largest category of electricity sales was residential users, accounting for 32 per cent of total sales or 306.6 million kWh. The country, however, has an enviable record in relation to the penetration of solar water heaters, with an estimated 40 000 systems in operation, 75 per cent of which are in residential use. The island is subdivided into five water protection areas, with Zone 1, being closest to the production wells, having stringent restrictions on development activities, and Zone 5, the least restrictions. Protection of the country's water resources is undertaken by the Town and Country Development Planning Office (TCPDO) through enforcement of development restrictions, with support from the Environmental Protection Department (EPD) and the Barbados Water Authority (BWA). Development on the island is governed by the Physical Development Plan, which attempts to match the demand for land to the island's development objectives.

The prospect of green building offers the possibility of improving resource efficiency, reducing waste and the use of toxic substances, enhancing water efficiency and sustainable site development, as well as raising the consciousness of practitioners in the construction industry and house owners so that they become more discriminating in their selection of green materials when building. In addition, green building offers general meliorations in indoor environmental quality. Most stakeholders in the industry have a strong desire to realise the potential social and financial benefits from improved quality in community living. They are also interested in increased cost savings accruing from greater efficiency in energy usage and energy-efficient building design and construction.

Challenges and priorities, including investment gaps

The constraints in relation to greening the industry have not changed since Barbados' First National Communication on Climate Change was presented to the United Nations Framework Convention on Climate Change in 2001. Recently, however, two other challenges have emerged, namely, perceptions by industry managers that low-cost housing is in direct conflict with sustainable housing, and; cultural preferences for the detached housing unit, which hinders the design and sale of alternative dwelling arrangements that would contribute to land conservation. Table 7 presents a summary of selective challenges in the greening of the building/housing industry.

Table 7. Assessment of challenges in building/housing sector

Challenges	Frequency of occurrence	Impact	Ranking of importance
Relatively high cost of newer technologies	5	8	40
Lack of overarching policy framework	7	8	56
Lack of training programmes and regional experts	8	9	72
Demand for low-cost green housing solutions	9	9	81
Cultural preference for detached housing units	6	6	36
Financial and economic constraints	9	7	63
Cultural perceptions	9	9	81
Limited home-grown technologies	6	6	36

To address these challenges, it was felt that training programmes, policy-making and educational campaigns would contribute positively to achieving the green economy objectives in the building/housing sector. Stakeholders noted that the island has a good complement of building professionals whose expertise should be built upon through retraining and technology transfer to improve the built environment and quality of new housing stock. It was also indicated that the building code should be updated to include high-rise housing, and calls were made for the private lending agencies to play their part by approving or underwriting loans based on environmental risk management considerations.

The challenges identified for the greening of the industry were used as a basis for determining those areas where greater investment would be required in order to realise green outcomes in the industry. Table 8 presents the outcome of this investment gap analysis.

Table 8. Investment gap analysis in building/housing sector

Challenges	Importance Score (1)	Performance Score (2)	Performance/ Investment Gap (3)=(1)-(2)
Relatively high cost of newer technologies	6	7	-1
Lack of overarching policy framework	7	2	5
Lack of training programmes and regional experts	8	1	7
Demand for low-cost green housing solutions	9	7	2
Cultural preference for detached housing units	6	6	0

Scaling up efforts to integrate renewable technologies in public infrastructure – the new Sharon Primary School
(Photo courtesy of the Natural Heritage Department)

Measures and potential returns

According to the Economic and Social Report[6] during 2009, the construction industry grew. During that year, it is estimated that 1 759 units were constructed compared with 1 321 in 2008, an increase of 33.2 per cent. Also, the impact of the building/housing on the cross-cutting issues of energy, water, solid waste and land are inextricably linked.

Barbados' over reliance on imported fossil fuels has led it to continue to explore renewable energy options. With respect to the building/housing industry, there has been a specific focus on increasing the use of household solar water heaters. In 2002, Barbados saved 15 000 metric tonnes of carbon emissions and over USD 100 million in energy savings from the 35 000 solar hot water systems that had been installed at the time (Husbands, 2009).

As of 2008, approximately 40 000 solar water heaters were operational in Barbados – 75 per cent of which represent domestic installations (Stuart, 2011). The Barbados government has implemented several schemes to further stimulate the installation of solar water heaters. Two examples of these are fixed amounts of funding (USD 1 000) that can be used for energy audits and a reduction scheme of 50 per cent for homes using alternative sources of energy. Job stimulation efforts include vocational training opportunities in areas such as solar water heater (SWH).

A cost-benefit analysis showed that homeowner payback periods for domestic SWH have dropped due to the implementation of fiscal measures (Perlack and Hinds, 2003). For instance, for the system size most commonly installed today (80 gallons), the payback period is about 2.1 years without the tax deduction. The payback period falls to 1.6 years if the homeowner is in the 25 per cent tax bracket and 1.2 years if in the 40 per cent tax bracket (Table 9).

Table 9. **Estimated payback periods for domestic SWH** (Source: Slightly modified from Perlack and Hinds, 2003)

Parameters		SWH size (gallons)			
		40	52	66	80
Installed cost (BBD)		2 250	2 400	2 850	3 500
Energy savings (kWh)		2 380	3 090	3 930	4760
Electric price (BBD/kWh)		0.35	0.35	0.35	0.35
Annual savings (BBD)		840	1 092	1 386	1 680
Payback period (years)					
- Without fiscal incentives		2.7	2.2	2.1	2.1
- With fiscal incentives:					
Taxable income	Tax rate (%)				
< BBD 24 000	25	2.0	1.6	1.5	1.6
> BBD 24 200	40	1.6	1.3	1.2	1.2

Other initiatives include a number of photovoltaic (PV) projects on the island. Barbados has about 250 kilowatts peak (kWp) of PV installed at various locations, making it one of the leading Caribbean countries utilising this technology (GOB,2001).

The main building materials used in construction are wood, concrete and steel. Further study of the energy used in the production and importation of these materials is required in order to determine if the use of these materials is sustainable from the perspective of national energy costs. The two main water-related concerns for the building/housing industry are the prevention of pollution of freshwater supplies and the increasing demand resulting from expanding urban development. Efforts to prevent pollution of freshwater supplies largely centre on a Ground Water Protection Zoning Policy, implemented since 1964. Water demand issues are being tackled, primarily, by initiatives to change consumption patterns. Efforts to date have included a public education campaign launched by the

Table 10. **Benefits of green buildings** (Source: City of Bloomington, 2011)

Economic	Social	Environmental
Energy and water savings (reduced utility cost leads to long-term savings)	Improved health (due to improved ventilation and use of non-toxic and low emitting materials)	Emission reduction (due to increased use of renewable energy sources)
Increased property value (resulting from lower operation costs and easy maintenance)	Healthier lifestyle and recreation	Water conservation (harvesting rainwater and recycling wastewater yields significant water savings
Decreased strain on the infrastructure (resulting from reduced demand on local power and water supply)		Storm water management (permeable surfaces and green roofs control and channel storm water runoff)
Increased employment productivity (resulting from healthier indoor environmental conditions)		Waste reduction (the deconstruction and recycling of building materials reduce waste production)

BWA in 2004. This programme involved the distribution of free low water use showerheads and kitchen faucet aerators to customers not in arrears; approximately 30 000 devices were distributed.

The Vaucluse Waste Transfer Station (materials recovery, composting facility and chemical waste management) came into operation in 2009 and, as a result, the amount of solid waste going in to the landfill has been reduced.[7] This includes construction and demolition waste, green waste, wood pallets, plastics, glass and metals.

A traditional chattel house in Barbados
(Photo courtesy of Anne E Gonzalez Collection©)

Greening of the building/housing industry in Barbados requires that careful consideration be given to the formulation of more effective strategies that will advance the regulation of the competition between land for building and land for agriculture and recreation. The introduction of green standards in the management of energy, solid waste, water and land will need to be integrated under an overarching policy framework for the greening of the building/housing industry.

Green construction not only has environmental benefits, but it also helps to improve employee productivity and work quality as well as public health in general, along with decreasing air and noise pollutants (Table 10). In this regard, four key opportunities for greening the industry were identified: i) conversion of derelict sugar factories into waste-to-energy plants; ii) education and technology; iii) provisions and subventions, and iv) recycling communities. In the process of transitioning to a green economy, there is the potential for green jobs in areas of retrofitting, lighting, sales and maintenance of efficient appliances, and the provision and use of low-energy construction materials in a sustainable building/housing industry. The island, however, requires a strategy and policy for on-going education, outreach and information-sharing in order to encourage behavioural change. Given the island's high literacy rate such a strategy should be highly effective. The launch of private-public sector building projects that integrate environmental and social benefits into their building/housing solutions can result in efficiency gains in natural resource usage, lower waste production and the creation of a healthier indoor environment. The Urban Development Commission (UDC) in 2010 launched a "Go Green" community project that was well received by community residents. While this project largely focused on beautification, it is possible that this endeavour could be scaled-up to include the green building/housing principles highlighted in this study.

The potential for greening various sectors

Key messages

- There is one vehicle for every two persons on the island. Barbados is placed 12th globally for roads victims per 100 000 people.
- Four main challenges related to the transport sector are: traffic congestion, high fossil fuel costs, public attitude towards use of public transport, and lack of finance and investment for greening the sector.
- A package of investment and policy reforms is needed for the development and implementation of fuel performance, air and noise pollution standards, improved traffic management, use of mixed modes of transport and internalization of climate change considerations in transport choices. To address congestion, a system of on-street parking charges and regularization of length of stay should be considered.
- The benefits of greening the transport sector will include: reduced traffic congestion and hence reduced travel time; lower fuel use and hence a lower oil import bill; improved quality of life, especially in terms of noise and air pollution, and reduced emissions of GHGs.

Transport

Overview

Barbados road network consists of more than 1,600 km of public paved roads, two active main ports (the Bridgetown Port and Port St. Charles) and one airport (the Grantley Adams International Airport). Statistical data from the Barbados Licensing Authority reveals that, in 2009, the vehicle stock on the island numbered 131 680; this implies that there is one vehicle for every two persons on the island. Barbados is placed 12th globally for road victims per 100 000 people and 23rd for actual road fatalities per 100 000 people, a position shared with the United States, Greece, Tunisia, Estonia and Georgia. There are three types of operators involved in the public transportation system on the island, two of which are privately owned.

The transport industry consumes 33 per cent of the country's imported fuel. Water use is primarily in relation to new road construction and improvement projects, while some is also used for irrigation of landscaped areas within large roundabouts along the ABC Highway. With respect to flooding resulting from road construction, the Drainage Division of the Ministry of the Environment and Drainage, along with TCDPO, are the agencies responsible for devising and implementing mitigation measures. However, inconsistency in planning and enforcement on the part of the TCDPO results in persistent challenges with flooding in high rainfall areas, especially during the wet season.

As a response to existing emission-related issues, as well as other economic, social and environmental concerns common to most countries, there is now a focus on the deployment of sustainable or green transportation options within the industry. Sustainable transportation is one of the key sectors in sustainable development and in the implementation of a green economy. Global Environment Facility (GEF, 2009) suggests that the transition towards a sustainable transportation system should consist of initiatives aimed at, among others:

- reducing the role of the private vehicle as the main mode of transportation;
- promoting and improving existing public transport;
- implementing vehicle emissions standards and introducing green vehicles (electric, hybrid, solar, natural gas, bio-fuel and fuel-cell vehicles) which achieve better energy efficiency;
- developing guidelines for the disposal of old vehicles, and for the recycling, recovery and reuse of vehicles and their components; and,
- integrating sustainable transportation policy into the overall planning policies.

Challenges and priorities, including investment gaps

A green transport industry should address existing issues in relation to emissions without harming economic activity. Greening transportation systems requires the integration of a sustainable transportation policy into the overall planning process for the industry.

In Barbados, there is inadequate land space to integrate pedestrian and bicycle mobility systems – sidewalks, trails, paths, and other amenities – into existing residential communities and employment centres. The main causes of air pollution are fuel (gasoline) mixes used by some vehicles and the absence of equipment to enforce a national air emission standard. Noise pollution by vehicles is also a matter of concern but, as with air quality, enforcement of a national standard is being stymied. The Environmental Protection Department, the government department

responsible for setting national standards to mitigate air and noise pollution, relies on standards produced by international organisations.

Using a 10-point scale, the challenges facing Barbados' green transport vision was assigned a score in relation to the frequency of occurrence and the likely impact on the goal of greening the sector within the plan period (2010–2025). Using this score-based assessment, the most significant challenges to greening the transportation sector are presented in Table 11.

The vulnerability of the country's transportation system is heightened by the position of the two main coastal highways that are barely above sea level. To address these challenges, further investment will be required in relation to air and noise pollution standards, traffic management, mode mixing, disaster management, and climate change adaptation. The provision of fiscal incentives and development of public-private partnerships within the transport sector would contribute significantly to the successful realisation of the overall vision. Table 12 presents the results of this investment gap analysis.

Adequate funding, however, is needed to accomplish the goals of the avoid-shift-improve strategy. In the face of

Table 11. Assessment of challenges to greening the transport sector

Challenges	Frequency of occurrence	Impact	Ranking of importance
Traffic congestion	9	10	90
On-street parking	8	7	56
High fossil fuel costs	7	10	70
Bus scheduling	6	7	42
Public attitudes to green initiatives	9	10	90
Air pollution	7	7	49
Cost of water	8	6	48
Finance for investment	8	8	64
Human resource capacity	7	7	49

Table 12. Investment gap analysis in transport sector

Challenges	Importance Score (1)	Performance Score (2)	Performance/ Investment Gap (3)=(1)-(2)
Traffic congestion	9	5	4
On-street parking	7	6	1
High fossil fuel costs	8	7	1
Bus scheduling	6	6	0
Public attitudes to green initiatives	9	3	6
Air pollution	7	2	5
Cost of water	7	5	2
Finance for investment	8	3	5
Human resource capacity	7	5	2

often limited funding for greening the transport industry, one recommendation is for the traditional financing framework to be reformed so that:

- funding is available to all aspects of green transportation technology, capacity-building, operations and infrastructure;
- investments are made in sustainable transport modes rather than unsustainable modes;
- public funding is accessible at the international, national and local levels for investments in green transport;
- private finance is leveraged, through the appropriate design of markets and the creation of consistent, long-term incentives to invest in green transport, and through the application of public-private sector models of collaborative effort to invest in and operate green transport systems (such as Bus Rapid Transit (BRT) systems)[8]; and,
- financing flows from different sources are designed to complement each other, rather than work towards different goals (UNEP, 2011a).

Measures and potential returns

There is an opportunity to green the transportation sector by promoting an integrated transport strategy, and an approach that takes into account all the contributing elements to increase effectiveness. For instance, in order to reduce the number of vehicles on the road, there will be a need to enhance the quality and quantity of public transport. A more widespread utilisation of public transport can reduce congestion and thus lower the fuel import bill of the country. Furthermore, since fuel mixes impact engine performance and, concomitantly, fuel efficiency, potential exists for setting standards for fuels that focus, not just on environmental standards, but also on quality and performance. Congestion within Bridgetown is also caused by on-street parking due to limited off-street parking facilities. In this regard, a system of on-street parking charges and regularisation of length of stay should be considered as measures to address the problem as well as to finance other green transport initiatives.

The transport sector consists of methods of transportation (private and public vehicles, cars and lorries, among others), roads, trails, sidewalks and fuels. The introduction of green approaches in all of these areas would yield, among others, environmental benefits associated with a lower level of emissions and discharge of fewer toxic contaminants into the atmosphere than that obtained with the current reliance on gasoline and diesel vehicles. It is anticipated, therefore, that the use of alternative fuel vehicles would reduce negative impacts on air quality, the environment, public health and the economy as a whole, and would increase Barbados' contribution to the mitigation of global warming.

It is anticipated that, in Barbados, opportunities for green jobs would centre primarily on the provision and maintenance of fuel-efficient vehicles and the management of an integrated public transportation system. A more specific analysis of a desirable system is limited due to the absence of detailed studies that point to the most appropriate mix of green modes of transport for the Barbadian context.

Electric Vehicle designed by Barbadians for island tourism applications; currently deployed at Barbados' number one attraction, Harrison's Cave
(Photo courtesy the Natural Heritage Department)

The potential for greening various sectors

Key messages

- Tourism and travel have seen some changes in prosperity, as well as negative impacts (social, cultural, economic and environmental) when tourism is not well planned and managed.
- For the Caribbean, the most tourism-dependent region in the world, sustainability or greening is no longer an option but an imperative.
- There are tremendous opportunities for savings through energy and resource efficiency in the hotel sector (average potential electricity savings near 40 per cent of hotel's total consumption).
- If the tourism industry is to engage a phased approach to greening, then communication with its supply chain will be critical for redefining and creating jobs.
- Focused policy and financial interventions are required to create sustainable agro-based and cultural-heritage tourism models.

Tourism

Overview

Barbados is one of the more established Caribbean tourist destinations, with large-scale tourism dating back to the late 1950s and early 1960s. Over the years, the various entities specifically responsible for tourism product development – the Ministry of Tourism (MOT) and the Barbados Tourism Authority (BTA) – have worked hard to diversify the options available by creating more competitive niche offerings, such as sports tourism, heritage tourism, gastronomic tourism and, more recently, health and wellness tourism. Total visitor expenditure in 2010 was estimated at USD 1.2 billion, about 6.3 per cent higher than in 2009. The average daily expenditure of overnight visitors from the UK and other European countries tends to be higher than that of tourists from any other region. Hotels supply most of the accommodation available on the island, but current average occupancy rates tend to be low (about 56 per cent).

Globally, the tourism industry has a significant impact on a country's resources, its environment, economy, people and society, particularly in small states (Table 13). Some of the main impacts are pollution, depletion of natural resources, soil erosion, displacement of residents, inflation, excessive foreign ownership accompanied by foreign exchange leakages, loss of culture, cultural commodification and extensive changes in societal norms.

The Caribbean Tourism Organisation (CTO) has developed a regional policy framework for more sustainable tourism development in the Caribbean. This policy framework has six thematic areas: tourism management capacity, marketing, transportation, the environment, linkages with other economic sectors, and health, safety and security. Given the inherent vulnerability of the tourism product in SIDS, a green approach to tourism development holds significant potential in relation to sustainable development.

Challenges and priorities, including investment gaps

Barbados has a number of inherent strengths that can be built upon in order to pursue a green growth strategy for the tourism sector.

Table 13. Impacts associated with tourism development

Dimension	Possible positive impacts	Possible negative impacts
Socio-economic	Employment creation, revitalization of culture, inter-cultural understanding, improvements in social/ community organization, cultural conservation	Overcrowding of public spaces, commoditization of culture, acculturation, residents denied access, social problems, such as crime, prostitution and gambling
Environmental	Protection and management of the natural environment, potential to raise revenue for environmental initiatives, such as recycling, site beautification	Disruption of flora and fauna species; acceleration of climate change: substantial carbon footprint; introduction of non-native species; adverse effects on water quantity, quality and use; breached environmental carrying capacity; pollution – air, water, architecture
Economic	Increases foreign exchange and government revenue, employment, fosters inter-sectoral linkages and entrepreneurship, produces multipliers, assists in the development of remote areas	Displacement of industries, overwhelming dependence on tourism, leakages, inflation of prices, limited access to land, vertical integration, increased propensity to import, employment seasonality

In 2011, the island was ranked 28th out of 140 countries on the Travel and Tourism Competitiveness Index produced by the World Economic Forum. Of particular interest is the fact that heritage and community-based tourism hold significant potential. The exploitation of these strengths is, however, dependent on the island addressing a number of challenges in relation to greening the industry. One of the main challenges is the low occupancy rate that characterises the industry. These low rates reduce profitability and limit the ability of the industry to finance green initiatives. In addition, the dynamism in the external tourism market with which the local industry competes and the cost of inputs also present a challenge to the island's future development of the industry. Moreover, access to tourism statistics, a necessary input for both planning and budgetary allocations, is still relatively limited because data collection is largely under-developed.

Investments in sustainable tourism solutions can contribute significantly to transforming national and regional economies to green economies. One important investment gap urgently requiring closure is in the area of reducing dependence on imports, in particular, food, manufacturing, labour and technology (Table 14). The creation of business models for sustainable agro-tourism, as well as the adoption of internationally recognised production standards for agricultural products, is equally critical.

Measures and potential returns

The greening of tourism is likely to be one of the key strategies used to ensure the future sustainability of the industry. Opportunities identified in this area include marketing Barbados as a green destination, developing heritage tourism sites, building relationships between the tourism industry and firms providing inputs, developing agro-tourism products and creating marine protected areas. In relation to heritage tourism, the Barbados Sugar Trail Tour and the Defence of Barbados Tour are products that can be easily traded and can yield significant growth benefits. In addition to the island's heritage potential, its rugged coastline, spectacular views and unique plant and wildlife have potential for further nature-based tourism development. The island also needs to ensure that its already existing nature-based tourism products (Harrison's Cave, Graeme Hall Nature Sanctuary and the Folkestone Park and Marine Reserve) are maintained and enhanced.

Table 14. Investment gap analysis of tourism sector

Challenges	Importance Score (1)	Performance Score (2)	Performance/ Investment Gap (3)=(1)-(2)
Cost of achieving green certification	7	3	4
Heavy dependence on imports	6	1	5
Climate change	9	5	4
External environment	8	5	3
Measurement	8	5	3
Low occupancy rates	9	2	7
Domestic transportation system	5	1	4
Crime and safety issues	7	5	2
Inconsistent supply of local inputs	5	4	1
Cost of inputs	8	7	1

Tourism – the mainstay of the Barbados economy (Photo courtesy of the Anne E Gonzalez Collection©)

The opportunities for hotels to improve their resource-use efficiency are well articulated and many have been shown to be cost-effective with short payback periods. The approaches include: carrying out a resource- and energy-use audit to identify potential areas for savings; organizational change in the importance and support for carrying out audits and setting objectives, implementing recommendations, and monitoring and reporting on progress; behavioural change to the way the use of resources are regarded by management and staff through training, encouragement and team building; and, technological change that allows the introduction of resource-efficient equipment, fixtures and fittings, and the search for ways in which operations can be reconfigured to maximise resource use. Table 15 presents a list of tools that can be used to advance the goal of greening the tourism industry.

Since the 1970s, tourism has been a key driver of economic growth in Barbados. The potential advantages of pursuing a green growth strategy in tourism can enhance the long-term sustainability of the industry, as well as act as a catalyst for the adoption of green processes and practices in related industries. For example, entrepreneurial opportunities can be created in the areas of organic farming, maintenance of energy and water efficient systems, manufacturing of biodegradable products, mobile applications for monitoring and sourcing, disposal of biodegradable and other refuse as the transition occurs, expansion of recycling companies to include hazardous waste and other non- biodegradable materials from restaurants, hotels, agro-tourism attractions, heritage attractions and eco-lodges. From a fiscal perspective, these entrepreneurs can be given incentives in the form of low-interest loan schemes such as the Smart Fund.

The Economic Partnership Agreement can be another mechanism through which training and technical assistance can be accessed to support green economy entrepreneurs, and small tourism business owners and operators.

Table 15. Potential tools for greening the tourism sector

Tools	Issues	Institutional examples
Environmental codes of conduct – provides guidelines for businesses to operate in a more sustainable fashion	• focuses primarily on the physical environment (not comprehensive enough) • voluntary in nature • ineffective sanctions	• World Travel and Tourism Council • International Hotel Initiative (Charter for environmental action) • Pacific Area Tourism Association – code of environmentally sustainable tourism
Certification schemes – verification of a company's performance against a set of standards	• tend to focus on environmental issues • can be disadvantageous to poorer countries – lack of skills, monitoring and recording systems • environmental standards may be insensitive to local realities	• Green Globe 21 • Smart Voyager (Galapagos Islands) • Certification for Sustainable Tourism (Costa Rica) • Green Deal (Guatemalan coalition of NGOs • Fair Trade Tourism (South Africa) • Hospitality Assured (Caribbean Tourism Organisation) • Tour Operators Initiative (2000) • Blue Flag
Triple bottom line reporting goes beyond narrow reporting on economic performance measures and reports on the social and environmental values that organizations add	• recognises that financial success itself is reliant upon all pillars of sustainability • efficiencies in cost savings • implementation costs may be too high for many businesses • measurement focuses on quantitative variables; limits to quantification	• Global Reporting Index (2002)
Indicators of sustainable tourism – measures, assesses, monitors progress using primarily quantifiable data	• requires data sets that may not be always available • recognizes the interconnectivity in the tourism system • methodology not always transparent or explicit; comparative methodologies become difficult • tension between placed based and global indicators	• UNWTO (1999) – developed for destinations • Association of Caribbean States (2001) – developed for the ACS member countries • Caribbean Tourism Organisation-developed for member countries (2003)
Travelife Sustainability System	• provides support, advice and tools to help improve their environmental and social performance	Examples of certified hotels in Barbados: • Bougainvillea Beach Resort • Barbados Beach Club • Mango Bay • Fairmont Royal Pavilion

Analysis of enabling conditions for transitioning to a green economy

This section of the report considers the enabling conditions necessary for the transition to a green economy. It is based partially on stakeholder consultations on the topic with representatives from the private, public and non-governmental organizations as well as an Enabling Conditions Experts' Workshop.

Finance and investment

One of the most important components of the emergence of the green economy will be the development and adoption of new approaches to finance green initiatives, that is green finance. The concept of green finance refers to market-based investing and lending schemes that explicitly take environmental factors into account. There are several areas that "green finance" can cover, such as car loans, mortgages, environmental bonds, carbon credits, certified emissions reduction certificates, venture capital for alternative energy projects, eco-savings deposits and green credit cards, to name a few. For example, a bank may provide car loans to finance vehicles powered by alternative fuels at preferential rates. As a result, the consumer benefits from reduced financing costs and the bank benefits due to the increased demand for loans, as well as an improved public image. Finally, the society benefits from reduced emissions.

The study identified numerous existing local, national and international mechanisms that can be used for financing the transition to the green economy. Table 16 provides a summary of such mechanisms.

There is also a special need to build such capacity in the private sector and with civil society institutions. Development partners and institutions should be approached in this regard. Additionally, Barbados is in the process of developing a Country Programme Strategy (CPS) for the GEF SGP. This mechanism targets civil society and non-profit organisations. It is proposed that the green economy, given its national priority status, be formalised as the umbrella focus of the CPS.

There is also an opportunity, through the Ministry of Finance, to focus the next IDB Country Strategy in its programme period to areas relevant to a green economy. It is proposed that Resource Efficiency, Sustainable Tourism and Ecosystem Protection and Management be included in the next Country Strategy.

Table 16. Summary of existing enabling financial mechanisms

Local/National	Regional and International
• Government's Consolidated Fund • Enterprise Growth Fund (Agriculture Development Fund; Industrial, Investment and Employment Fund; Tourism Loan Fund; and Small Hotels Investment Fund) • Ministry of the Environment's Grant to Non-Profit Organisations • Energy Smart Fund • IDB Country Strategy • GOB-IDB Sustainable Energy Initiative • Catastrophe Fund • Central Bank's Credit Guarantee Scheme • Central Bank's Industrial Credit Fund	• IDB (Multi-lateral Fund of the IDB Group) • Caribbean Development Bank-European Investment Bank • Department for International Development of the United Kingdom (DFID) • Climate Finance (Fast Start Financing, Clean Development Mechanism, Adaptation Fund) • Global Environment Facility • GEF Small Grant Programme • The Caribbean Catastrophe Risk Insurance Facility (CCRIF) • European Development Fund • User Fee Systems for Marine Protected Areas

In addition, consideration should also be given to alternative funding mechanisms such as resource-use fees. It is possible to develop a formula that links the payment to measurable variables that are related to usage.

Regarding the private financial sector, the Ministry of the Environment and Drainage, in collaboration with The Barbados Bankers' Association (TBBA) and UNEP Finance Initiative (UNEP-FI), should continue its effort to promote Environmental and Social Risks Management in the Financial Sector. Expansion of this programme should be considered to include the Cave Hill School of Business, UWI as the academic partner and the issue of climate change should be integrated into on-going research efforts.

Development, access and transfer of clean technology

While Barbados is not a major contributor to global CO_2 emissions, new technologies that enhance resource efficiency provide numerous social, environmental and economic benefits for SIDS. For example, a significant reduction of the fuel import bill would result in foreign exchange savings, reduced cost of doing business and increased available resources to be used on other sustainable development objectives. Most international agreements identify technology transfer from developed to developing countries as a critical aspect of helping developing countries achieve their sustainable development and green economy goals.

For technology transfer to take place, however, issues related to intellectual property will need to be confronted on an on-going basis (Figure 3). The Inter-governmental Panel on Climate Change (IPCC, 2000) notes that one of the major requirements for a successful technology transfer is the existence and enforcement of intellectual property rights, which encourages firms to transfer their technology via trade, foreign direct investment (FDI), technology licensing and/or joint ventures. Barbados has a comprehensive legislative framework in relation to the protection of intellectual property. The island is also in compliance with the WTO's Trade-related Aspects of Intellectual Property Rights (WTO-TRIPS) and is a signatory to numerous international treaties relating to intellectual property rights for resource efficiency and cleaner production.

In recent times, the outcome statement of the 2010 Commonwealth Small States Meeting (Commonwealth Secretariat, 2010) notes "**… a number of specific opportunities have been identified for action, including the establishment of technology-based small states collaborative programmes to audit, develop and harness more effectively intellectual property assets in countries.**" Small Island Developing States Technical Assistance Programme (SIDS-TAP) holds significant potential for assisting Barbados in accessing applicable clean technologies to enable its pursuit in developing a green economy. The GOB, in collaboration with the CARICOM Member States and strategic development agencies, should give consideration to activating this facility.

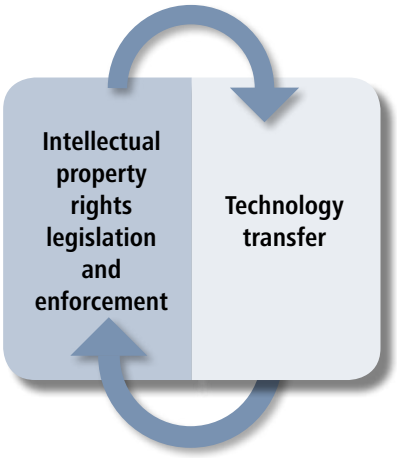
Regionally, Barbados has shown significant progress in the area of small-scale renewable energy technologies, which is integrated in its energy matrix. Specifically, solar water heaters were introduced since the early 1970s and there are now approximately 40 000 solar water heaters in Barbados, with more than 30 000 domestic installations.

The stakeholder consultation process also identified opportunities within government to demonstrate various green/environmental technologies via its public investment programme. Social housing, public transport and agriculture were identified as applicable areas.

Tariffs and trade policy

SIDS, by their very nature, are open economies. In the case of Barbados, trade contributes more than 96 per cent of

Figure 3. Facilitating technology transfer



GDP. Using trade policy to address environmental problems can elicit important behavioural change in the local marketplace and can help increase access to international markets for sustainably-produced products.

Rather than using punitive tariffs, Barbados focused on trade liberalisation of goods used in environmental management systems (referred to herein as green goods), attracting duty-free access or reduced tariffs. In 2006, Barbados established tax and customs incentives for renewable and energy-efficient equipment. These trade concessions include:

- reduced customs duties at the rate of 5 per cent for compact fluorescent lamps (CFLs), house and attic fans, ceramic coatings for roofs and window tint; and
- full customs waivers for solar photovoltaic systems, solar thermal systems, biofuel systems, hydropower systems, wave and tidal power systems, fuel cell systems and geothermal heat pump systems.

The issue of developing and monitoring environmental standards should be given special attention in the modernisation of the Barbados National Standards Institution (BNSI). Similarly development and marketing of "greener" niche products particularly in the agro-sector can be significantly enabled on completion of these projects. There is also need for research on the liberalisation of green goods (environmental goods and services). The National Trade and Environment Sub-Committee (NTESC) has been instrumental to date in this regard (Singh, A., pers. comm).[9] In the context of the CSME, future emphasis should be placed on identifying regional opportunities, developing the environmental services industry, climate change implications on trade in environmental goods and services sector, and the development of an environmental goods and services index to monitor trade flows. In this regard, the presence of the UWI's Sir Shridath Ramphal International Trade Centre in Barbados presents a research partnership opportunity for the NTESC.

Taxation, incentives and fiscal reform

Green fiscal policies can be used to elicit behavioural change and enhance the speed with which the country moves towards its green economy goals. UNEP (2011b) identifies five broad fiscal policy options:

- environmental taxes (e.g. carbon taxes, tax exemptions, and others);

- pollution charges;
- green subsidies;
- elimination of environmentally harmful subsidies; and,
- public expenditure on infrastructure.

The fiscal regime of Barbados tends to focus largely on environmental taxes and green subsidies. In 1974, the Government instituted a number of fiscal incentives to support renewable energy initiatives, such as the Fiscal Incentives Act, which granted import benefits and tax exemptions to solar water heater producers, and the 1984 Income Tax Amendment, which allows taxpayers to directly and fully deduct the cost of solar water systems from personal income taxes payable. At the same time, all electric water heaters became subject to 60 per cent consumption tax, which makes them financially unattractive (FTC Barbados, 2011).

As a result of this initiative, the penetration rate for solar water heaters now exceeds 50 per cent. Fiscal incentives, however, also imply a loss of revenue for government that needs to be taken into account, particularly given the current focus on fiscal consolidation around the globe. At present, Barbadians can write-off up to USD 2 500 per year for home improvements, inclusive of purchases of solar heaters. While exact figures are unavailable for tax receipts forgone as a result of purchases of solar water heaters, write-offs for these home improvement allowances tends to be about 7 per cent of total tax deductions. Green fiscal incentives can therefore have an important impact on the level of receipts from Government's tax effort.

Unfortunately, the Government does not have an estimate of the total value of waived taxes and customs duties over the intervening period to the present. This data would have been useful to assess the value and effectiveness of each particular incentive, thereby enabling current policy makers to identify areas for improved incentives.

In 2007, the GOB introduced three greening initiatives for the residents of Barbados: green homes, composting and recycling. The most relevant of these for the greening of the building/housing industry is the "Green Homes" checklist. More recently, the 2011 Financial Statement and Budgetary Proposals suggested a number of initiatives with respect to renewable energy and energy efficiency. These include:

- an increase in the energy conservation and renewable energy deduction from USD 2 500 to USD 5 000 for individuals, and USD 12 500 for registered small business;
- an extension of the energy conservation and renewable energy deduction to lessees;
- the write-off of 150 per cent of costs associated with the conversion to alternative energy over a five year period for specific businesses; and
- a rebate of up to USD 2 500 to farmers who retrofit structures to house livestock with solar energy.

Table 17 provides an assessment by stakeholders of the Government's current policy approach. Stakeholders especially noted that while much has been done to potentially elicit changes in consumer behaviour, the main challenge to the take-up rate remains public awareness and low investment capacity due to poverty.

There is a need to develop measures supportive of the preferred development pathways in agriculture, transportation, tourism and the built environment such that compliance or the adoption of new practices and technology do not become an additional burden. There are measures in place that allow for tax rebates on capital investments of up to 150 per cent on environment-friendly investments. It may be necessary to expand the definition such that services and other forms of support come within the ambit of the tax breaks.

Other mechanisms to encourage green practices are the creation of a revolving fund, offering tax incentives for actions that improve the environment or introducing concessions applicable to a system of collection depots, to which waste materials could be returned for reuse or recycling.

Finally, while new taxes are always a controversial issue, many states have been introducing so-called green taxes to elicit behavioural change. For example, all European Union (EU) member countries have taxed motor fuels in addition to value-added taxes. In Barbados, motor fuel use excises have recently been increased significantly. However, widespread exemptions to the tax base remain. The elimination of these exemptions would enhance the efficiency of tax collections and improve the Government's fiscal position.

Education, training and capacity enhancement

Investment in training and education helps smooth the transition to a green economy and also allows the population to exploit its potential benefits. During discussions with stakeholders, it was noted that there is a significant gap between the awareness and the availability of requisite skills and expertise to meet the needs of a green economy. Undoubtedly, there is need for investment in the labour force to support its acquisition of pertinent skills. In some areas, this process has already begun: experts are currently teaching solar PV installation courses and renewable energy modules are being offered by UWI. Notwithstanding, there are other gaps in important sectors that were identified which still need to be addressed: agro-industry, agriculture and fisheries. Moreover, professionals that possess the understanding of sustainable principles and the knowledge to apply them to new projects are still in short supply in the housing and building industry. In general, there will be a need for a variety of knowledgeable technicians, engineers and skilled tradesmen.

Gaps in the level of awareness, knowledge and capacity to respond to new agro-industrial opportunities in the agriculture and fisheries sectors have been identified. It is clear that there is a gap in the national ability to provide the requisite level of training and support to these

Table 17. Key findings from stakeholder consultation on fiscal instruments

Existing implementation mechanisms		Key findings from stakeholder meetings and experts' workshops
Local/National	Regional and International	
• Income Tax Act (Annual Budget) • Fiscal Incentives Act (1974) • Agriculture Incentives Scheme • Tourism Development Act • The Returnable Containers Act	• CARICOM Common External Tariff	Strengths • Green economy policies are now a part of the Income Tax Act and the Agricultural Incentives Scheme • Smart Energy Fund Challenges • Whereas incentives have been put in place, more needs to be done to increase awareness of them • Poverty and unemployment are factors that constrain what can/should be done Opportunities • Government must encourage involvement in ventures that can generate revenue instead of spending taxpayers' money • Focus more on production rather than usage Responses/Effectiveness • Green taxes can encourage firms to move to lower tax jurisdictions

sectors. Thus the feasibility of providing vocational training for the agricultural and fisheries sectors to address the shortcomings needs to be considered. Without knowledge and professional training of these sectors, their transition to become export as well as domestic market-orientated will not be realised. Such training does not have to be undertaken by the Government but it does need to create a supportive environment that creates a demand for such training and skills development.

There appears to be a lack of willingness among professionals (architects, engineers, technicians) in the housing and building sectors to ensure that green or sustainable principles are applied to the design, construction and operation of the built environment. It also includes those in the spatial planning discipline. The country though has a pool of well-trained professionals; therefore lack of personnel is not the problem, rather the lack of knowledge among consumers (that create the demand for green interventions) and the will among the various professions.

A capacity-building programme needs to be developed in partnership with professions such as architects, engineers, planners and others to ensure that practitioners are equipped with the necessary skills and that this becomes both, in the short run, a continuing professional development requirement and, in the long run, a requirement for professional accreditation. However, this has to be complemented by a regulatory requirement that developments have to be in accordance with sustainable principles, which will also require a cadre of regulatory officers who both understand what the statutory requirements are and have the necessary skills to engage with those involved in all stages of development to ensure that such requirements are met.

Other areas identified as having potential to contribute to a transition towards a green economy include: the development and adoption of renewable energy technologies (such as PV, wind and anaerobic digesters), wastewater treatment plants, rainwater harvesting, auditing and evaluation of resource use efficiencies. Government investment projects should be utilised to lead the demonstration of such technologies. Whilst some exemplars (e.g., Harrison's Cave) and skills in the workforce already exist, these will not be sufficient to meet the expected demand for such services. The report has highlighted examples that have been hampered by a lack of skilled personnel. Thus, one of the necessary enabling conditions will be to identify the nature and extent of demand for such skills and to look at ways in which the necessary skills training and development can be provided. This may well require the development of partnerships with extra-regional institutions, support from UNEP through their Cleaner Production Centres and Sustainable Consumption and Production programmes, as well as the development of national networks of internships and local training providers.

Standards and regulations

Standardisation and regulations, if properly utilised, provide end-users of the service or good with confidence in their purchase. The consumer knows that the producer has used consistent standards when producing the product and that the process has been subject to external assessment. Within recent years, collaborative standards initiatives (CSI) have been growing in importance as an instrument in the global governance arena (Litovsky et al., 2007). These CSIs attempt to address shortcomings in market systems, and even regulations, by building consensus in relation to rule-setting.

At the local level, the Barbados National Standards Institution (BNSI) was established in 1973 as a joint venture between Government and the private sector to prepare and implement national standards; encourage education and training in standardisation; certify products, commodities and processes that conform to national standards; and promote the use of standardisation as a tool for enabling sustainable development. To date, the BNSI has assisted a number of companies in achieving international certification. However, incentives could be developed to

The future generation of Barbados (Photo courtesy of the Natural Heritage Department)

encourage the greater uptake of certification schemes such as the ISO 14000 environmental management series and the European Union's Eco-Management and Audit Scheme (EMAS).

Other standards such as Leadership in Energy and Environmental Design (LEED) for the built environment should also be mandated. Indeed, there needs to be a review of those areas of production, manufacturing and the provision of services where pro-green standards are upheld with the goal of adopting them after making any requisite modifications to make them more comprehensive. Moreover, it is critical that any such review be extended to those areas where no standards currently exist but which must embrace pro-green initiatives if greening the economy is to become a reality.

The BNSI is currently working on standards in relation to various green technologies and management systems in such areas as solar heating systems for domestic hot water, methods of thermal testing of solar collectors and energy management systems. Through the CROSQ/IDB-MIF Project,[10] the BNSI is also seeking to enhance the competitiveness of small and medium-sized enterprises through industry, country and region-wide standardisation.

Recognising the potential marketing benefits of environmental certification, many hotels on the island have also been pursuing the Green Globe Certification[11], which operates under a worldwide 10-year license from Green Globe Limited, the owner of the Green Globe brand worldwide. This rating/certification attempts to promote energy efficiency, water conservation, reduction in the production of pollutants and generally contributing to healthier environments.

To date, only a few hotels on the island has pursued Green Globe Certification. The Green Building Initiative (GBI) is another organisation that seeks to "accelerate the

adoption of building practices that result in energy-efficient, healthier and environmentally sustainable buildings by promoting credible and practical green building approaches for residential and commercial construction".[12] The Future Centre Trust, a local NGO, has also developed its own certification programme[13] for businesses desirous of greening their operations. The Trust certifies a business as a "green business" if it meets certain benchmarked goals: waste reduction and recycling, energy conservation and renewable energy development, pollution control and management, water conservation, and education and outreach.

The regulations pertaining to the operation of wastewater treatment plants and the use of treated water should be revisited to ensure that they properly balance the needs of public health and the environment without being unnecessarily prescriptive.

With respect to solid waste, and in particular reused and recycled products, there is a need to ensure that the necessary testing and certification standards and procedures are developed and in place and that they conform to international standards.

There is a significant body of regulatory provisions. However, many of these still need to be updated, integrated, adopted and/or operationalized in order to meet the requirements and standards for greening the building/housing industry as a specific integrated policy objective.

Government procurement

Like most countries around the world, the public sector is the single largest purchaser of goods and services in Barbados. In 2010, net government expenditure was USD 834 million or about 20 per cent of GDP in that year (GOB, 2010). This expenditure is usually on acquisitions of goods such as office equipment, fixtures and fittings, vehicles, building maintenance, transport, cleaning and catering. Government can therefore act as a catalyst for the production and consumption of greener goods by shifting its purchasing policy.

The purchase of some of the goods used by Government ministries/departments are secured through the Central Purchasing Department, whose budget (approximately USD 1.75 million) represents just a small proportion of all the purchases made by Government. With the support of Inter-American Development Bank (IDB), the Government has taken steps recently to modernise the procurement process via a USD 5 million project entitled "Modernisation of the Barbados National Procurement System".

In 2006, the public sector energy conservation programme was initiated to reduce the cost of energy in the public sector. Key provisions of the programmes include mandates to increase fuel efficiency in government vehicles, install energy-efficient lighting and appliances and to do energy audits on government buildings. The programme also envisages establishing conservation obligations for various public entities and departments, and enforcing penalties for non-compliance.

In 2007, the Ministry responsible for the Environment produced a Procurement Brief that outlined the current status of procurement policy on the island, the rationale behind green procurement and a proposed programme for the implementation of a green procurement policy.

One of the potential hurdles towards the implementation of a green procurement policy in Barbados is the relatively high cost of these goods as well as their unavailability. UNEP (2011a; 2011b) therefore recommends that, in the short-to-medium term, governments focus on those goods and services that promise lower overall costs, consider long-term lease arrangements, and consider transforming tenders for individual products into tenders for integrated services.

Governance and institutions

Central to an integrated approach to the Government's green economy endeavours is the role of governance and the effectiveness of the supporting institutional framework. This scoping study highlights several polices and mechanisms already in place that can assist in enabling Barbados' green economy transition, as well as governance challenges that might affect its realisation, including:

- stakeholder buy-in;
- whole-of-government approach and singularity of vision;
- responsiveness of government institutions;
- institutional cohesion and collaboration,
- policy prioritisation;
- policy impact analysis capability;
- harmonisation of government reporting systems (economic reporting is separate to financial reporting);
- timely reporting and feedback systems;
- public information and accountability; and
- public sector-private sector trust and cooperation.

The Social Partnership was considered by the Experts' Meeting as having a major role in overseeing the implementation of Barbados' green economy agenda. Of note, is the Social Partnership's May 2011 declaration with respect to pursuing sustainable development in Protocol Six.[14] Environmental protection and the green economy were specifically integrated in the current Protocol by strengthening those clauses already subscribed to in Protocol Five and fully supporting initiatives which seek to reduce the country's carbon footprint and health and safety matters. The specific clauses are:

> "7.40 The Social Partners acknowledge and reaffirm Barbados' commitment to the full implementation of the Programme of Action for Sustainable Development of Small Island Developing States agreed to by the global community at the 1994 United Nations Global Conference on Sustainable Development of Small Island Developing States, held in Barbados.
>
> 7.41 The Social Partners fully subscribe to the concept of a low carbon resource-efficient green economy and the goal of Barbados becoming the most environmentally advanced green country in Latin America and the Caribbean and therefore support the principles of the United Nations Environment Programme and therefore fully support the promotion of all aspects of a green economy in Barbados.
>
> 7.44 The Social Partners therefore fully support those policies which acknowledge agreed criteria for sustainability and which seek to implement those principles and practices specifically designed to ensure that economic growth and development do not occur to the detriment of ecological capital."

With respect to clause (7.44), the principles of sustainable development articulated in the National Sustainable Development Policy should be built on to establish the required criteria for sustainability.

Measuring progress towards a green economy

Closely related and intertwined with the role of "**governance and institutions**" is that of "**data, information and communication**". An evidence-based approach to policy development and evaluation will require effective green economic, or sustainable development indicators, built on data, statistics and information systems. According to (Singh and Sealy, 2007), several initiatives have been undertaken to date with respect to establishing a system of sustainable development indicators in Barbados, including:

- establishment of the National Indicators Programme 1997, including participation in the UN Commission on Sustainable Development Testing Programme on Indicators for Sustainable Development;
- support for the National Workshop on Indicators for Sustainable Development in 2000;

- establishment of a Steering Committee on Indicators of Sustainable Development;
- participation in the Organization of American States (OAS) Project: Capacity Building in Creating Information Management Systems to Improve Decision-Making on Sustainable Development- Issues and Challenges for Caribbean SIDS,
- production of a State of Environment Report (GOB, 2001);
- consultation on developing Indicators for the 2006-2025 National Strategic Plan, including indicators for Goal 4, "Building a Green Economy – Strengthening the Physical Infrastructure and Preserving the Environment".

The Government is also engaged in:

- the Working Group on Environmental Indicators called for by the Forum of Ministers of Environment of Latin America and the Caribbean;
- various initiatives by CARICOM Secretariat on environmental statistics.

Singh and Sealy (2007) outlined several challenges to institutionalising environmental indicators in Barbados and specifically to data collection, including:

- lack of dedicated personnel;
- fragmentation of institutions involved in data collection;
- variation in media-type used to collect data;
- sensitivity of some data-types collected; and
- lack of coherent data-request structures among regional and international institutions.

As previously mentioned, Barbados is currently implementing the GOB-IDB Funded Modernisation of the Barbados Statistical Service Project (MBSS).[15] The USD 6.25 million project presents a significant opportunity for mainstreaming environment in core social and economic data and statistical systems. The MBSS can assist in addressing the afore-mentioned constraints. The Ministry of the Environment and Drainage is also collaborating with UNEP Regional Office for Latin America and the Caribbean (UNEP ROLAC) and the UWI Cave Hill Campus in the production of a national sustainable development indicators report under the Latin America and the Caribbean Initiative for Sustainable Development (Singh, A., pers. comm.).[16] The latter effort should be developed with a view to inform the MBSS.

The Government has also made several attempts at integrating Geographical Information Systems (GIS) in environmental, social and economic planning systems. The most successful effort to date has been the Environmental Management and Land Use Project (EMLUP). The application of cartographic information systems can improve the efficiency and effectiveness of green economic evidence-based policy processes in Barbados. However, the constraints highlighted the various applications of GIS. Given the cross-cutting nature of data and information systems of the three Rio Conventions and the transformation to a green economy, the National Capacity Self-Assessment (NCSA) project should be utilised strategically to assess and build the Barbados GIS capabilities. The data processing department of the Government should be strengthened to support a central policy and government-wide information and communication technology (ICT) and geographic information services and solutions (GISS) processes.
The report identified a number of potential sectoral opportunities. Bringing these ideas to fruition will require support in relation to some of the enabling conditions identified. As a preliminary assessment of these opportunities, Table 18 identifies the key supporting elements that might be necessary in relation to finance, taxation, incentives and fiscal reform, education, training and capacity enhancement.

Engineered Irrigation technology utilised in local agriculture. (Photo courtesy of the Anne E Gonzalez Collection©)

Table 18. Synoptic table of an assessment of opportunities identified at the sectoral level with respect to required and available policy support mechanisms

	Finance		Development, access and transfer of clean technology		Trade, tariffs and investment		Taxation, incentives and fiscal reform	
	REQ	AVA	REQ	AVA	REQ	AVA	REQ	AVA
Agriculture								
Cooperatives	PR	PA	-	-	-	PA	PR	-
Fish offal as organic fertilizer	PR	PA	PR	PA	-	-	PR	-
Use of household waste as fertilizer	PR	PA	PR	-	-	-	PR	-
Fisheries								
Process fish offal into higher value-added products	PR	PA	PR	-	-	-	PR	-
El Dorado skin into fish leather	PR	PA	PR	-	-	-	PR	-
Clean technologies	PR	PA	PR	-	PR	PA	PR	PA
Building/Housing								
Convert derelict sugar factories into waste-to-energy plants	PR	-	-	-	-	-	PR	-
Provisions and subventions	PR	PA	-	-	-	-	PR	-
Recycling communities	PR	-	-	-	-	-	PR	-
Transport								
Integrated approach to public transport	PR	-	-	-	-	-	PR	-
Standards for fuel mixes	PR	-	PR	PA	-	-	PR	-
Green vehicles	PR	-	PR	PA	PR	PA	PR	-
Tourism								
Marketing Barbados as a green destination	PR	PA	-	-	PR	-	PR	PA
Develop heritage tourism sites	PR	PA	-	-	PR	-	PR	PA
Creation of marine protected areas	PR	PA	-	-	-	-	PR	-

REQ= Required Policy Support Mechanism; AVA=Available
PR= Primary Requirement, SR=Secondary Requirement; PA= Partially Available

Education, training and capacity enhancement		Standards and regulation		Government procurement		Governance and institutions		Information, data analysis and communication		
REQ	AVA	REQ	AVA	REQ	AVA	REQ	AVA	REQ	AVA	
										Agriculture
PR	-	SR	-	PR	PA	PR	-	SR	-	Cooperatives
PR	-	SR	-	SR	-	-	-	-	-	Fish offal as organic fertilizer
PR	-	PR	-	SR	-	-	-	-	-	Use of household waste as fertilizer
										Fisheries
-	-	SR	-	-	-	-	-	SR	-	Process fish offal into higher value-added products
-	-	SR	-	-	-	-	-	SR	-	El Dorado skin into fish leather
PR	-	SR	PA	-	-	-	-	SR	-	Clean technologies
										Building/Housing
PR	-	SR	-	-	-	-	PA	-	-	Convert derelict sugar factories into waste-to-energy plants
PR	-	PR	-	SR	-	PR	PA	-	-	Provisions and subventions
PR	-	SR	-	-	-	PR	PA	-	-	Recycling communities
										Transport
PR	-	PR	-	SR	-	PR	PA	SR	-	Integrated approach to public transport
PR	-	PR	PA*	SR	-	PR	PA	SR	-	Standards for fuel mixes
PR	-	PR	PA*	SR	PA	PR	-	SR	-	Green vehicles
										Tourism
PR	PA	SR	PA*	-	-	PR	-	SR	PA	Marketing Barbados as a green destination
PR	-	SR	-	-	-	PR	PA	SR	PA	Develop heritage tourism sites
PR	-	PR	PA	-	-	PR	PA	SR	-	Creation of marine protected areas

Considerations for a green economy roadmap

The national principles of sustainable development are expounded in the 2004 Barbados Sustainable Development Policy, which provides a philosophical underpinning for a green economy. These are: **quality of life, conservation of resources, economic efficiency, equity and participation**. In developing a roadmap, the following operational principles are recommended: i) advancement of the well-being of society, particularly vulnerable groups; ii) achievement of the protection and/or restoration of ecosystems' health; iii) enabling of efficiency in resource/energy use and management; iv) promotion of participatory governance; v) enabling of responsive institutions, and vi) promotion of research, development and innovation.

To complement the above, the research and consultation for the Scoping Study suggested a few powerful ideas for sectoral investments and policy reforms to advance the green economy transformation in Barbados. These include: institutional strengthening; environmental fiscal reforms; sustainability standards and regulations; training programmes; an investment package and media campaign to promote green and healthy lifestyles, and; mainstream adaptation to climate change in different economic sectors.

The study also identifies a number of critical enabling conditions including:

- institutionalising the Green Economy Technical Steering Committee;
- promoting use of economic instruments such as resource-use fees for heritage, community and marine/nature-based tourism initiatives, use of taxes to elicit behavioural change when regulating utilities and services including wastewater;
- reforming trade and tariffs to support trade in clean technologies and resource efficient products;
- building capacity for a green economy through vocational training, trade schools, university and on-the-job training initiatives; and
- mainstreaming environmental and health considerations in public procurement decisions.
- Although there are existing legal instruments that can support the transition to a green economy, the findings of the sectoral analysis has given rise to the following recommendations which will further strengthen the legislative base for a green economy:
  - finalisation of environmental management legislation and operationalization of the Environmental and Natural Resources Management Plan;
  - establishment of water re-use regulations;
  - development of groundwater provisions legislation;
  - development of solid waste management legislation;
  - finalisation of legislation dealing with greening the building/housing sector and operationalization of the Barbados Building Code; and
  - strengthening of the policy guidelines framework as outlined in the Physical Development Plan (Amended 2003).

At the launch of the GESS on 9th March 2011, the Prime Minister noted that the roadmap for Barbados should encapsulate the following foci for the short- to medium-term:

- principles of sustainability;
- policy cohesion, governance and institutions;
- public sector leadership in conservation and sustainable procurement;
- private sector commitment through financing, investment and innovation;
- public education and engagement;
- a horizontally and vertically integrated partnership platform; and
- periodic monitoring and assessment.

Based on this vision, and the ensuing in-depth analyses and multi-stakeholder consultations, building blocks for a roadmap aimed at achieving Barbados' goal to become an environmentally advanced green country were formulated and are presented in the following pages.

Policy cohesion, governance and institutions

Barbados' world-renowned Social Partnership, a tripartite mechanism established to formulate a united response to the country's economic and social challenges, was identified during stakeholder workshops as the most appropriate mechanism to oversee Barbados' transition to a green economy. The Social Partnership, given its composition (business, labour and government) and strategic role in national development, and its new emphasis on a green economy and the implementation of the BPOA, as articulated in Protocol VI, should have umbrella responsibility for monitoring, reviewing and reporting on Barbados' green economy roadmap.

Moreover, a Sustainability Policy Impact Assessment Framework (SIAF) should be developed, according to the operational principles, and administered by the Social Partnership for the purpose of evaluating the strategic effect of newly articulated sector-specific policies. The SIAF would provide a structured consultative mechanism for identifying gaps and articulating interventions that would result in an alignment of policies with the operational principles. To buttress the Social Partnership in activating the SIAF, a 10-member Sustainability Strategic Advisory Group should be established. These persons are to be chosen from among those serving in the Cabinet-appointed Green Economy Technical Steering Committee as well as from a GESS stakeholder consultation process. The purpose of this body would be to provide support to the Social Partnership in mainstreaming green economy initiatives.

It is essential that the Social Partnership be afforded a research secretariat to support the above-mentioned functions. A co-funding strategy for this secretariat could be developed by the Social Partnership. Furthermore, the Social Partnership should be commissioned to publish a biannual report regarding Barbados' progress in implementing the green economy roadmap. Other sectoral institutional interventions recommended are:

Agriculture

- Establish an overarching programme for strengthening agricultural cooperatives in Barbados.
- Implement an institutional strengthening and training programme for "green" agricultural extension services.

Fisheries

- Execute an institutional strengthening programme for the Fisheries Division and harmonisation of the supporting legislative framework.
- Create and implement a sustainable business and financial model to support the development and management of marine protected areas as well as develop fiscal incentives and innovative financial mechanisms to promote the use of fish waste in agriculture.
- Undertake a feasibility study on creating a sustainable agriculture and fisheries micro-credit scheme, focusing on accessing clean and more efficient technologies.

Transport

- Develop an integrated public transportation policy and investment programme, and establish a vehicle emission testing facility.

Building/Housing

- The legal operationalisation and enforcement of the Barbados Building Code (1993).
- Review and upgrade the Barbados' Integrated Solid Waste Management Programme, with special emphasis on recycling communities.
- Expediting the implementation of the Water and Sanitation Upgrade Project.

Tourism

- Expedite the establishment of the Barbados National Park and System of Protected Areas.

Public sector leadership and public procurement

There are several examples in Barbados of public sector innovation and initiative in operationalizing various aspects of a green economy. It is critical that such efforts be intensified in the following areas: implementation of the Public Sector Energy Conservation Programme; establishment of sustainable design criteria for public sector social housing initiatives and; public sector social and environment reporting pilot project with a focus on statutory corporations. In addition, a government-wide climate adaptation project should be undertaken to enable ground water recharge through "soft-scapes and infiltration technologies"; Warrens Suburban Centre should be enabled to become a 'Green Urban Centre', and; the BIDC should spearhead a Warrens Industrial Park Eco-Innovation Initiative with a focus on improving resource efficiency.

Moreover, the Public Investment Unit, as the coordinating agency for capital projects, needs to be strengthened and encouraged to integrate sustainability principles throughout the procurement and public investment process. A multiplicity of skill sets should be acquired to support the agenda of the Unit. The feasibility of establishing 'A Sustainability Design Brief' as a standard requirement for all tenders should also be undertaken.

Private sector commitment

A comprehensive impact assessment of the existing fiscal instruments to support environmental management is needed to reform and strengthen such measures. In addition, the Green Business Programme administered by the Future Centre Trust should be evaluated for establishment as a national certification scheme in collaboration with the EPD and the BNSI.

The environmental and social risk analysis training undertaken by TBBA, UNEP-FI and the Ministry of the Environment and Drainage should be expanded to include all other financial institutions in Barbados and the Eastern Caribbean.

The following are other actions to enhance private sector commitment:

- initiate and launch a Prime Minister's Corporate Social and Environmental Annual Award Scheme;
- conduct a feasibility study and mobilize private sector resources for establishment of the Resource Efficiency and Technology Innovation Centre (RETIC). It is proposed that the IDB's Competitiveness Programme be accessed for implementation support through its Cluster Facility.
- facilitate investment in marine protected areas. The GEF SGP should be approached for seed financing to facilitate such conservation efforts. The recommendations of the Folkestone Redevelopment Programme should be reviewed and implemented.
- promote the efforts of Barbados Chamber of Commerce and Industry's (BCCI) to green its facilities across the private sector;
- develop incentives to encourage research and development by local enterprises on cost-effective, alternative energy options under a joint private–public sector partnership.

Public education

- Develop a national public education and information strategy to promote a green economy, including the use of social and electronic media.
- Host an annual television series on Barbados' Best Practices built on case studies identified in the GESS.
- Refocus the Ministry of the Environment and Drainage's grant fund for NGOs towards green economy initiatives at the community level.
- Create and implement constituency-wide environmental enhancement initiatives under the Government's Constituency Empowerment Councils.

Partnerships and synergies

Achieving a transition to a green economy is not something that a government can hope to achieve by itself. It will be necessary not just to draw on national expertise, but to look beyond national borders and partner with actors in the international community, especially with other SIDS.

In the areas of capacity building and knowledge transfer, partnerships with international bodies will be advantageous to Barbados. This could include partnering with UNEP's Resource Efficiency and Cleaner Production Programme and its national centres across the globe to help develop local approaches to green technologies. The UNEP Sustainable Production and Consumption Branch is also a likely candidate for cooperation, information sharing and technical support.

Other partnerships that should be explored for the purpose of capacity building are the European Union – for assistance with developing green accounts coming out of The Economics of Ecosystems and Biodiversity (TEEB) Project, as well as other countries that have embarked upon similar exercises. This would include partnerships with the BNSI and the Barbados Statistical Service to assist them in preparing such accounts as well as assistance with developing appropriate national green standards. To support this, specific assistance might be available through the GEF.

The development of sustainability certification programmes and accreditation, in particular, will require partnerships with certifying bodies. A programme to identify certification schemes that Barbados should seek to adopt or emulate and the potential partners should be launched. As part of this effort, there is a need to identify particular projects that would support transitioning different sectors of Barbados' economy.

At the local level, the social partnerships will be critical to securing a national consensus.

Periodic monitoring

The establishment of targeted indicators for purposes of monitoring and evaluating the impact and trends associated with sector-specific green economic policies and the broader sustainable development policy is urgently required.

As a follow up to the GESS, it is therefore recommended that the UWI, with the support of the Initiative for Latin America and the Caribbean (ILAC) led by UNEP's ROLAC, produce sustainable development core indicators.

To support this process, a technical advisory group drawn from the Green Economy Technical Steering Committee should be established.

It is also recommended that Barbados update its State of the Environment Report following development of the indicators.

In collaboration with the Barbados Statistical Service and the Ministry of the Environment and Drainage, UWI should undertake a Green Accounting Project in Barbados (see Appendix on Green Accounting in the full report).

Promote SIDS-SIDS knowledge transfer of green economic policies and practices

The GESS highlights on-going initiatives led by various institutions consistent with the green economy concept, such as Barbados Sustainable Finance Group, which is reflective of the societal stakeholder approach pursued

by the island. The group is a partnership between the Government of Barbados, UNEP-FI and the banking community. It seeks to raise the level of awareness and education among stakeholders in the local financial sector in relation to the constraints and potential opportunities associated with the adoption of a sustainable finance agenda. The main results to date include stakeholder training, preliminary research and dialogue fora.

A repository of several case studies is appended to the full report. Beyond their catalytic value at the local level, they are also replicable in other SIDS. It is therefore recommended that the best practices be submitted to the Rio+20 website and shared at the Caribbean Green Economy Forum, in Barbados, in March 2012.

Table 19. Capacity-building needs and actions required

Capacity-building needs	Actions required
Private sector research and development	• Tax and investment measures that would encourage businesses to invest in research and development.
Skilled workers in the area of green design, green standards and monitoring and evaluation of these processes.	• Train staff of departments/agencies such as Town and Country Development Planning Office, the Building Authority, the Environmental Protection Department, the Sanitation Services Authority, the Electrical Engineering Department, departments servicing agriculture and fisheries and the Barbados Water Authority. • Provide the private and public sector with incentives for retraining and retooling of staff. • Based on the above, a human resource capacity-building programme directed towards the goal of greening the economy should be developed via the Social Partnership.
Modernized Statistical Services	• Completion of the Statistical Service Modernisation Programme (given the importance of data collection, Green Economy indicators and proposed development of green national accounts).
Shift in attitude within the public and private sector	• A strategy and policy for on-going education, outreach and information of targeted publics.

Additionally, the Prime Minister, in his statement of 9th March 2011, suggested the establishment of a Green Economic Policy Institute for SIDS. The UWI Cave Hill Campus Principal has since commenced discussion with the GOB and UNEP in this regard. It is further recommended that the Institute, upon its establishment, host a SIDS-SIDS Knowledge Transfer Platform of Green Economy Policies and Practices.

Capacity-building

A critical component of a green economy initiative is having the right mix of skills and knowledge to support the transition. In numerous stakeholder consultations, it was noted that government departments that interface with businesses or the public and implement policy are often short-staffed. Many private sector actors also mentioned the need for government to build capacity to enable them to play their part in transitioning to a green economy and to engage in new economic opportunities. Having the human capital for this purpose is a critical enabling condition, which will have to be met.

Moreover, it is clear that there are new areas of need, such as certification, which will require support. All of these will require capacity-building at different levels and by different types of institutions in the form of vocational and technical training, graduate and postgraduate training, and continuing professional development. There is an exigency, therefore, for a better understanding of the country's capacity-building needs to support a green economy, as well as the identification and definition of roles of stakeholders involved (Table 19).

In addition, the following further recommendations are advanced:

- The Environmental and Social Risk Analysis Training undertaken by TBBA, UNEP-FI and the Ministry of the Environment and Drainage should be expanded with a view to systematically including all other financial institutions in Barbados and the Eastern Caribbean. The Cave Hill School of Business UWI could be approached as an academic partner in this regard.
- A short course in a resource efficiency programme for property and operations managers should be developed in the short- to medium-term. The tourism sector should be targeted for recruits at the earliest possible time. The Barbados Community College Industry Services Unit should be approached as well.
- Some consideration should be given to integrate a resource efficiency stream in UWI-CERMES' postgraduate programme offerings, with an emphasis on water, waste and energy.
- Given the synergies among the MEAs, the GOB should proceed to redirect the focus of its GEF National Capacity Self-Assessment Project towards strengthening pertinent capacities within government, the private sector and civil society institutions in the context of green economy priorities.
- The National Development Scholarship should include five of the following areas in its annual postgraduate offerings: Biotechnology – Food Processing Technology – Urban Planning – Environmental Planning – Transport Planning – Tourism Planning, with emphasis on Nature, Heritage or Community Tourism – Marine Spatial Planning – Protected Areas Management – Environmental Design – Industrial Ecology/Resource Efficiency – Sustainable Building Technologies – Electrical Engineering – Public Health Engineering/ Environmental Engineering – Development Economics – Sustainable Supply Chain/Logistics Management – Trade and Climate Change – Cartographic Information Technology/Systems Design.

Establishing a science-policy research platform

Given its core competencies, the UWI is a willing technical partner in advancing sustainable development and green economy priorities in Barbados and the CARICOM region. The preparation of the GESS is testimony to this fruitful partnership between science and policy. Several areas for further studies have been identified in the Table 20.

Every effort should be made to encourage partnerships with development agencies and governments to facilitate the creation of a Science-Policy Platform for enabling green economy and sustainability targeted postgraduate research for the Caribbean.

Table 20. Proposed areas of study

Sector	Proposed green economy research
Agriculture	• Undertake the feasibility of establishing: i) a payment for ecosystem Services in the agricultural sector and ii) an agri-insurance scheme for small-scale producers (fisheries and farmers). • Research into 'waste to energy' options, utilising the current derelict sugar cane factories.
Fisheries	• Undertake a systematic technical and economic feasibility of utilizing fish skin as leather for niche products. • Undertake the feasibility of establishing a regional eco-label scheme for sustainably harvested fish in Barbados and the Caribbean.
Building/Housing	• Research on the social, cultural and economic impacts of high-rise communities. • Development of best practice guidelines for harvested rainwater, wastewater treatment systems or on-site solid waste management facilities. • Analysis of investment data for public and private sector investments in energy efficiency in both residential and commercial buildings. • Evaluate the economics of alternatives to local sand resources in the building and construction industry. • Explore opportunities to extend community-level recycling programmes by building on the experiences of the Future Centre Trust and the Solid Waste Project Unit of the Ministry of the Environment and Drainage. • Conduct socio-environmental cost-benefit analysis on green low cost housing options to meet demand for social housing.
Transport	• Assess the cost of retrofitting existing bus fleet(s) to make them compatible with the new green technology. • Design and implement a mode-switching programme (shifting travel from the private vehicle to other sustainable modes, such as public transit, park and ride systems, carpooling, cycling and walking), within a specified zone. • Develop a master plan/planning strategy that guides the use and integration of a non-motorized mode of transport over a medium term period. • Conduct a cost – benefit analysis of alternative fuel options for the transport industry. This assessment could help to significantly reduce the foreign exchange spent on fossil fuels. • Develop government incentives to encourage the private sector to get involved in research and development in the greening of the transport industry. • Develop and implement climate change adaptation plans for air and seaports.
Tourism	• Development of a system of tradable permits as a market-based solution to environmental management for the tourism sector.
Policy Support Mechanisms	• A study on the impact of integrating sustainable criteria in the Central Purchasing Department's procurement process on small and medium entreprises (SMEs) should be undertaken. • The role of the Fair Trading Commission in regulating economic performance and consumer service in the delivery of transport, water and solid waste services. • An assessment of the status of trade in environmental goods and services in Barbados with a view to developing an environmental goods and services index. • In-depth sector specific study of fiscal policy options for supporting green industries and technologies. • Analysis of national energy costs of production and importation of main raw materials (concrete, aluminium, wood, steel) used in the construction industry with the purpose of developing a sustainable energy plan and best practice guidelines. • Assess need for curricular changes in tertiary facilities to support a green building industry. This would represent an extension of public education and training efforts that currently include the activities at the Barbados Training Board where vocational opportunities are available for local skill enhancement such as instructional training for prospective SWH technicians.

Statue of Barbados' Father of Independence, Right Excellent Errol Walton Barrow
(Photo courtesy of the Anne E Gonzalez Collection©)

Conclusions

As a small island developing state, Barbados faces special challenges in relation to its small size, remoteness from large markets, and high vulnerability to economic and natural shocks. It also has a high dependence on imported fossil fuels and relatively fragile ecosystems. Its transition to a green economy, therefore, offers opportunities for further diversifying the economy, increasing resource efficiency and supporting the goals of poverty reduction and sustainable development. In fact, tremendous potential exists for greening the agriculture, fisheries, building, transportation and tourism sectors.

To fully realize these potential opportunities, the country will have to address various sector-specific challenges, such as: lack of research and development in agriculture; lack of standards legislation in fisheries; lack of training programmes and regional experts in building/housing; unsustainable public attitude to green initiatives in transportation; heavy dependence on imports, as well as low occupancy rates in tourism. It will also be necessary to develop the supporting enabling conditions to facilitate the transition in the areas of financing, development, access to and transfer of clean technology, trade tariffs and investment, taxation, incentives and fiscal reform, education, training and capacity-enhancement, standards and regulations, and government procurement. Given the importance of these sectors, and the already existing legislation that support behavioural change, it is likely that there could be spill-over effects on other sectors of the economy.

Almost sixty years ago, Barbados embarked on a plan to diversify its economy away from one that is sugar-based to tourism. This vision resulted in the transformation of the island and provided its citizens with a higher standard of living. A transformation to a green economy now portends a similar moment in history, whereby the country can enable the next great economic transformation that benefits both current and future generations.

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Notes

1 Team members are from the University of the West Indies, Cave Hill Campus unless stated otherwise.
2 Ecoisle Consulting Inc.
3 Formerly the Ministry of the Environment, Water Resources and Drainage.
4 An importance score is assigned to each category based on a 10-point Likert scale, where 1 denotes insignificance and 10 means very important. The importance of the investment gap is quantified by subtracting column 2 from column 1. A positive value in column 3 indicates that greater investment is required to enhance a particular strength or minimization of an identified challenge in the category column.
5 In general, EAF is understood as requiring: (1) definition and scientific description of the ecosystem in terms of scale, extent, structure, functioning; (2) assessment of its state in terms of health or integrity as defined by what is acceptable to society; (3) assessment of threats; and (4) maintenance, protection, mitigation, rehabilitation, etc., using (5) adaptive management strategies. Fisheries and Aquaculture Department. Terminology and Paradigms. FAO Corporate Document Repository. 2003. http://www.fao.org/DOCREP/006/Y4773E/y4773e03.htm. Accessed March 7, 2012.
6 Ministry of Economic Affairs, Empowerment, Innovation, Trade, Industry and Commerce. 2010. Barbados Economic and Social Report 2009, pp. 69-70.
7 Numerical estimates of the size of reduction are currently not available.
8 BRT is a flexible, rubber-tired rapid-transit mode that combines stations, vehicles, services, running ways, and Intelligent Transportation System (ITS) elements into an integrated system. BRT applications are designed to be appropriate to the market they serve and their physical surroundings, and they can be incrementally implemented in a variety of environments. In brief, BRT is an integrated system of facilities, services, and amenities that collectively improves the speed, reliability, and identity of bus transport. (TRB, 2003). http://www.gobrt.org/CaseStudies.pdf. Accessed March 12, 2012.
9 Singh, A.D. 2011. Submitted in the review of the GESS. Ms. Amrikha D. Singh is responsible for Sustainable Development Programming, Trade and Environment matters and Indicators in the Ministry of the Environment and Drainage of the Government of Barbados.
10 Source: https://crosq.org/index.php?option=com_content&view=article&id=10:crosqidb-mif-sme&catid=28:idb-sme-project&Itemid=63
11 Source: http://greenglobe.com/register/standard/. Accessed March 15, 2012
12 Source: http://www.thegbi.org/about-gbi/. Accessed March 15, 2012.
13 Source: http://futurecentretrust.org/main/wp-content/uploads/2010/03/GBB-Brochure-August-2010.pdf. Accessed March 15, 2012.
14 The Social Protocol, articulated by the Social Partnership comprising Government, Private Sector and the Trade Unions, is another key planning-policy-governance framework guiding Barbados' development. The Social Partnership first formalized their relationship in 1993 by signing an agreement entitled "Protocol for the Implementation of a Prices and Income Policy 1993-1995". In May of 2011, the Social Partners signed the 6th Social Protocol.
15 Source: http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=1589333
16 Singh, A.D. 2011. Submitted in the review of the GESS. Ms. Amrikha D. Singh is responsible for Sustainable Development Programming, Trade and Environment matters and Indicators in the Ministry of Environment and Drainage of the Government of Barbados.

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